# FAIRVIEW LAKES QUADRANGLE UTAH

*by*

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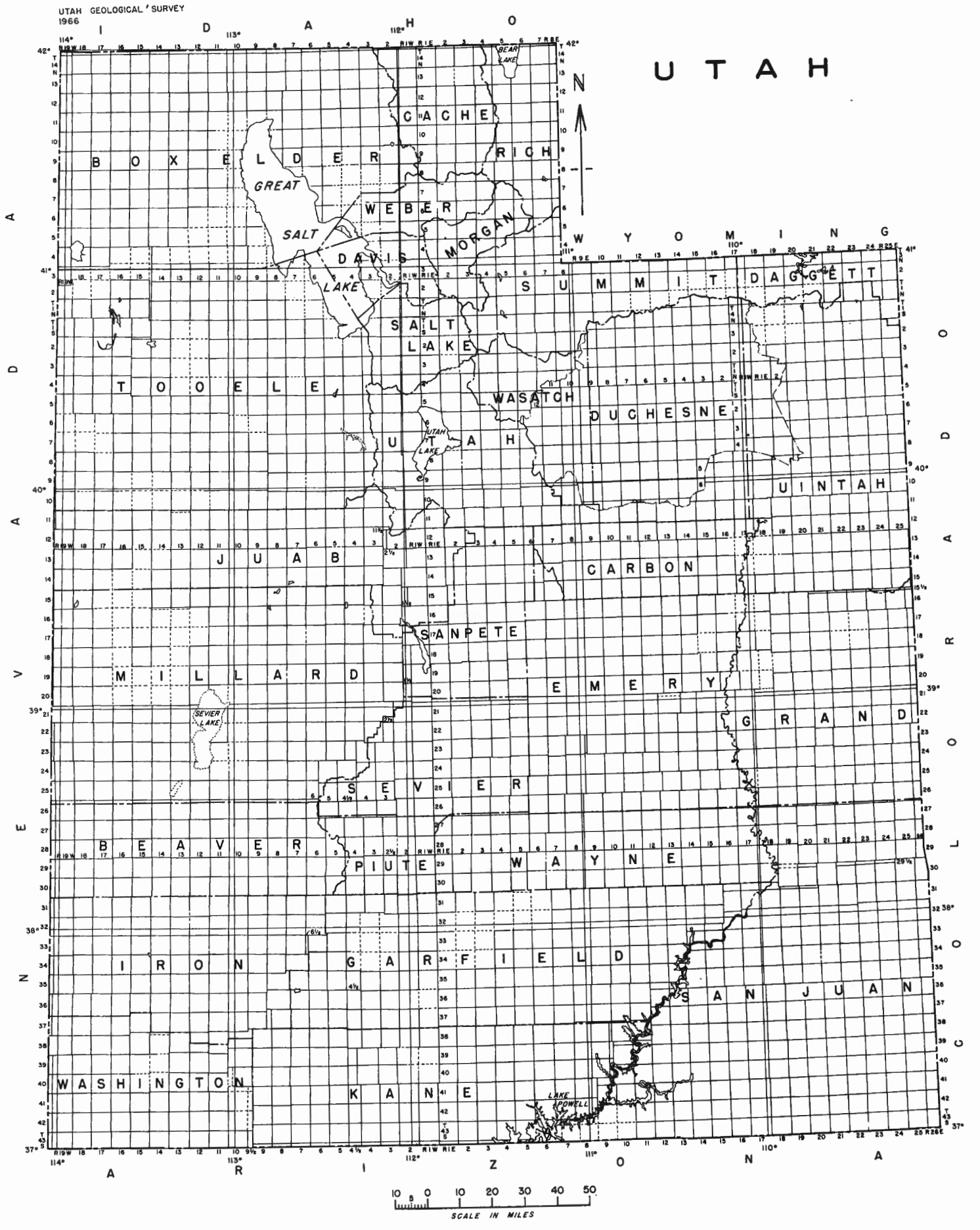
Map 56

UTAH GEOLOGICAL AND MINERAL SURVEY
*a division of the*
UTAH DEPARTMENT OF NATURAL RESOURCES
Map No. 56 Price $3.00 July 1980


UTAH GEOLOGICAL SURVEY
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EMERY
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WAYNE
IRON
GARFIELD
SAN JUAN
WASHINGTON
KANE
GREAT SALT LAKE
UTAH LAKE
BEAR LAKE
SEVIER LAKE
LAKE POWELL
SCALE IN MILES

# FAIRVIEW LAKES QUADRANGLE, UTAH

*by Gary G. Oberhansley*

## INTRODUCTION

The eastern third of the Fairview Lakes quadrangle is included in the northern Wasatch Plateau coal field and contains important coal reserves in the Blackhawk Formation. This part of the coal field is expected to gain more importance as the demand for coal increases and as the easy-to-mine reserves in other areas are depleted.

Interest in possible petroleum accumulations in the Wasatch Plateau increased after discovery of natural gas in Carbon and Emery Counties. This resulted in drilling on two structures within the quadrangle, neither of which were productive in the Cretaceous section tested. However, lower formations that produce east of the plateau remain untested and may be of significant value.

Although the southwest part of the quadrangle had been mapped previously by Pashley (1956) as part of his study of geology of the western monoclinal flexure of the Wasatch Plateau, no recent detailed mapping of the Fairview Lakes quadrangle has been done. An interest in coal, petroleum and natural gas in this area prompted this more detailed investigation of the geology in the quadrangle.

## STRATIGRAPHY

### General

Rocks exposed in the Fairview Lakes quadrangle total approximately 1,050 meters (3,445 ft) and consist mostly of sandstone, conglomerate, limestone, mudstone and shale. The exposed stratigraphic section includes, in ascending order, the Upper Cretaceous Blackhawk Formation, Castlegate Sandstone, Price River Formation and lower part of the North Horn Formation and the Paleocene upper part of the North Horn Formation and Flagstaff Limestone. Quaternary deposits include morainal material of late Pleistocene glaciation, and Holocene deposits of colluvium, alluvium, alluvial fans, and landslide debris.

### Cretaceous System

*Blackhawk Formation:* This unit is a complex of interbedded sandstone, mudstone, shale, and thin coal beds. It is commonly covered with soil and slope wash, with only the thick resistant sandstone beds exposed. The sandstone beds are thick-to very thin-bedded and are composed of very fine- to medium-grained quartz grains. The sandstone ranges from orangish brown to a light yellowish gray and is cemented with calcite and limonite. Well preserved fossil leaves, parts of logs, and twig impressions are found in some of the sandstone beds, along with coaly, macerated plant fragments. Shale and mudstone are dominantly gray to dark gray and locally grade vertically from carbonaceous shale to nearly pure coal. A few thin beds of coal are exposed in the formation. One coal bed, about 20 cm (8 inches) thick, is exposed in a limited outcrop on the north hillside of Flat Canyon, near the mouth of Boulger Canyon in section 33, T. 13, S., R. 6 E. Another coal bed, 20 to 30 cm (8-12 inches) thick, is exposed in the road-cut along Huntington Creek, just south of Little Swens Canyon. In adjoining areas, coal beds thick enough to mine are found in the lower part of the Blackhawk Formation. It is possible that these coal beds extend into the Fairview Lakes quadrangle, but here, the lower part of the formation is unexposed.

The upper 190 to 262 meters (623-860 ft) of the formation is exposed in the canyons of Gooseberry Creek, Mill Creek, and French Creek in the northeast corner of the quadrangle. All other exposures in the quadrangle represent only the uppermost 66 meters (217 ft) or less of the Blackhawk Formation. A complete measurement of the Blackhawk Formation can be deduced for a location 5 miles south of the Fairview Lakes quadrangle (section 35, T. 14 S., R. 5 E), by combining a measured section by Pashley (1956, p. 19-25) with the log of a hole drilled for the U. S. Bureau of Mines (War Minerals Report 151, 1943). From this the thickness is assumed to be about 575 meters (1753 ft). The formation is 230 to 328 meters (700-1000 ft) thick in exposures in the eastern part of the Wasatch Plateau (Spieker, 1931, p. 28), in the coal-mining areas.

The base of the Blackhawk Formation is not exposed in the quadrangle, but elsewhere Spieker (1931, p. 35) has defined the contact as conformable and "clear-cut" with the upper surface of the Star Point Sandstone. The top of the formation is usually drawn at the base of the massive cliff-forming Castlegate Sandstone. However, in the eastern third of the quadrangle

the Castlegate Sandstone does not form a distinctive cliff and rocks at the contact are generally covered. The sandstones of the Castlegate are usually much coarser than those in the Blackhawk Formation and this difference was used to separate the two formations within the mapped area. The contrast of fine-grained sandstone in Blackhawk beds to grit and conglomeratic sandstone in the Castlegate beds is well expressed along the walls of Boulger Canyon, Flat Canyon, and Brooks Canyon in the southeast and Gooseberry Creek in the northeast.

*Castlegate Sandstone:* This unit is exposed as part of a cliff that extends almost continuously for 400 kilometers (249 miles) from the southern end of the Wasatch Plateau north to Price, Utah, and eastward to the Colorado border along the Book Cliffs. In the Fairview Lakes quadrangle, the Castlegate Sandstone is exposed immediately east of the Frontal fault in Cottonwood Canyon, in the SW¼, NE¼ of section 33, T. 13 S., R. 5 E., and in Oak Creek Canyon, in the SE¼ SW¼ of section 21, T. 13 S., R. 5 E. The formation is also exposed in the eastern part of the quadrangle in the canyons cut into the flat upland, east of the Gooseberry graben. In Cottonwood Canyon the formation crops out as massive sandstone cliffs and ledges and is best exposed on the north side of the canyon wall below Utah State Highway 31 at the Blind Fork confluence. On the south side of the canyon, the formation is concealed by slope wash and tree cover. In Oak Creek, the formation is poorly exposed in the bottom of the canyon and is covered by slope wash and trees along the hillsides.

In these canyons the sandstone is thick-bedded to massive, with occasional cross-bedding and channel fills. The sandstone is usually dark yellowish orange to light yellowish gray and composed of medium- to coarse-grained quartz, cemented by calcite and limonite, with quartzite grit and pebble clasts in the bottom of some channel fills. A few carbonaceous plant fragments were found in some of the sandstone beds. In the eastern part of the quadrangle, it forms steep slopes with only occasional outcrops along the canyon walls and does not form a prominent cliff. In outcrops in Boulger Canyon and on the north side of Flat Canyon, the Castlegate Sandstone is light gray to light yellowish gray and conglomeratic, with quartzite pebbles and cobbles in a sandstone matrix. In Brooks Canyon, in the SW¼ of section 8, T. 13 S., R. 6 E., occasional outcrops of the formation consist of fine- to medium-grained sandstone with a few grit- and pebble-sized clasts. The formation is less conglomeratic in the northeast corner of the quadrangle. The upper part of the Castlegate Sandstone is exposed along Bean Ridge as fine- to medium-grained and light yellowish gray. On the north side of Gooseberry Creek Canyon, in the NW¼ of section 29, T. 12 S., R. 6 E., the base of the Castlegate is a thick conglomeratic sandstone that is light gray, locally stained to orangish brown, cross-bedded and channel-filled, containing quartzite pebbles and cobbles. Above this unit the formation is mostly covered with slope wash, but it does crop out in ledges of fine-grained, light-gray sandstone at the top of the hill. In the eastern part of the Fairview Lakes quadrangle the thickness ranges from 66 to 98 meters (217-322 ft). However, only the upper 50 meters (164 ft) of the formation are exposed in Cottonwood Canyon and Oak Creek.

The upper contact of the Castlegate Sandstone with the Price River Formation is gradational in Cottonwood Canyon, and best exposed in the NE¼ of section 33, T. 13 S., R. 5 E. The contact was mapped at the top of the massive Castlegate Sandstone ledges, where mudstone of the Price River beds first appears. The contact is not exposed throughout the rest of the quadrangle, but the Castlegate was separated from the Price River Formation east of the Gooseberry graben on the basis of differences of slopes and terracing produced by the lithologic differences of the two formations.

*Price River Formation.* This formation crops out in Cottonwood Canyon and in Oak Creek Canyon, east of the western plateau frontal faults. It is exposed in the deep canyon of Gooseberrry Creek, in the NE¼ of section 31 T. 12 S., R. 6 E., but that outcrop belt is truncated by the north-trending East Gooseberry fault. The formation overlies the Castlegate Sandstone in the canyon walls of the upland area east of the East Gooseberry fault and on the east hillside of the Gooseberry graben. The formation is best exposed in roadcuts of Utah State Highway 31 along Cottonwood Canyon in the NE¼ of section 33, and in the NW¼ of section 34, T. 13 S., R. 5 E. Here it consists of thin- to thick-bedded sandstone and mudstone. The sandstone varies from light yellowish gray to moderate yellowish brown, fine to medium-grained and is cemented with calcite and limonite. The sandstones are crossbedded and show channeling into the underlying mudstone. Chips from the underlying mudstone are found at the base of some of the channel-filled sandstones and a few coaly plant fragments are found in some of the sandstone beds. The sandstone beds thin laterally in both directions from the thick channels and commonly have undulatory bedding surfaces, with evidence of soft-sediment deformation. Farther up the canyon, the top part of the formation contains more thick and massive, cross-bedded, chan-

nel-filled sandstones. These thick sandstone beds are coarser grained and contain occasional quartzite grit and pebbles. Mudstone beds are thicker and more common in the lower part of the formation and are generally olive gray to light yellowish gray. The mudstone weathers to crumbly and splintery slopes and reentrants below resistant sandstone beds.

In Oak Creek Canyon, the formation is poorly exposed but is recognizable as thick, cross-bedded and channel-filled sandstone found in the bottom of the stream bed. In the canyon of Gooseberry Creek, only occasional sandstone beds are exposed along the hillsides. The covered slopes between thick sandstone beds are assumed to be mudstone and thinner bedded sandstone. Upper sandstone beds in Gooseberry Creek exposures are light gray and conglomeratic, with quartzite pebbles and cobbles. The lower sandstone beds are light yellowish gray, medium-grained and thick-bedded. The Price River Formation is poorly exposed east of the Gooseberry graben along the hillsides and canyon walls of the flat uplands within the quadrangle. The hillsides are covered with slope wash and are forested such that only a few outcrops of sandstone occur. Near the mouth of Boulger Canyon, on the hillside north of Flat Canyon, the formation crops out at the front of the ridge as a light yellowish gray to light gray and fine- to medium-grained sandstone. It is cross-bedded and channel-filled and contains occasional grit and pebbles. The lower part is not exposed beneath slope wash there, but probably contains more mudstone beds, similar to those exposed in Cottonwood Canyon, based on terraces formed between the upper Price River Formation and the underlying Castlegate Sandstone. In general, the Price River Formation is not as coarse-grained as the underlying Castlegate Sandstone, but in a roadcut along Bean Ridge, in the SE¼ of section 33, T. 12 S., R. 6 E., Price River beds are light gray, coarse-grained, cross-bedded, and channel-filled conglomeratic sandstone, with grit-to cobble-sized clasts.

In Cottonwood Canyon the formation is about 83 meters (272 ft) thick. On the east side of the Gooseberry graben, it ranges from 66 to 85 meters (217-279 ft). Based on map patterns and topography. The upper contact of the unit is placed immediately above the last thick sandstone and where the first reddish mudstone of the North Horn Formation first appears. This contact is somewhat gradational and is well exposed in roadcuts in Cottonwood Canyon, NE¼ of section 34, T. 13 S. R. 5 E. It is also clearly defined the upland area east of Gooseberry graben. In small north- and east-facing cirques and related depressions, the thick sandstone beds form ledges directly below reddish brown and purplish slope-forming mudstone beds of the North Horn Formation. Exposures are particularly good in cirques in the head of Mill Creek, in the head of Upper Huntington Creek, and along the east side of Winterquarters Ridge, in the northeast corner of the quadrangle. Similar exposures are found in the NW¼, SE¼, of section 8, and in the N½ of section 5, T. 13 S., R. 6 E.

## Cretaceous - Tertiary System

*North Horn Formation:* Exposures of this formation are present in the deep canyons of South San Pitch Canyon, Dry Creek, Oak Creek, Cottonwood Canyon, and Spring Creek, west of the Gooseberry graben. The formation makes up much of the floor of the Gooseberry graben and caps the uplands east of the East Gooseberry fault. Three distinct units are recognizable within the North Horn Formation, but were not mapped because of poor exposures. The lower unit, as seen in Cottonwood Canyon, is about 63 meters (207 ft) thick and consists of thick- to thin-bedded sandstone and mudstone. The sandstone, for the most part, is light yellowish gray to grayish orange, fine-grained, and cemented with calcite and limonite. The sandstone beds are channel-filled and cross-bedded with rip-up clasts from underlying mudstone beds near the base of the channel fills. The mudstone beds are variegated reddish brown, purple, and olive gray, slightly calcareous, and weather crumbly and splintery. The thicker sandstone beds form small ledges along the hillsides where the mudstone weathers to slopes and reentrants. The middle unit is at least 130 meters (427 ft) thick in Cottonwood Canyon, but may be somewhat thicker inasmuch as the outcrop is truncated by the Cottonwood Ridge fault. The middle unit consists of interbedded limestone, sandstone, and mudstone, with a few very thin coal beds. The limestone is medium gray to light yellowish gray, micritic, and thinly bedded. The mudstone is medium gray to light olive gray, calcareous, and contains plant fragments in beds nearest to the thin coal beds. The sandstone is grayish yellow, fine-grained, and thinly bedded. Limestone and sandstone units have undulatory lower bedding surfaces. The upper unit is at least 158 meters (518 ft) thick in Cottonwood Canyon, but it is truncated by a fault. This unit consists of interbedded sandstone and mudstone similar to the lower unit. Sandstone beds are thicker in the upper unit than they are in the lower unit. They are yellowish orange to yellowish gray, fine-grained, cross-bedded and channel-filled, and cemented with calcite and limonite. The

mudstone is similar in appearance to the mudstone of the lower unit.

The formation is poorly exposed along the floor of the Gooseberry graben, except where stripped bare along the canyon walls of Gooseberry Creek. Here, the same three generalized units can be recognized. The lacustrine unit is exposed at the head of Boulger Canyon and along the canyon walls of Gooseberry Creek, immediately north of the Lower Gooseberry Reservoir, section 6, T. 13 S., R. 6 E. Thick-bedded sandstone of the upper unit is exposed in the canyon walls of Gooseberry Creek in section 19, T. 13 S., R. 6 E. East of the Gooseberry Graben, the North Horn Formation caps the flat uplands and ridges within the quadrangle. Most of the exposures there are of the lower unit, consisting of reddish brown and purple mudstone and thin-bedded sandstone. The lacustrine middle unit is also well-exposed in the cirque wall of Little Swens Canyon. The complete formation is 410 (1,345 ft) thick.

In the Indianola quadrangle, immediately northwest of the Fairview Lakes quadrangle, Runyon (1977, p. 70) reported conglomerate containing abundant Paleozoic limestone clasts and large algal balls within the North Horn Formation. In this quadrangle, these kinds of rocks occur as a conglomeratic and oncolitic sandstone unit near the top of the formation. These beds crop out along the Left Fork of Cottonwood Canyon in the NW¼, NE¼ of section 23, on the east side of the road to Lower Gooseberry Reservoir in the NW¼, NE¼ of section 24, and in the NE¼, NW¼ of section 13, T. 13 S., R. 5 E. The sandstone is light yellowish gray, medium- to coarse-grained and conglomeratic with occasional medium gray and light gray algal mats up to 40 cm (15½ inches) wide. The sandstone is cross-bedded and channel-filled and contains rip-up chips of mudstone.

Fossils found in the formation include gastropods, pelecypods of the family Unionidae, ostracods, fish scales and bone, turtle shell fragments and bone fragments. All of the fossils collected came from the middle unit, except for a few bone fragments which were found in fluvial sandstones of the upper and lower units. Most of the fossils were collected from roadcuts along Utah State Highway 31, in the NW¼ of section 33 and the NE¼ of section 27, T. 13 S., R. 5 E., at the head of Boulger Canyon, from below Lower Gooseberry Reservoir along the canyon walls of Gooseberry Creek and from the cirque wall of Little Swens Canyon. The upper contact of the unit is gradational with the overlying Flagstaff Limestone and is best observed at the head of Dry Creek. The North Horn Formation is considered part Late Cretaceous and part Paleocene in age.

## Tertiary System

*Flagstaff Limestone:* This Paleocene formation is exposed only in the western half of the quadrangle. It crops out as thin resistant caps along the crest of ridges and flat broad uplands, where it generally holds up a dip slope. The lower 80 meters (262 ft) of Flagstaff Limestone, exposed at the head of Dry Creek, is the most completely exposed section within the quadrangle. Here, the formation consists of thin beds of gray to light yellowish gray, principally micritic limestone, with thin-bedded gray shale and mudstone. The limestone has undulatory bedding surfaces and beds vary from 1 to 6 meters (3-20 ft) thick. Mudstone beds vary from 20 cm to 6 meters (0.7-20 ft) and form undercuts below the ledges of limestone. Minor sandstone beds less than 1 meter (3.2 ft) occur within the limestone and mudstone units. More sandstone beds are observed in other areas of the quadrangle. Only the lower part is preserved in the mapped area, although more complete sections are exposed along the monocline immediately west of the quadrangle boundary. The preserved part of the formation ranges from 32 to 80 meters (105-262 ft) on most of the capped ridges and flat uplands, but in some limited areas, such as on Chokecherry Peak, it is as much as 118 meters (387 ft) thick.

The most abundant fossils in the Flagstaff Limestone are gastropods, pelecypods, and ostracods, in decreasing order. The limestone beds range from almost a coquina of gastropod shells to beds with very rare shell fragments. Algal growths have coated gastropod and pelecypod shells, forming oncolites up to 15 cm (6 inches) in diameter in a few beds. Trace fossils, mostly horizontal and vertical burrows, commonly can be found in many of the limestone beds.

## Quaternary System

Morainal deposits of late Pleistocene (Pinedale) glaciation, and Recent deposits of alluvium, alluvial fans, and landslide debris are differentiated within the Fairview Lakes quadrangle.

Morainal deposits are restricted to the high southern valley of the Gooseberry Graben along the north side of the high peak, southwest of Fairview Lakes, in the NE ¼ of section 2, T. 14 S., R. 5 E., to Boulder Canyon near the intersection of Boulger Canyon and Flat Canyon and to the head of Little Swens Canyon. These deposits

are mapped as numbered series of older to younger terminal, recessional and ground moraines. Tarns and kettles were also recognized and mapped. Morainal surfaces are hummocky and irregular, with occasional small depressions or kettles. The till is composed of small to large angular blocks up to 60 cm in diameter of locally derived sandstone and limestone, all embedded in a matrix of unstratified sand and clay. The thickness of the moraines ranges up to 20 meters (65 ft.).

Alluvial fans occur along the east wall of the Gooseberry Graben, east of Lower Gooseberry Reservoir, and along the east-facing canyon wall of Boulger Canyon. Fans are composed dominantly of clay and sand, but contain occasional small sandstone and limestone clasts.

Alluvium is confined to stream channels in most of the canyon floors and within the valley floor of the Gooseberry Graben. The alluvium consists of fine-grained sand and clay, with pebbles and cobbles restricted to the deeper canyons in which major streams flow, such as Cottonwood Canyon, Oak Creek, and Gooseberry Creek.

Although slumping is active in parts of the quadrangle, only a few small landslides were mapped. These are located along the north canyon walls of Oak Creek, Cottonwood Canyon, Gooseberry Creek, and Boulger Canyon (plate 1). Major slumping occurs along the deep canyon walls where soil and colluvium are underlain by the North Horn Formation. The north-facing slopes are generally more unstable than the south-facing slopes, but the north-facing slopes are covered with forest, which makes it difficult to identify and map landslides. Much of the landslide material is clay and mud from the North Horn Formation, with a few large sandstone and limestone blocks from disrupted beds. Drainages along Oak Creek and Cottonwood Canyon have been disturbed by recent slumping. This is recognized by the addition of more coarse material into the stream bed that produced variations in gradient and local areas of rough water within the streams.

## STRUCTURE

The structural pattern in the Fairview Lakes quadrangle is dominated by a north-trending system of faults superimposed on the broad westward-dipping monocline of the western Wasatch Plateau. Westward dip of the plateau averages about five degrees and is related to continued uplift of the San Rafael Swell and High Plateau, whereas the faulting is of later origin. In the southwest corner of the quadrangle, west of the Frontal Fault, the rocks dip to a maximum of fourteen degrees where the steep flexure of the Wasatch Monocline is approached. Hunt (1956, p. 53) attributes the structure of the plateau, with its northward trending faults, as representing a zone transitional between the Colorado Plateau and Basin and Range province.

Rocks of the quadrangle are broken by high-angle, generally north-trending normal faults, such as those which define the Gooseberry Graben. Smaller faults split from or trend parallel to main faults which extend into adjoining quadrangles. These smaller faults form small horsts, grabens and antithetic systems. The principal named structures of the quadrangle includes the Gooseberry Graben and its boundary faults, Frontal fault, Cottonwood Ridge fault and Fairview Lakes fault. The East Gooseberry fault displacement ranges from 260 meters (853 ft) in the northern part to 360 meters (1,181 ft) in the southern part of the quadrangle. The West Gooseberry fault displacement ranges from 30 to 70 meters (98-230 ft) increasing to the south. In Cottonwood Canyon the Frontal fault displaces strata about 172 meters (564 ft) and the Cottonwood Ridge fault has a displacement ranging almost to 100 meters (328 ft) in the NW¼ of section 35, T. 13 S., R. 5 E. The Fairview Lakes fault displaces strata about 30 meters (98 ft) to the north and 65 meters (213 ft) to the south.

Structural contours placed on top of the Blackhawk Formation provide a picture of fault displacements and also show an anticlinal nose with a westward plunge in the northwest part of the quadrangle, and a synclinal nose with a westward plunge in the middle of Gooseberry Graben. These are gentle structures that are not immediately obvious at the surface.

## ECONOMIC GEOLOGY

Coal is the main economic deposit in the Wasatch Plateau and the Blackhawk Formation is the important coal-bearing unit in the area. The eastern third of the Fairview Lakes quadrangle lies within the Wasatch Plateau coal field. The western extent of this coal field is effectively terminated by the East Gooseberry Fault, which drops the coal below present economically recoverable depths.

A few thin coal beds are exposed in the upper part of the Blackhawk Formation and in the lacustrine unit of the North Horn Formation, but these have little economic potential. All of the important thicker beds lie within the lower one-third of the Blackhawk Formation.

The thick coal beds are all in the subsurface, with 350 to 500 meters (1150 - 1625 ft) of overburden in the bottom of the canyons east of the Gooseberry Graben, and over 1,150 meters (3800 ft) of overburden in the Gooseberry Graben. West of the graben, the estimated overburden is approximately 1,100 meters (3600 ft) along the ridge top and 525 meters immediately east of the Frontal Fault, in the bottom of Cottonwood Canyon and Oak Creek.

The only reasonable area of possible coal recovery is in the eastern third of the quadrangle, east of Gooseberry Graben. Doelling (1972, p. 224) reported that in this area at least 60 million potentially recoverable tons are present on leased acreage (about 7,000 acres). The coal beds in the rest of the area, for the most part, are deeply buried and broken by faults. However, underground gasification of coal may be of future interest.

In Dry Creek Canyon, west of the quadrangle, beds of lignite or low grade bituminous coal are exposed along the canyon walls in the lacustrine unit of the North Horn Formation. This coaly material is up to 4.5 meters (14.5 ft) thick in some places and was mined between 1955 and 1963 (Pratt and Callaghan, 1970, p. 59). These exposures are located east of Milburn, in section 7 and 8, T. 13 S., R. 5 E. The extent of the lignite field is unknown, but similar, thinner beds of coaly material can be found in the bottom of Oak Creek in NE¼, SE¼ of section 16, T. 13 S., R. 5 E.

## PETROLEUM AND GAS POTENTIAL

Interest in possible natural gas fields in the Wasatch Plateau increased after the discovery of natural gas in Carbon and Emery counties. To the southeast of the study area, in Joe's Valley, a small gas field was discovered by El Paso Natural Gas Company. The field produces from the Ferron and Dakota Sandstones.

An up-dip fault-seal structure on the west side of the Gooseberry Graben, in the SE¼, NW¼ of section 36, T. 12 S., R. 5 E., was tested with a well by Sunray Mid-Continental Oil Company in 1961. The structure has a closure of about 60 meters along the West Gooseberry Fault. The well was drilled through the Ferron Sandstone into the Lower Mancos Shale or the Tununk Shale Member and yielded no show of gas.

Carter Oil Company tested a similar structure on the east side of the graben in 1954, in the NW¼, NE¼, SW¼ of section 16, T. 13 S., R. 6 E. This well was also drilled into the Lower Mancos Shale and produced a show of gas from the Ferron Sandstone, but there was not enough gas for economic production (Pratt and Callaghan, 1970, p. 61). Recommendations for further search for natural gas or petroleum within the quadrangle was summarized by Walton (1963, p. 352). He suggested that the structures already tested should be drilled through the Cretaceous section to test lower formations that are productive east of the plateau.

## CONSTRUCTION MATERIALS

The Flagstaff Limestone has been crushed and used as road metal on some of the gravelled roads in the Fairview Lakes quadrangle. The limestone was excavated from a small pit where the road to Lower Gooseberry Reservoir branches off from the Skyline Drive. This is the best material for this purpose found within the quadrangle. Most of the alluvium is too fine to be used as gravel, and that gravel found in the area is restricted to small deposits concentrated in a few stream beds in the bottom of deep canyons, such as along Cottonwood Canyon, Oak Creek, and Gooseberry Creek.

## WATER RESOURCES

Numerous springs occur throughout the quadrangle and many are being utilized by cattlemen and sheepmen. Several springs have been developed and water piped into troughs. Many of these springs flow throughout the summer and fall months. In the eastern highland area, a few summer home owners have piped spring water into their homes. The water seems to be quite pure and potable.

The springs are controlled by permeable sandstone beds within the Blackhawk, North Horn, Castlegate, and Price River Formations. Limestone beds of the North Horn Formation and Flagstaff Limestone, along with faults, also control the spring distributions within the quadrangle. Most of the drainages of the area have permanent flows of water. Reservoirs and lakes within the area provide water storage for parts of Sanpete, Emery, and Carbon counties. The region is an important watershed and recreational area.

## SCENIC AND RECREATIONAL AREAS

The combination of geologic and geomorphic processes in this part of the Wasatch Plateau have provided a significant resource for the region in scenic and recreational values. The area supports woodland and mountain pastures, lakes, reservoirs, and permanent

streams. During the winter months, the area also provides potential for a variety of winter sports.

REFERENCES

Armstrong, H. L., 1968, Sevier orogenic belt in Nevada and Utah: Geological Society of America Bulletin, v. 70, p. 420-458.

Clark, F. R., 1928, Economic geology of the Castlegate, Wellington, and Sunnyside quadrangles, Carbon County, Utah: U.S. Geological Survey Bulletin 793, 165 p.

Degraff, J. F. and S. W. Zsiray, 1978, Quantitative analysis of cirque distribution on the northern Wasatch Plateau, Utah: (abstract) Geological Society of America Abstracts with Programs, v. 10, no. 5, p. 214.

Doelling, H. H., 1972, Central Utah coal fields: Sevier-Sanpete, Wasatch Plateau, Book Cliffs and Emery: Utah Geological and Mineralogical Survey Monograph Series, no. 3, 571 p.

Fisher, D. J., C. E. Erdmann and J. B. Reeside Jr., 1960, Cretaceous and Tertiary formations of the Book Cliffs, Carbon, Emery, and Grand Counties, Utah, Garfield and Mesa Counties, Colorado: U.S. Geological Survey Professional Paper 332, 80 p.

Forrester, J. B., 1918, A short comment on Bulletin 371 of the U.S. Geological Survey: Transactions of the Utah Academy of Sciences, v. 1 (1908-1917), p. 34-31.

Gilliland, W. N., 1951, Geology of the Gunnison quadrangle, Utah: University of Nebraska Studies, no. 8, 101 p.

Godfrey, A. E., 1978, Land surface instability on the Wasatch Plateau, central Utah: Utah Geology, v. 5, no. 2, p. 131-140.

Gundersen, W. C., 1961, An isopach and lithofacies study of the Price River, North Horn, and Flagstaff Formations of central Utah: unpublished M.S. thesis, University of Nebraska.

Hawks, R. L., Jr., 1980, The stratigraphy and structure of the Cedar Hills, Sanpete County, Utah: Brigham Young University Geology Studies, in press.

Hunt, C. B., 1956, Cenozoic geology of the Colorado Plateau: U.S. Geological Survey Professional Paper 279, 99 p.

Knoll, K. M., 1977, Chronology of alpine glacier stillstands, east-central Lemhi Range, Idaho: Special Publication of the Idaho State University Museum of Natural History, Pocatello, Idaho, 230 p.

La Roque, A., 1960, Molluscan fauna of the Flagstaff Formation of central Utah: Geological Society of America Memoir 78, 180 p.

McGookey, D. P., 1960, Early Tertiary stratigraphy of part of central Utah: American Association of Petroleum Geologists Bulletin.

Parker, L. R., 1976, the paleoecology of the fluvial coal-forming swamps and associated floodplain environments in the Blackhawk Formation (Upper Cretaceous) of central Utah: Brigham Young University Geology Studies, v. 22, part 3, p. 99-116.

Pashley, E. F., 1956, The geology of the western slope of the Wasatch Plateau between Spring City and Fairview, Utah: unpublished M. S. thesis, Ohio State University.

Pratt, A. R. and E. Callaghan, 1970, Land and mineral resources of Sanpete County, Utah: Utah Geological and Mineralogical Survey Bulletin 85, 69 p.

Richmond, G. M., 1962, Quaternary stratigraphy of the La Sal Mountains, Utah: U.S. Geological Survey Professional Paper 324, 135 p.

Richmond, G. M., 1964, Glaciation of Little Cottonwood and Bell Canyon, Wasatch Mountains, Utah: U.S. Geological Survey Professional Paper 454-D, 41 p.

Runyon, D. R., 1977, Structure, stratigraphy, and tectonic history of the Indianola quadrangle, central Utah: Brigham Young University Geology Studies, v. 24, part 2, p. 63-82.

Ryder, R. T., T. D. Fouch and J. H. Elison, 1976, Early Tertiary sedimentation in the western Uinta Basin, Utah: Geological Society of America Bulletin, v. 87, no. 4, p. 496-514.

Spieker, E. M., 1931, the Wasatch Plateau coal field, Utah: U.S. Geological Survey Bulletin 819, 210 p.

Spieker, E. M., 1946, Late Mesozoic and Early Cenozoic history of central Utah: U.S. Geological Survey Professional Paper 205-D, p. 117-161.

Spieker, E. M., 1949, The transition between the Colorado Plateau and the Great Basin in central Utah: Guidebook to the Geology of Utah, no. 4, Utah Geological Society, 106 p.

Spieker, E. M., 1956, Mountain building chronology and nature of geologic time scale: American Association of Petroleum Geologists Bulletin, v. 40, no. 8, p. 1769-1815.

Spieker, E. M., 1960, The Cretaceous-Tertiary boundary in Utah: International Geological Congress 21st Session, part 5, p. 14-24.

Spieker, E. M. and M. P. Billings, 1940, Glaciation in the Wasatch Plateau, Utah: Geological Society of America Bulletin, v. 51, p. 1173-1198.

Spieker, E. M. and J. B. Reeside Jr., 1925, Cretaceous and Tertiary formations of the Wasatch Plateau, Utah: Geological Society of America Bulletin, v. 36, p. 435-454.

Stanley, K. O. and J.W. Collinson, 1979, Depositional history of Paleocene-lower Eocene Flagstaff Limestone and coeval rocks, central Utah: American Association of Petroleum Geologists Bulletin, v. 63, no. 3, p. 311-323.

Stokes, W. L., 1956, Tectonics of the Wasatch Plateau and nearby areas (Utah) (abstract): American Association of Petroleum Geologists Bulletin, v. 40, no. 4, p. 790.

Van de Graaff, F. R., 1972, Fluvial-deltaic facies of the Castlegate Sandstone (Cretaceous), east-central Utah: Journal of Sedimentary Petrology, v. 42, no. 3, p. 558-571.

Walton, P. T., 1955, Wasatch Plateau gas field, Utah: American Association of Petroleum Geologists Bulletin, v. 39, p. 385-421.

Walton, P. T., 1963, Gas fields of the Wasatch Plateau, *in* Oil and Gas Possibilities of Utah, Re-Evaluated: Utah Geological and Mineralogical Survey Bulletin 54, p. 341-352.

Weiss, M. P., 1969, Oncolites, paleoecology, and Laramide tectonics, central Utah: American Association of Petroleum Geologists Bulletin, v. 53/5, p. 1105-1124.

Young, R. G., 1976, Genesis of western Book Cliffs coal: Brigham Young University Geology Studies, v. 22, part 3, p. 3-14.

Appropriations No. 016103
Archives Approval No. 8000220

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
UTAH GEOLOGICAL AND MINERAL SURVEY

MAP 56
GEOLOGY OF THE FAIRVIEW
LAKES QUADRANGLE, SANPETE COUNTY, UTAH

| SYSTEM | SERIES | FORMATION | SYMBOL | LITHOLOGY | THICKNESS IN FEET (METERS) | DESCRIPTION |
|---|---|---|---|---|---|---|
| QUATERNARY | | Alluvium - Till | Qal, Qls, Qaf, Qtm, Qlm, Qgm, Qk, Qt | | 0-66 (0-20) | alluvium, alluvial fans, landslide debris, colluvium, ground moraine, lateral moraine, terminal moraine |
| | | | | | 262 (80+) | limestone, light gray, mudstone, gastropods, pelecypods, oncolites |
| TERTIARY | Paleocene | Flagstaff Limestone | Tf | | | |
| | | North Horn Formation | KTnh | | 1345 (410) | variegated mudstone, sandstone, limestone, thin coal beds, oncolites, pelecypods, gastropods, fish scales, turtle shell, bone fragments |
| UPPER CRETACEOUS | | Price River Formation | Kc | | 272 (83) | sandstone, thick bedded, channel-filled, mudstone, few quartzite pebbles |
| | | Castlegate Sandstone | Kp | | 262 (80) | massive sandstone, ledge and cliff forming, locally conglomeratic, quartzite pebbles |
| | | Blackhawk Formation | Kb | | 1312 (400+) | sandstone, mudstone, shale, coal, leaf, bark, and twig impressions |

QUATERNARY
- Qal — Alluvium
- Qls — Landslide Debris
- Qaf — Alluvial Fan

GLACIAL DEPOSITS
- Qtm — Terminal Moraine 1, 2, 3, and 4
- Qlm — Lateral Moraine
- Qgm — Ground Moraine
- Qk — Kettle
- Qt — Tarn

TERTIARY
- Tf — Flagstaff Limestone
- KTnh — North Horn Formation
- Kp — Price River Formation
- Kc — Castlegate Sandstone

UPPER CRETACEOUS
UNCONFORMITY
- Kb — