

SHORT GEOLOGY GUIDE: Salt Lake City to Price, UT

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The geology of Utah is exciting and varied because Utah lies at the edge of the craton where there has been a mix of sedimentologic and tectonic processes. The major physiographic provinces of Utah include: the Basin and Range to the west; the Middle Rocky Mountains to the north-northeast; the Basin and Range-Colorado Plateau Transition to the south-southwest; and the Colorado Plateau to the southeast. Salt Lake City lies along the Wasatch Front /Ranges (as well as the Wasatch Fault!). In the route from Salt Lake City (SLC) to Price (Fig. 1), Late Paleozoic through Cenozoic rocks (Fig. 2) are encountered as we head along the Wasatch Front and cross a juncture of provinces (Fig. 3) into the Colorado Plateau region, where the rocks are relative flat and well exposed.

Upper Cretaceous rocks (of particular interest in this trip) in central and eastern Utah record deposition in an epicontinental sea. This Western Interior seaway was a broad, N-S trending foreland basin which formed with subduction of the Farallon plate beneath the North American plate. Stratigraphic sequences (Figs. 4, 5) are largely the result of interactions between tectonism (associated with eastward thrusting), eustasy, and sedimentation. Tertiary rocks of east-central Utah mark a change to continental intermontane conditions, and contain rich resources in lacustrine deposits.

The Cretaceous deposits of the Book Cliffs and along Castle Valley, UT exhibit classic facies relationships, cyclicity (transgressions-regressions) and intertonguing of fluvial, deltaic, shoreline, shelf and offshore facies. Depositional models derived from these examples are significant to the understanding of deltaic and shoreline - shelf processes, and have important applicability to coal, oil, and gas exploration. These Cretaceous rocks have also been particularly instrumental in distinguishing eustatic events and in developing global sea level curves.

The Upper Cretaceous Mesaverde Group is a thick clastic wedge of regressive sandstone tongues shed off the Sevier orogenic belt and deposited along the western shoreline of an epicontinental sea. Within the Mesaverde Group and Mancos Shale, several formations have been distinguished (Fig. 5). Nearing Price, UT, Highway 6 drops downsection through the various formations of the Mesaverde Group and levels off within the Mancos Shale.

MILEAGE & FIELD GUIDE

(Refs. Fouch et al, 1976; Rigby et al, 1974; and Franczyk et al, 1989)

Leave SLC, head S on I-15. Road Log mileage begins at the junction of I-15 southbound and I-80 eastbound.

- 0 The Wasatch Range to the east (left) is composed mainly of PreCambrian metamorphic rocks and Paleozoic and Mesozoic sedimentary rocks (see Fig. 2), which were deformed by thrust faulting during the Cretaceous Sevier orogeny. Normal faulting associated with Basin and Range extension uplifted the mountains to the present-day position. Geomorphic aspects of the Wasatch range were influenced by Pleistocene glaciation. At the foot of the Wasatch Front are terraces and ancient shorelines of Pleistocene Lake Bonneville (32-10 ka).
- 7 To the east, PreCambrian quartzites and schists and Tertiary intrusives are exposed in the Wasatch Mountains and canyons. To the west are the Oquirrh Mountains. The world's largest manmade "hole-in-the-ground", the Bingham Pit Copper Mine, and its tailings are visible to the west. Mineralization is associated with Tertiary intrusion in Pennsylvanian (PP) -Permian (P) limestones and quartzites.

