DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

MISCELLANEOUS INVESTIGATIONS SERIES
MAP I–1830
Explanatory pamphlet accompanies map

GEOLOGIC MAP OF THE LYNNDYL 30- BY 60-MINUTE QUADRANGLE, WEST-CENTRAL UTAH

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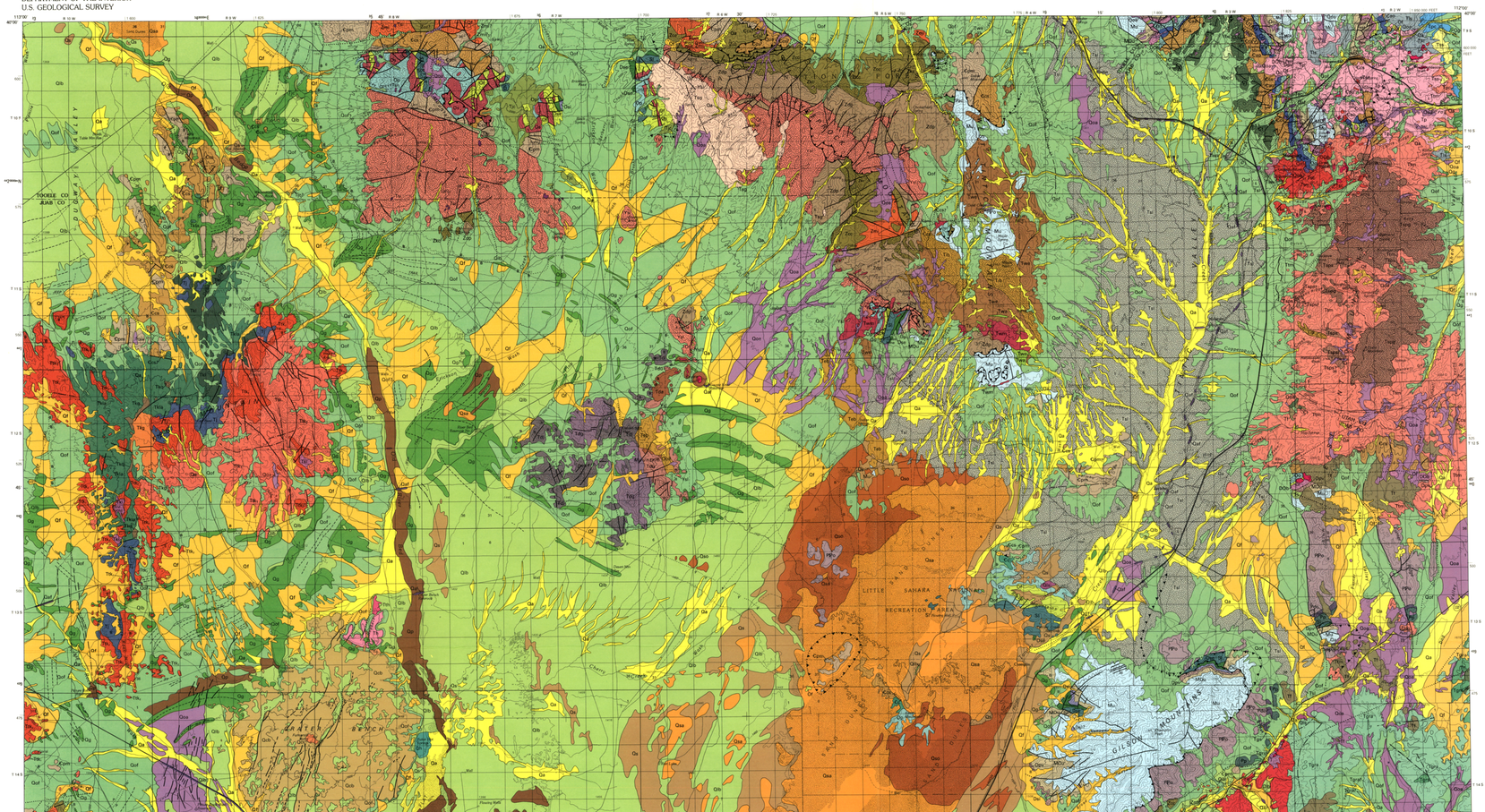
1989



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DESCRIPTION OF MAP UNITS

Qa ALLUVIUM (HOLOCENE)—Stream, river, and channel deposits consisting of clay to cobble-size, poorly sorted, moderately to well-bedded, undissected detrital material. Commonly less than a few meters thick but locally may reach 10 m. Locally may include alluvial fan deposits (Qf). Overlies Lake Bonneville shoreline features

Qf ALLUVIAL FAN DEPOSITS (HOLOCENE)—Unconsolidated, poorly sorted alluvial fan deposits of sand and gravel, slightly dissected and alluvial (Qoa) and older fan deposits (Qof). Deposits are crudely stratified, subhorizontal to moderately dipping. Thickness is variable, commonly 10 m. Commonly overlie the older alluvial deposits. Locally may include alluvium (Qa) and older fan deposits (Qof). Generally subdued topography and smaller in areal extent and volume than older fan deposits

Qls LANDSLIDE DEPOSITS (HOLOCENE)—Rockfall-rock slide to weakly consolidated, coarse- to fine-grained quartz sand and silt with some clay forming flat-lying and cross-bedded deposits, some rotated, and slight stabilized dunes derived principally from Lake Bonneville deposits to the south-southwest. Largely divided into

Qlsb Active dunes—Loose sands in south-central part of map area, part of which is designated Little Sahara National Recreation Area. In places active dunes overlap bedrock ridges whose exposure varies with the amount of wind action, for example, the Sand Hills. Thickness unknown but in places the dunes are more than 20 m high

Qlsd Old dunes—Weakly consolidated sand in dunes which appear to be stabilized, at least in part, by a light cover of vegetation. Thickness unknown but in places the old dunes are exposed over a vertical distance of more than 60 m

Qp PLAYA DEPOSITS (HOLOCENE)—Unconsolidated flat-lying silt and moderately expansive clay derived from Lake Bonneville sediments that accumulated in closed basins in or near the Old River Bed. Thickness unknown but probably does not exceed a few meters

Qls LANDSLIDE DEPOSITS (HOLOCENE)—Irregular bodies of rock and soil that have moved downward and outward from an adjacent source area. Many more exist than are shown. Some may be pre-Holocene in age

Qaf ARTIFICIAL FILL (HOLOCENE)—Man-made debris, slag heaps, mine dumps, mill tailings, and earthworks constructed from local materials. Some, such as embankments for dams, highway and railroad roadbeds, and engineering structures are engineered fills; others are random accumulations of various materials. Although not shown as the artificial fill unit, much of the Intermountain Power Project site is covered with graded and compacted local and imported earth materials

Qt STREAM TERRACE DEPOSITS (HOLOCENE)—Unconsolidated, poorly sorted alluvial deposits of silt, sand, and gravel forming a crudely layered nearly flat-lying veneer on older geologic units adjacent to present drainage channels. Mapped only along the Sevier River near Leamington where they may be as much as 10 m thick

Qch HOT SPRING DEPOSITS (HOLOCENE AND PLEISTOCENE?)—Chiefly light-gray clay, silt, and sand and reddish-brown manganese-rich calcareous tufa in a spring mound. Mound has built up around hot spring in part by precipitation of minerals from spring water but largely by entrapment of eolian sediment by vegetation and wet ground. Thickness is less than 5 m. Mapped only at Baker Hot Springs on east side of Crater Bench

Qlb DEPOSITS OF LAKE BONNEVILLE (PLEISTOCENE)—Lake sediments which consist of interlayered white, light-gray, brown, tan, and yellowish-gray clay, silt, sand, marl, and gravel. The clay, silt, and sand range from light-gray, yellowish-gray and tan to brown depending on exposure to desiccation and weathering; the light colors prevailing in natural outcrops, the fine clastic sediments commonly occur as alternating layers. Well-exposed near Leamington where thickness exceeds 80 m. Well widely exposed in southwest quarter of map area, is yellowish-gray to white and composed almost entirely of minute calcareous shells, most of the marl is laminated and massive but some is fissile. In several places the marl is underlain by rusty-colored gravel, possibly representing one or more old soil horizons. Maximum thickness of exposed marl is 5 m on east side of Drum Mountains. Locally the land surface is strewn with oolitic formed calcareous shells coated with calcium carbonate. Black basaltic sand is present in marl near Leamington (Varnes and Van Horn, 1961; 1984), and rhyolitic ash is present in lake beds west of Lynndyl (Keuai and Patterson, 1980); radiocarbon age dates from lake beds adjacent to basaltic ash horizons range from about 11,000 to more than 32,000 ±B.P.; dates from shells west of Lynndyl range from about 11,000 to 30,000 ±B.P. Lake beds also are correlative with the Bishop Tuff (700,000 ±B.P.) and fission track dates from zircons in the ash give an age of 730,000 ±73,000 ±B.P. (Keuai and Patterson, 1980)

Qg GRAVEL AND SAND DEPOSITS (PLEISTOCENE)—Spits, bay-mouth bars, tombolos, cuspate forelands and bars, and crescent beaches present at or below the Bonneville shoreline, which ranges in elevation from 1559 to 1593 m (Currey, 1982) across this quadrangle; features are especially well-developed in west half of map area. Consist largely of reworked old alluvial fan deposits and contain moderately well-sorted sand to cobble-size rounded clasts. Mostly lacustrine but deposits but includes some fluviatile stream terrace gravels interbedded in lake sediments along the Old River Bed and along the Sevier River between Leamington and Lynndyl (Varnes and Van Horn, 1961; 1984). Includes The Snowplow (southwest corner of Simpson Mountains), Reservoir Butte and Gun Butte (see fig. 6) of Gilbert (1890) and numerous other well-defined and well-preserved coarse shoreline deposits in the Sheep Pen Hills, west slope of the Simpson Mountains, Keg Mountain and adjacent to Desert Mountain, and the wave-bench deposits of Gulgardi and Bull Valleys. Thickness is 50 m thick

Qoa OLDER ALLUVIUM (PLEISTOCENE)—Stream, river-channel, and basin deposits consisting of clay to small boulder-size detrital material. Poorly sorted, crudely stratified, and moderately to deeply dissected. Thickness ranges from a few to tens of meters. Locally includes old stream terrace deposits

Qof OLDER FAN DEPOSITS (PLEISTOCENE)—Semi-consolidated, poorly sorted alluvial deposits of sand and gravel forming large fans bordering upland areas. Deposits, several tens of meters thick, are crudely stratified parallel to the sloping fan surface, and commonly are deeply dissected. Older fan deposits lower than the Bonneville or many places even reworked by wave action and marked by strand lines. Locally include coarse- and fine-grained deposits of Lake Bonneville origin, including alluvium and older alluvium (Qoa). Include talus deposits in the Sheeprock Mountains and wave-worked talus deposits surrounding Crater Bench. In northwest part of map area include loess, alluvium and colluvium, pre-Wisconsin (glaciation) soil, and landslides (Goode, 1961); and east of Eureka include old stream terrace gravels (Morris and Lovering, 1979)

Qtr SALT LAKE FORMATION (PLIOCENE AND MIOCENE)—Predominantly reddish-brown to gray-to-orange, semi-consolidated, poorly sorted and calcareous clay, with lesser amounts of green and red tuffaceous bentonitic clay, light-gray to white marly limestone, and thin pebble to cobble gravel lenses. Includes a poorly exposed section of reddish-brown to pink sandy silt and clay more than 30 m thick uncomformably overlies by Quaternary basalt at the south edge of Crater Bench. Includes some tuffaceous deposits thought to correlate with the Brigham City Formation of the Salt Lake Formation (H.T. Morris, oral commun., 1983; Izett and Wilcox, 1982). Thickness exceeds 600 m (Morris and Kogl, 1976)

Tb FLAGSTAFF LIMESTONE (EOCENE AND PALEOCENE)—Cream-colored silty, sandy, and algal limestones, shale, sandstone, and pebble conglomerate present only in extreme southeast corner of map area where a tongue of red, well-cemented cobble conglomerate is interlayered with the limestone. Section exposed is 60 m thick

TKg CANYON RANGE FORMATION OF STOLLE (1978) (PALEOCENE AND EOCENE) UPPER CRETACEOUS)—Synorogenic poorly-sorted, red-weathering, weakly-cemented, pebble to cobble conglomerate with brick-red sandstone and shale interbeds overlain by an interbedded sequence of yellowish-orange to purplish-gray coarse to fine clastic and limestone strata. Correlated with the Flagstaff North Horn, and Price River Formations; farther east. Present along east side of the Canyon Mountains. Originally mapped by Christiansen (1962) as the Upper Cretaceous Indianola Group. Called the Upper Cretaceous and Paleocene North Horn Formation, Price River Formation and Indianola Group undivided by Campbell (1979), and mapped by Higgins (1982) as the Cretaceous and Tertiary. Conglomerate contains abundant Paleozoic and Precambrian large shale blocks of limestone. About 1,050 m thick

TKn NORTH HORN FORMATION (PALEOCENE AND UPPER CRETACEOUS)—Brick-red conglomerate, sandstone, siltstone and some silty and sandy limestone. Present only in extreme southeast corner of map

EXTRUSIVE AND SEDIMENTARY ROCKS

Qcb BASALT OF CRATER BENCH (PLEISTOCENE)—Black, fine-grained flows of basaltic andesite, grading from vesicular to non-vesicular upwards from base of flow units. Some in Fumarole Butte flows of Hogg (1972) and basalts of Crater Bench of Gulgardi and Rush (1981). Overlies lacustrine deposits of the Salt Lake Formation; overlain by Lake Bonneville deposits. K-Ar age determined as 0.88 m.y. (Peterson and Nash, 1980) and 0.95±0.1 m.y. (Gulgardi and Rush, 1981). Maximum thickness estimated to be about 180 m near Fumarole Butte thinning to a few meters or less at the margins

Qcc CINDER CONE DEPOSITS (PLEISTOCENE)—Remnant of cinder cone around a vent, presumed source of the basalt of Crater Bench (Qcb). Consist of densely welded cinders intruded by fine-grained dense basalt and overlain by loose cinders. Exposed thickness is 50 m thick

Tcs BASALT OF THE HOGBACK (MIOCENE)—Black vesicular tholeiitic basalt flows as much as 45 m thick from The Hogback of Crater Bench. Equivalent to the North Butte flow of Hogg (1972), and the basalt of the Hogback of Gulgardi and Rush (1981). K-Ar age 5.0±0.4 m.y. (Gulgardi and Rush, 1981) and 6.03 m.y. (Peterson and Nash, 1980). Includes thin gravel and sandy beds in the upper half of the unit. Overlies Paleozoic rocks in the Sheeprock Mountains

Tpc PINYON CREEK CONGLOMERATE (MIOCENE)—Grayish-tan to reddish-brown conglomerate composed of sub-angular to rounded, pebble- to boulder-size monolithologic volcanic clasts interbedded with light-gray to white volcanic debris. Conspicuously bedded; lensing and channeling are common. Individual beds may be poorly- or well-sorted. The Pinyon Creek Conglomerate is mapped only in the northeast corner of map, where it is more than 300 m thick. Included, along with Miocene conglomerate (Tc) at The Hogback, in the Miocene gravel unit by Morris (1978). Age is early Miocene

Tj JASPEROID (OLIGOCENE?)—Silicified and opaline? Tertiary volcanic and Paleozoic carbonate rocks whose origin is apparently related to Oligocene Topaz Mountain Rhyolite are present near top of section. Mapped only at north end of Crater Bench as Tertiary conglomerate by Hogg (1972), Peterson and Nash (1980), and Gulgardi and Rush (1981). Age is late Miocene

TQmz TOPAZ MOUNTAIN RHYOLITE (MIOCENE)—Chiefly light-gray alsik rhyolite flows with some black obsyrphite at base of flow units and some white to tan interbedded ignimbrite. Four fission-track and two K-Ar dates of flows in the type area range from 6.1±0.4 to 6.8±0.3 m.y. (Lindsey, 1978). Included in the rhyolite of Topaz Mountain by Morris (1978). Age is late Miocene. On this map divided into the rhyolite of The Hogback and the rhyolite flows, plugs, and dikes of Keg Mountain

Trh Rhyolite of The Hogback—Light-gray flow-banded rhyolite with some black obsyrphite, both of which contain phenocrysts of sanidine up to 4 mm long and quartz. Lithophysae as large as 2 cm in diameter in the rhyolite and filled with drusy quartz crystals. Medium to a coarse irregular vuggy surface. Exposed in upper half of Crater Bench and K-Ar dates of Crater Bench. Thickness exceeds 60 m (Morris and Kogl, 1976)

Trk Rhyolite flows, plugs, and dikes of Keg Mountain—Light-gray to reddish-gray flows, plugs, and dikes of aphanitic to porphyritic rhyolite; some units have chilled margins of obsidian and spherulitic rhyolite, and locally include lithophysal zones, minor flow breccia, ten to white compact friable tuff locally silicified or welded, and gray quartz latite porphyry containing numerous phenocrysts of quartz, sanidine, and plagioclase. Total thickness unknown but thought to exceed a few hundred meters. These volcanic rocks extend eastward from the type area in the Thomas Range (Lindsey, 1979) and also contain accessory topaz, topaz bearing rhyolite, and pseudobrookite but in lesser amounts than in the type area (Staub, 1975). Petrologically indicated two successive units. The, being the older, commonly separated by tuff and (or) vitrophyre from the younger Tru, flow. Includes the Keg Mountain rhyolite unit; porphyritic rhyolite of West Mountain unit, Keg Mountain tuff unit, and Drum Mountain rhyolite unit of Staub (1975) and the rhyolite of Keg Mountain of Shawe (1972) and Lindsey and others (1975) in Keg Mountain. Age of rhyolite flows of Dommer (1980) is Miocene. Fission-track dates of flows in Keg Mountain indicate an age of about 8 m.y. (Lindsey, 1979, Lindsey and others, 1975)

Tmb EXTRUSIVE BRECCIA (MIOCENE)—Material erupted from breccia pipes (Tfb) during early, explosive stage consisting of small fragments to large blocks of Precambrian to Tertiary sedimentary and igneous rocks in a matrix of tuffaceous breccia containing shattered crystals of quartz, feldspar, and biotite. Widely exposed in the southern Sheeprock Mountains (Morris and Kogl, 1976). Morris, (1978) advises it may be in excess of 90 m thick; mapped as rhyolite porphyry by Kattelman (1968) and as the dacitemal? complex by Rees and others (1973) in Desert Mountain where it is exposed over a vertical distance of more than 200 m

Tss SILVER SHIELD QUARTZ LATITE (MIOCENE)—Medium- to dark-gray coarsely porphyritic flows and dikes in northeast corner of map area. Phenocrysts of plagioclase, quartz, biotite and augite up to 15 mm long. Rock is a very fine grained to aphanitic groundmass with a high proportion of K-feldspar and quartz. The Silver Shield has a maximum thickness of 38 m (Morris and Lovering, 1979). Age is considerably younger than 50 m thick

Tbl BASALT OF THE HOGBACK (MIOCENE)—Black vesicular tholeiitic basalt flows as much as 45 m thick from The Hogback of Crater Bench. Equivalent to the North Butte flow of Hogg (1972), and the basalt of the Hogback of Gulgardi and Rush (1981). K-Ar age 5.0±0.4 m.y. (Gulgardi and Rush, 1981) and 6.03 m.y. (Peterson and Nash, 1980). Includes thin gravel and sandy beds in the upper half of the unit. Overlies Paleozoic rocks in the Sheeprock Mountains

Tc CONGLOMERATE (MIOCENE)—Reddish-brown conglomerate and interlayered sandstone containing sand to boulder-size clasts of white to pink quartzite and lesser amounts of dark-gray limestone, and pumice, rhyolite, and basalt. The conglomerate locally is cemented with calcium carbonate and resistant to erosion. Thickness of exposed section exceeds 229 m. A thin tuff bed is present near base of section and clasts of the Topaz Mountain Rhyolite are present near top of section. Mapped only at north end of Crater Bench as Tertiary conglomerate by Hogg (1972), Peterson and Nash (1980), and Gulgardi and Rush (1981). Age is late Miocene

Tru UNALTERED EXTRUSIVE ROCKS OF DESERT MOUNTAIN (OLIGOCENE)—Pale-brown to light-gray rhyolite to quartz latite porphyry with phenocrysts of quartz and K-feldspar in an aphanitic groundmass. Thickness unknown but probably exceeds 100 m. Equivalent to part of Kattelman's (1968) rhyolite porphyry unit; rhyolitic and quartz latite welded ash-flow tuff units of Shawe (1972); and unaltered porphyritic volcanic rocks unit of Rees and others (1973) in east half of Desert Mountain. Includes small patches of the dark-purple to black quartz latite (defelinite) porphyry unit of Kattelman (1968) in southeastern part of Desert Mountain

Tqlt LATITE AND QUARTZ LATITE EXTRUSIVE ROCKS OF WEST TINTIC MOUNTAINS (OLIGOCENE)—Chiefly purplish- to brownish-gray, medium-grained porphyritic lava containing phenocrysts of andesine, sanidine, biotite, augite, hornblende, and quartz in a fine-grained to microcrystalline groundmass with minor quartz. Exposed in Sunset Peak quadrangle where it is largely gray-brown to white, fine- to medium-grained air-fall tuff, containing fragments of feldspar, augite, hypersthene, and magnetite crystals in a matrix of comminuted minerals and glass shards. The lower agglomerate member of Shawe (1975) is a dark-gray, medium-grained breccia containing lenses of lapilli and boulder tuff and minor thin flows of dark-gray latite. A whole-rock age determination of the Big Canyon Latite yielded an anomalous age of 35.3±1.4 m.y. (Morris and Lovering, 1979). Combined total thickness is 0 to more than 400 m

Tqlt GOLDENS RANCH FORMATION (OLIGOCENE)—Volcano-sedimentary rocks consisting mainly of agglomerate but includes some tuff, agglomerate, sandstone, and algal limestone. Present in southeast corner of map area adjacent to Sage Valley and northeastward in Long Ridge where originally defined by Maxwell (1951a, 1951b). Largely temporally correlative with the Thorn Mountain Volcanic Group (Tbn). Divided into:

Tgra Agglomerate—Chiefly light-colored weakly-cemented volcanic-clothe conglomerate more than 250 m thick. At base includes the pinkish-gray andesite crystal tuff unit of Higgins (1982) which overlies the Canyon Range Formation of Stolle (1978) (TKc) east of the Sevier River. Largely equivalent to the middle agglomerate member of the Copperopolis Latite of the Tintic Mountain Volcanic Group (Tmt) and some of the Lapoint Springs Volcanic Group (Tls). Conglomerate cut by numerous east-trending rhyolite porphyry dikes and sills. Age is about 25 m.y.

Tgrs Sage Valley Limestone Member—Light- to medium-gray, thin- to medium-bedded algal limestone lenses interbedded with volcanic conglomerate. Sage Valley Limestone lenses are about 250 m above the basal contact and are as thick as 90 m. Unit of Maxwell (1951b)

Tp PACKARD QUARTZ LATITE (OLIGOCENE)—Chiefly pinkish- or lavender-gray, medium-grained quartz latite porphyry. Generally double into four parts: an upper unit of dark-gray to black vitrophyre and tuff as much as 50 m thick, a massive middle unit of quartz latite porphyry locally more than 820 m thick, a lower unit of dark-green to black vitrophyre as much as 60 m thick, and a basal unit of fine-grained tuff as much as 210 m thick (Morris and Lovering, 1979) but averaging less than 10 m thick. Richter and sandine from the quartz latite porphyry yielded isotopic ages of 32.8±1.0 and 32.7±1.0 m.y. (Laughlin and others, 1969) and mineralogically similar to the Swansea Quartz Monzonite (Tsw). Present in the East Tintic Mountains in northeast corner of map area, and is lithologically and temporally equivalent to the Fernow Quartz Latite (Tf) of the southern East Tintic Mountains and Sage Valley area. These two formations are the oldest post-tectonic volcanic units in the East Tintic Mountains. Age is middle Oligocene

Tf FERNOW QUARTZ LATITE (OLIGOCENE)—Light- to medium-gray medium-grained welded tuff containing phenocrysts of quartz, sanidine, andesine, and biotite. Tuff contains a few thin flows and is as much as 300 m thick in welded glass shards. Locally includes thin patches of air-fall tuff at base. Present in the southern East Tintic Mountains and Sage Valley area where it is 0-460 m thick. Lithologically and temporally equivalent to the Packard Quartz Latite (Tp). Age is middle Oligocene

Tsr SUNRISE PEAK MONZONITE PORPHYRY (OLIGOCENE)—Medium- to dark-gray porphyritic andesitic flows, welded tuff, dikes, and dikes containing phenocrysts of augite, hypersthene, biotite, labradorite, and orthoclase in an aphanitic groundmass. Widely exposed in the Sunset Peak Quadrangle and closely related to the extensive rocks of the Tintic Mountain Volcanic Group (Tmt) Shawe (1965, 1972), and the tuff of Drum Mountains (Tdm). Dipping to the east-southeast. Divided into:

Tsrp Intrusive stock—Stock, plugs, dikes, and other large steeply dipping bodies. Large map unit (Tsps) south of Sunrise Peak stock includes plugs and dikes of latite porphyry that may be the eruptive source of the Tintic Mountain Volcanic Group (Morris, 1975)

Tsrq Gough and Dry Ridge sills—Gently east-dipping intrusive bodies originally part of a single sheet derived from the Sunrise Peak stock (Morris, 1975, Morris and Lovering, 1979) and dipping east

Tsw SWANSEA QUARTZ MONZONITE (OLIGOCENE)—Pale-grayish-pink to grayish-green to buff and white, depending on degree of freshness and alteration, medium- to coarse-grained porphyritic quartz monzonite. Nearly identical to the Packard Quartz Latite (Tp) in chemistry and mineralogy (Morris, 1975) and relative age. The Swansea stock has chertly and silty limestone, and medium-blue-gray, thin- to medium-bedded silty and sandy limestone interlayered in various combinations. Consists of the West Canyon and Furnel Valley Limestones and the Butterfield Peaks and Bingham Mine Formations in the southern East Tintic Mountains (Morris and others, 1977). Exposed only in east half of map area. Fossiliferous sandy carbonate rocks forming The Knoll northwest of Lynndyl are questionably assigned to the lowermost part of the Oquirrh Group but may belong to the uppermost part of the Humbug Formation. Only lower or Pennsylvanian part of the Oquirrh is exposed in the West Tintic Mountains. About 5,000 m thick in southern East Tintic Mountains: about 1,700 m at section exposed in Gilson Mountains

Mu GREAT BLUE AND HUMBUG FORMATIONS AND DESERET LIMESTONE, UNDIVIDED (UPPER MISSISSIPPIAN)—Chiefly blue-gray cherty limestone, light-gray limestone interlayered with medium- to coarse-grained quartzitic sandstone, blue-gray, medium- to thin-bedded cherty limestone, and locally with thin beds of quartzite sandstone and fine-fossiliferous and phosphatic shale. Present in east half of map area. As much as 1,340 m thick in East Tintic Mountains

MDu GARDISON LIMESTONE (LOWER MISSISSIPPIAN) AND FITCHVILLE FORMATION, UNDIVIDED (LOWER MISSISSIPPIAN AND UPPER DEVONIAN)—Undivided—Chiefly prominently bedded, dark- to medium-blue-gray partly cherty limestone with abundant well-preserved fossils, and some blue argillaceous limestone, massive light-gray to white medium-grained limestone, blue, thin-bedded shaly limestone, dusky-blue-gray, massive cherty dolomite, quartzite, pinkish-gray sub-lithographic limestone, and medium- to dark-gray, dense stromatolitic limestone. Present in east half of map area. The Gardison is wholly Early Mississippian. The Fitchville, as exposed in the East Tintic Mountains, is Early Mississippian and Late Devonian. In the Gilson and southern Sheeprock Mountains the Fitchville was thought to be wholly Early Mississippian but may contain Late Devonian strata. No Fitchville is present in unit MDu in the southern West Tintic Mountains. As much as 300 m thick in southern East Tintic Mountains

Dp PINYON PEAK LIMESTONE (UPPER DEVONIAN)—Medium- to dark-blue massive limestone with tan to light-brown silt and clay with a lower unit of buff to light-brown medium-grained massive quartzite. As much as 300 m thick in Allen Quarter of Stringham (1942) in the southern Sheeprock Mountains. Maximum thickness is about 75 m

Ds SIMONSON DOLOMITE (MIDDLE DEVONIAN)—See description under Area A

Dsv SEVY DOLOMITE (LOWER DEVONIAN)—See description under Area A

Sl LAKETOWN DOLOMITE (MIDDLE SILURIAN)—See description under Area A

Of FISH HAVEN DOLOMITE (UPPER ORDOVICIAN)—See description under Area A

Ofs SWAN PEAK FORMATION (MIDDLE ORDOVICIAN)—See description under Area A

Op POGONIP GROUP (MIDDLE AND LOWER ORDOVICIAN)—See description under Area A

Ccc CARBONATE ROCKS, UNDIVIDED (UPPER CAMBRIAN)—Dark-gray, thin- to thick-bedded limestone, dolomite, and dolomite, and oolitic, pebbly, and cherty limestones, pisolitic dolomite, and light-green fissile shale, and intraformational conglomerate. In the Sand Hills and Black Mountains equivalent to the Notch Peak (part) and Orr Formations and Dunderberg Shale (part) of Hintze (1951) and in the southern part of map area Dolomite and Opex Formation (Cacc) in the East Tintic Mountains

Cacc CARBONATE AND CLASTIC SEDIMENTARY ROCKS (MIDDLE CAMBRIAN)—See description under Area A

Cpm PROSPECT MOUNTAIN QUARTZITE (LOWER CAMBRIAN)—See description under Area A

Pzc CARBONATE ROCKS, UNDIVIDED (PALEOZOIC)—Present as a small thrust slice in the West Tintic Mountains

ROCK UNITS OF AREA C

Pc PARK CITY FORMATION (UPPER AND LOWER PERMIAN)— Chiefly gray, medium-bedded limestone of the Grandeur Member of the Park City Formation separated by a brownish-black, thin-bedded cherty limestone and phosphatic shale of the Meade Peak Member of the Phosphoria Formation (Morris, 1977). Exposed in southern part of map area in the Gilson Mountains in the upper half of the Valley Tuff. Thickness ranges from about 100 to 470 m

Pcm DINWOODY FORMATION (LOWER PERMIAN)—Largely white to red, massive, friable, cross-bedded, calcareous sandstone with interlayered gray to pink dolomite, limestone, and sandy limestone. Present in southern East Tintic and eastern Gilson Mountains in the lower plate of the Tintic Valley thrust fault where it is 470 m thick

PIPu OQUIRRIH GROUP (LOWER PERMIAN TO LOWER PENNSYLVANIAN)—See description under Area B

MDu GARDISON LIMESTONE AND FORMATIONS AND DESERET LIMESTONE, UNDIVIDED (UPPER MISSISSIPPIAN)—See description under Area B

DDfc FITCHVILLE FORMATION (LOWER MISSISSIPPIAN AND UPPER DEVONIAN)—See description under Area B

Ogv PINYON PEAK LIMESTONE AND VICTORIA FORMATION, UNDIVIDED (UPPER DEVONIAN)—Light-blue-gray, dark-blue, fine-grained, thin-bedded to massive, silt-streaked limestone, buff to light-brown, medium-grained, massive quartzite and quartzite, and medium-gray, medium-bedded interlayered dolomite and sandstone. Present in the East Tintic Mountains and in the Drum, Simpson, Sheeprock, and Gilson Mountains; sections exposed in the Drum and Gilson Mountains are least sorted and contain gray-green, brown, and pink sandstone and conglomerate. As much as 2,000 m thick in the Sheeprock (Christie-Blick, 1982) and Gilson (Hintze, 1951) Mountains; in the Drum Mountains about 170 m of the Caddy Canyon Quartzite is exposed beneath the Inkom Formation (Dormer, 1980)

DDb BIRBELL DOLOMITE (DEVONIAN, SILURIAN, AND UPPER ORDOVICIAN)—Medium- to dark-gray, medium- to thick-bedded, medium- to coarse-grained, moderately resistant dolomite, locally mottled and cherty dolomite, with a prominent stromatolite horizon near the middle, and quartzite. Unit is as much as 1,000 m thick in southern Sheeprock Mountains. Silurian part of the Bluebell is lithologically equivalent to the Laketown Dolomite. Ordovician is represented only in the East Tintic Mountains. Thickness ranges from about 100 to 230 m

Of FISH HAVEN DOLOMITE (UPPER ORDOVICIAN)—See description under Area A

Ocs OPOHONGA LIMESTONE (LOWER ORDOVICIAN)—Light-blue-gray, thin- to medium-bedded limestone commonly with pink to yellow argillaceous partings with nodules of white chert in the lower limestones, and a thin basal sandy limestone. Present in the Gilson Mountains where it is 90-305 m thick

Cacc ALAX, DOLOMITE AND OPEX FORMATION, UNDIVIDED (UPPER CAMBRIAN)—Medium- to dark-gray, partly mottled, medium-bedded cherty dolomite, and medium- to coarse-grained massive dolomite, massive dolomite, medium- to dark-gray, massive-bedded cherty dolomite, and light-gray, thin-bedded limestone, sandstone and siltstone. Present in northeast corner of map, in the lower plate of the Tintic Valley thrust where it is 305-610 m thick

Ccs CARBONATE AND CLASTIC SEDIMENTARY ROCKS (MIDDLE CAMBRIAN)—See description under Area A

Cc TINTIC QUARTZITE (LOWER CAMBRIAN)—White to buff, medium-grained, well-bedded to massive quartzite, shaly at top and conglomeratic at base. Contains an altered basalt flow as much as 12 m thick about 300 m above base. Present in northeast corner of map area in the East Tintic Mountains where maximum thickness is 975 m

Ybc BIG COTTONWOOD FORMATION (MIDDLE PROTEROZOIC)—Predominantly dark-gray, medium- to thin-bedded shale and medium- to coarse-grained quartzite containing a lens of brown-weathering fine-grained dolomite. Present only in the Gilson Mountains. The Big Cottonwood Formation but may prove to be equivalent to Late Proterozoic rocks of the Osmond Mountains. Upper part of section is not present in the northeast corner of map area. More than 560 m thick

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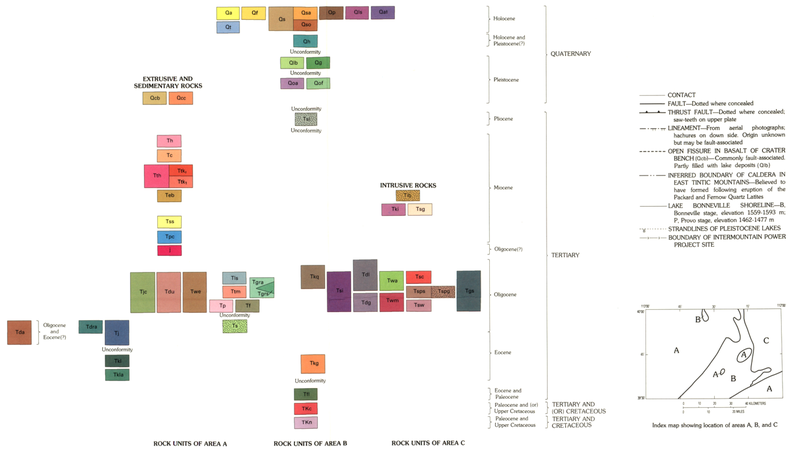
CORRELATION OF MAP UNITS



Erickson (1963). As mapped, the unit near Keg Pass includes ignimbrites assigned to the Oligocene Dell Tuff whose average age by fission-track methods is 32.0±0.6 m.y. (Lindsey, 1982, table 2). As much as 150 m thick

Tv PREVOLCANIC SEDIMENTARY DEPOSITS (OLIGOCENE)—Chiefly tanglomerate and alluvium on east side of the Canyon Mountains and southeast side of Sage Valley but also includes small patches of conglomerate and volcanic gravels in the West Tintic Mountains and the Apex Conglomerate in the East Tintic Mountains. Locally exceeds 90 m thick

Tdla ALTERED EXTRUSIVE ROCKS OF DESERT MOUNTAIN (OLIGOCENE AND EOCENE?)—Porcelanite and volcanic rocks in northeast Desert Mountain and Allison Knolls. Thickness unknown but probably exceeds 120 m. Strongly argillized and silicified; locally mapped as jasperoid (j). Equivalent to part of the rhyolite porphyry unit of Kattelman (1968) and the rhyolite and quartz-latite welded ash-flow tuff units of Shawe (1972), and correlated with part of the crystal tuff member of the Joy Tuff (Tj) (Lindsey, 1979). Lindsey and others, 1975). The crystal tuff member here was dated at 34.5±1.3 m.y. by the fission-track method on zircon but this age probably is too young because the tuff has been intruded by granitic rocks of Desert Mountain, an event that may have slightly reset the zircon ages (Lindsey, 1982)

Tlt LATITIC FLOWS OF KEG MOUNTAIN (EOCENE?)—Porphyritic andesite and latite flows and pyroclastic rocks containing phenocrysts of K-feldspar, biotite, and hornblende. Thickness estimated at 45 to 75 m. Weathers to brown soil. Includes upper part of the Keg Spring Andesite and Keg Spring Latite of Erickson (1963) and the latite, andesite, and basaltic flows and agglomerates unit of Shawe (1972)

Tkl LATITIC, ANDESITIC, AND BASALTIC FLOWS OF KEG MOUNTAIN (EOCENE?)—Dark latite, dark rhyodacite, andesite, and andesitic basalt flows and agglomerate. Thickness estimated to be in excess of 225 m. Includes lower part of the Keg Spring Andesite and Keg Spring Latite of Erickson (1963) and the latite, andesite, and basaltic flows and agglomerates unit of Shawe (1972), and part of the Keg Spring Andesite unit of Staub (1975)

INTRUSIVE ROCKS

Tra INTRUSIVE BRECCIA (MIOCENE)—Breccia pipes in the West Tintic and Sheeprock Mountains containing minute fragments to large blocks of Precambrian to Tertiary sedimentary and igneous rocks in a matrix of tuffaceous breccia containing shattered crystals of quartz, feldspar, and biotite. Widely exposed in the southern Sheeprock Mountains (Morris and Kogl, 1976). Morris, (1978) advises it may be in excess of 90 m thick; mapped as rhyolite porphyry by Kattelman (1968) and as the dacitemal? complex by Rees and others (1973) in Desert Mountain where it is exposed over a vertical distance of more than 200 m

Tss SILVER SHIELD QUARTZ LATITE (MIOCENE)—Medium