- 13.0 Pass Exit 294, stay on I-15 S. Point of the Mountain at 1 o'clock to the southwest. Note prominent Pleistocene lake levels of Lake Bonneville. Utah State Prison is at the right. 1.5 mi down the interstate.
- 31.0 Mt. Timpanogos to the east (left) is a thick section of the PP-P-Oquirrh Group (ss, ls)
- 32.1 Past the exit to American Fork, I-15 cuts across the Provo Bench, part of a large fan-delta complex, deposited during the regression associated with the Provo shoreline. Entering the Provo valley, the Lake Mountains (to the west) form the western border of Utah Lake.
- 47.0 Take (and stay on) Hwy 6 junction (east) towards Price through Spanish Fork Canyon. The road crosses lacustrine deposits of the Spanish Fork fan-delta complex. Up the mouth of the canyon are exposures of the PP-P-Oquirrh Formation (ls), P-Diamond Creek Sandstone, and P-Park City Formation (ls). * Note: Cumulative mileage may be off by a mile or so around this point in the log.
- 58.1 Past the junction to Diamond Fork is the Tr-Ankareh Fm (equivalent to Moenkopi Fm), composed of fluvial and floodplain ss and sh.
- 59.2 J-Nugget Ss (lg eolian x-sets), overlain by J-Twin Creek Ls.
- 60.0 Thistle summit (see Fig. 3). This slide (complex slump + debris flow) to the right occurred along a ramp anticline (we're looking at the down-dropped block) in April 1983. The slide direct and indirect costs totaled about \$400 million, and required relocation of U.S. Hwys 6 and 89. "Lake Thistle" formed behind the "dam" and was as much as 180' deep. The slide statistics: width- about 4000' at the head, 900' at the toe; length - 8000'; and thickness- 50'. The Tertiary Colton and Flagstaff Formations and the K-T-North Horn Formation are the source materials of the landslide, with much of the sliding occurring along the interface of the latter formation because of the instability of its poorly consolidated "slippery" red sh, sltst, and ss. The Twin Creek Limestone crops out right at the summit in the roadcut.
- 60.8 Looking over your right shoulder (to the south) you can see whitish "bathtub rings" due to flooding in the Manti valley. Along the north side of the road (to the left) are exposures of the Cretaceous Indianola Group.
- 63.6 Start of the Red Narrows, K-T-North Horn Conglomerate (some of lower section may be Price River Cgl). See Figs. 4, 5.
- 64.5 The North Horn Cgl marks the initiation of Laramide-style intermontane, alluvial fan depositon in this portion of the Rocky Mountains. The cgl is dominantly clast supported with crude imbrication and graded chanel forms. Higher in the section (continuing down the road) are more sheet-flood overbank deposits.
- 68.1 North of Hwy 6 are oncolite beds in the T-Flagstaff Member of the Te-Green River Fm (nearshore marginal lacustrine).
- 68.9 Exposures in the Green River Fm (north of Hwy) record transition between sediments deposited on a high alluvial mud-flat (red claystone) and those deposited in marginal - lacustrine (gray-green claystone).
- 71.3 Channel-form (interdeltaic) ss beds in Te-Green River Fm.
- 76.5 Faults in Green River Fm along RR cuts.
- 84.4 Soldier Summit. The reddish T-Colton Fm forms some of the valleys + rolling topography. The variegated clyastone and sandstone units of the Colton Fm probably formed on an alluvial-plain, several miles S of the Lake Flagstaff shoreline.
- 88.7 White River
- 91.6 T- Colton Fm channel exposure (right) at summit. Note thinning overbank "wings" at edges of channel form. The sandstone content of the Colton increases to the east and southeast areas, which were closer to the source of the siliciclastics.
- 92.0 Another roadcut exposure of a T- Colton Fm channel, here symmetrically filled.
- 95.0 Flagstaff Member of Green River Fm here contains oncolites in the resistant carbonate bed.
- 95.8 Utah County line
- 96.3 Approx. base of Flagstaff-North Horn intertonguing

- 97.1 Bridge over Ford Creek. Thin lipid-rich algal coal seams in the North Horn Fm. were deposited in clear, quiet, fresh-water conditions.
- 98.0 BLM Price River Canyon Rec area
- 98.6 Lenticular red K-North Horn beds (alluvial sandstone sequence).
- 99.2 Approx contact of North Horn (intermontane deposits)+ Price River (foreland basin deposits) Fms.
- 100.8 Contact between the K (Campanian)-Price River Formation and the underlying upper fluvial portion of the K-Castlegate SS.
- 101.9 The K-Castlegate SS is a distinctive unit which disconformably overlies the Blackhawk Formation (see Figs. 4, 5). Three informal units (Pfaff and Chan, in review) are recognized here in Price canyon. The lowest unit (164') records shallow, braided channel deposition. The middle unit (371') contains wider channels with abundant lateral accretion sets and a greater proportion of floodplain deposits (attributed to lower sinuosity channels). The upper unit (102') is the Bluecaste Tongue, and is locally a pebbly ss. Pass by the fin of the Castlegate SS, which is the type locality of the formation.
- 102.6 Red to varicolored "clinker" beds in the Kenilworth Member (youngest member) of the Blackhawk Formation resulted from baking of oxidation of iron from burning coal.
- 103.3 Pullout by Utah Coal sign. Outcrop in road directly opposite the sign (south side of Hwy 6) is the Blackhawk Fm. The Blackhawk Formation was named for the coal-bearing rocks that overlie the marginal-marine sandstone of the Star Point Formation. Within the Blackhawk strata, there has been production of about 225 million tons of coal, with an estimated 1 billion tons of recoverable coal still remaining (Stokes, 1986). This portion of the Blackhawk (and continuing into the Book Cliffs) shows repetitive progradational sequences which are stacked intervals of marine shale and sandstone overlain by coal-bearing, coastal plain deposits. This cyclic nature is characteristic of much of the Upper Cretaceous throughout the Western Interior.
- 103.4 Double roadcut in the Blackhawk (Spring Canyon and Aberdeen Members). At the lower (south) end of the roadcut are parallel-laminated ss with *Ophiomorpha* burrows. Above this sandstone, large tree casts are preserved in fine-grained sandstone. Hummocky cross stratification towards the upper (north) end of the roadcut has been used to infer wave dominance in the deltaic and shoreline systems (Balsley, 1982).
- 104.3 Port of Entry
- 104.7 K- Panther Tongue of the Star Point Formation at crossing of Gentile Wash. The Panther Tongue at this locality has been interpreted as distributary mouth bar deposits (Balsley, 1982) that formed when waves and longshore currents redistributed river-mouth sediment along the delta front. The dip of the beds reflects the original geometry of the mouth bar as it prograded seaward (northeast). The progradational sequence contains Bouma beds overlain predominantly by low-angle stratification.
- 106.5 Town of Helper (named because it helped push railroad cars over the summit).
- 109.4 Garley Canyon beds (shoreface deposits) of the K-Emery Sandstone form the low cliffs, and a portion of the local golf course.

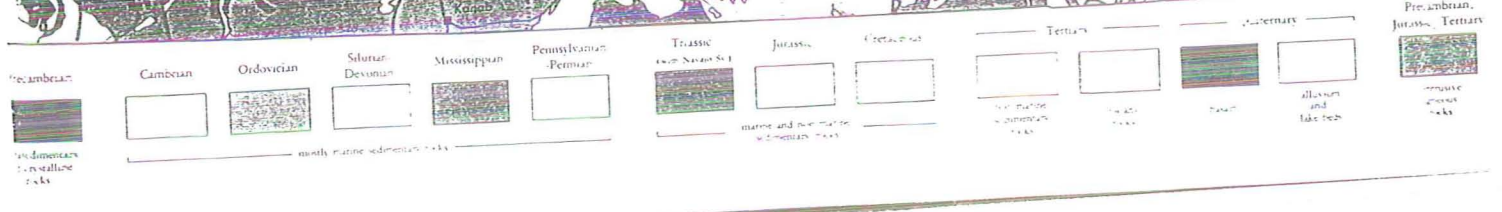
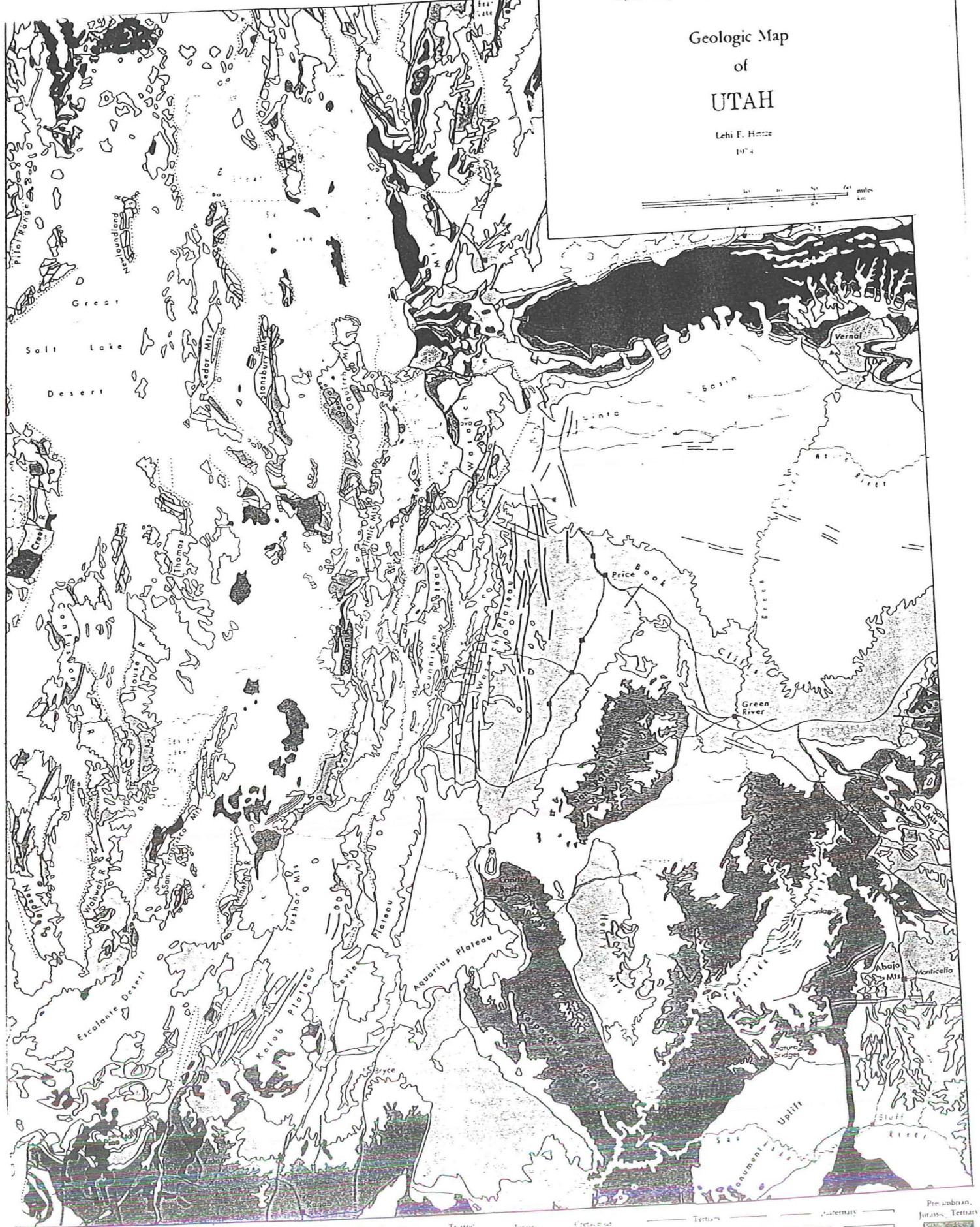
Head into Price, UT

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Geologic Map of UTAH

Lehi F. Howe
1974

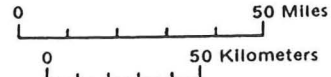


MAP 43
PHYSIOGRAPHIC SUBDIVISIONS
OF UTAH

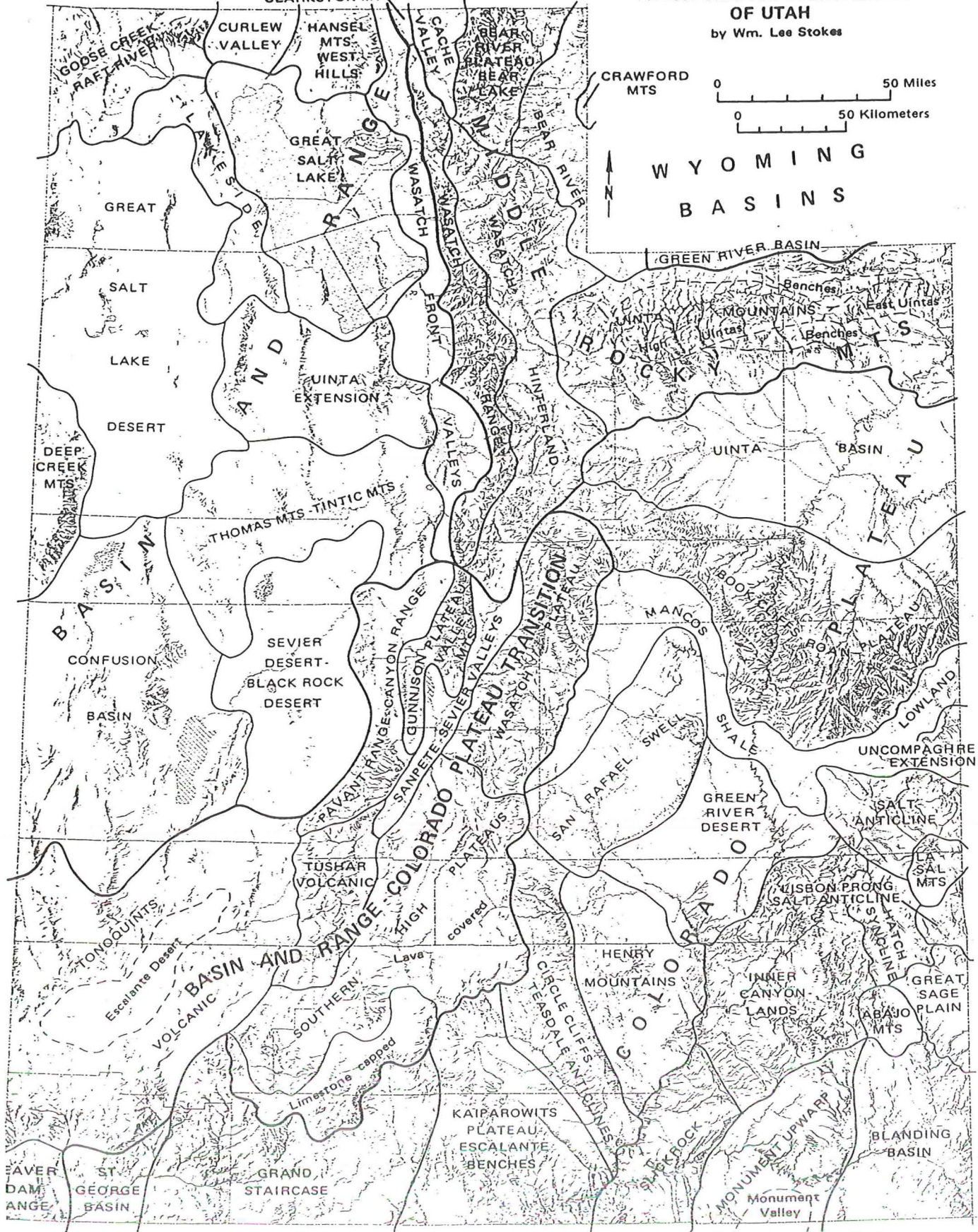
by Wm. Lee Stokes

CLARKSTON MT

CRAWFORD
MTS



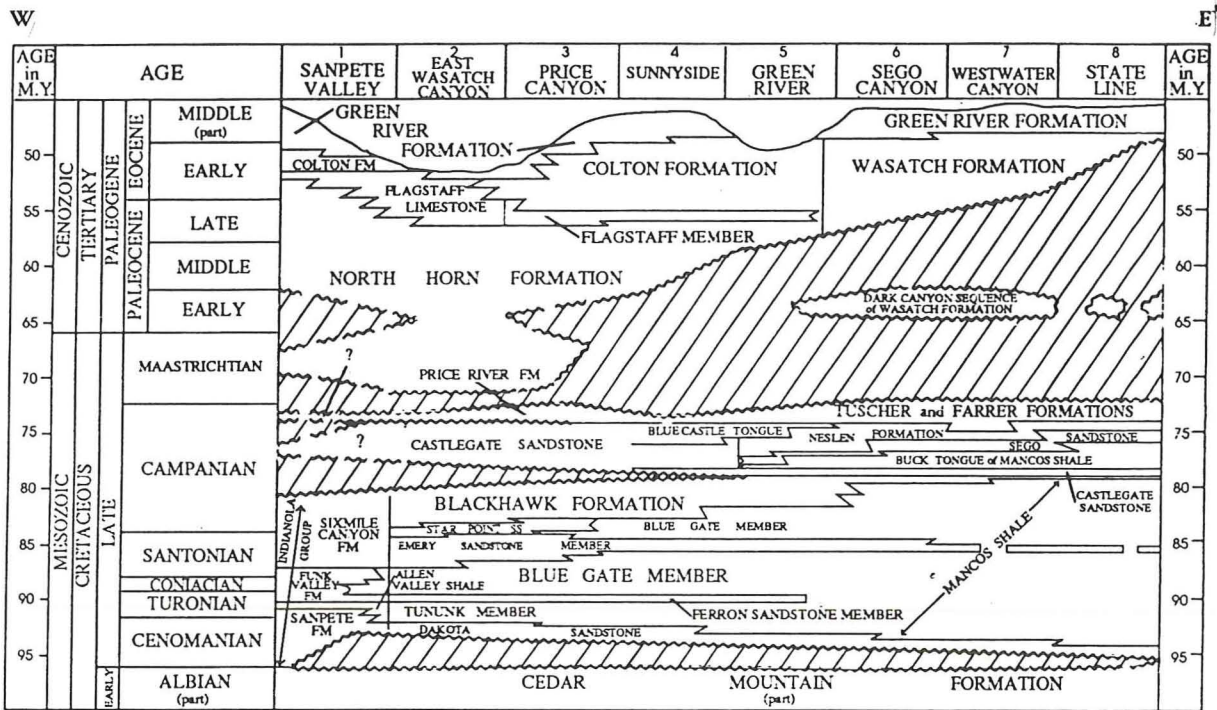
WYOMING
BASINS



Utah Geological and Mineral Survey
Donald T. McMillan, Director
606 Black Hawk Way
Salt Lake City, Utah 84108
Shaded relief from U.S.
Geological Survey, 1958.

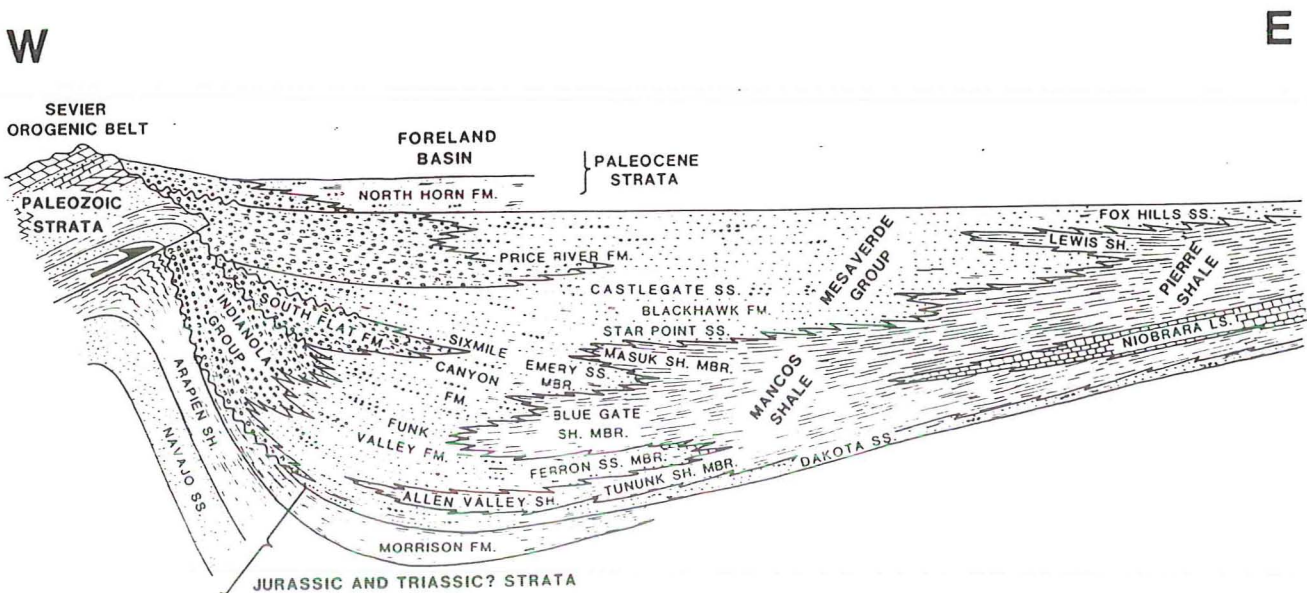
Reprint from W.L. Stokes' article, "Subdivisions of the
Major Physiographic Provinces in Utah," in *Utah Geology*,
Spring 1977, Vol. 4, No. 1.

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Stratigraphic nomenclature and correlation of major Albian to middle Eocene rock units from the Sanpete Valley of central Utah to the Book Cliffs of eastern Utah. Vertical line through strata indicates a change in stratigraphic nomenclature. Modified from Fouch and others (1983).

Fig. 4 Stratigraphic nomenclature and correlations (Franczyk et al, 1989)



Diagrammatic, restored west-east cross section of Cretaceous strata extending from western Utah to western Colorado. (Modified from Armstrong, 1968.)

Fig. 5 Diagrammatic cross section (Ryer, 1981)

Fig. 1 Route from SLC to Price, UT

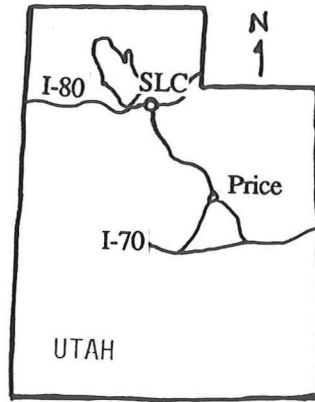


Chart 33

WASATCH RANGE NEAR SLC

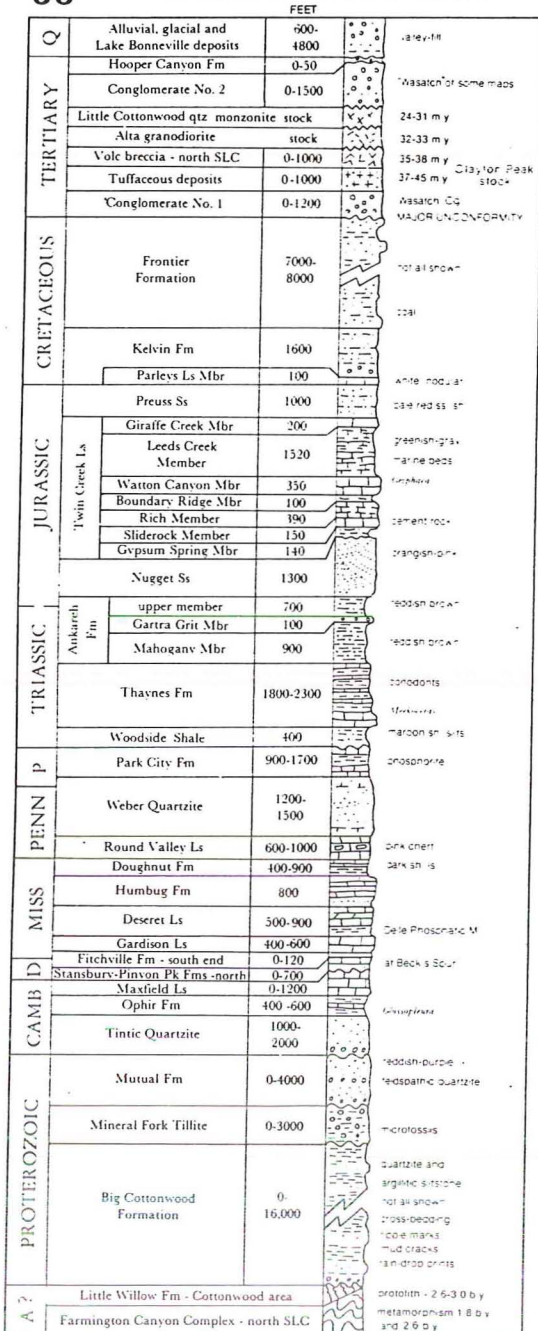


Fig. 2 Stratigraphic section of Wasatch Front (Hintze, 1988)

Chart 36

SPANISH FORK CANYON - THISTLE

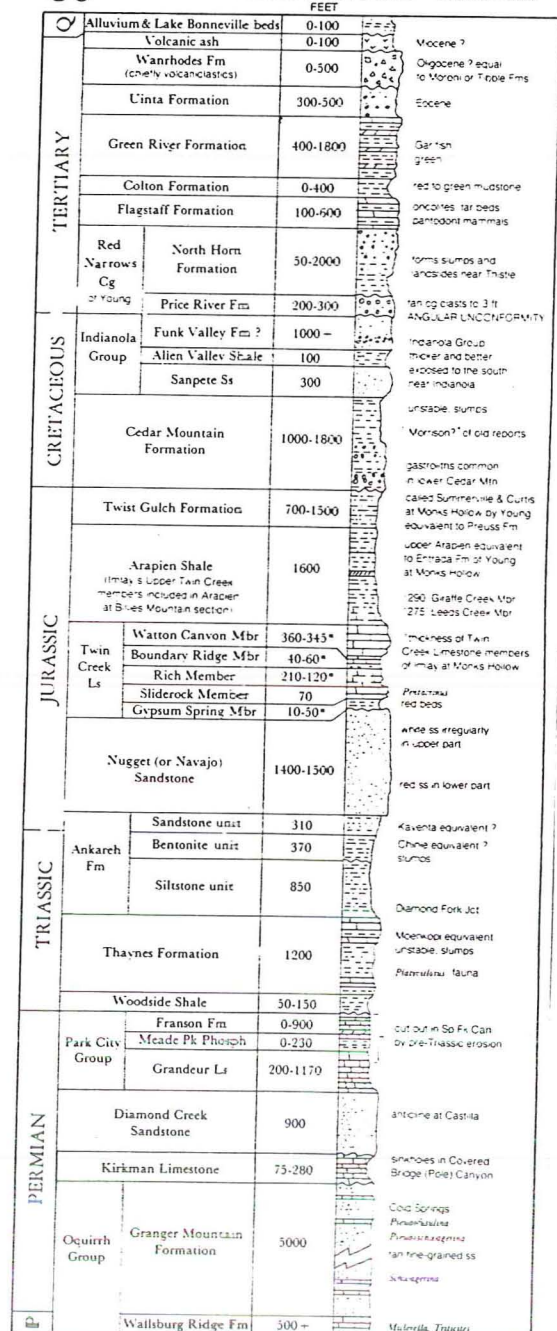


Fig. 3 Stratigraphic section of Thistle Area (Hintze, 1988)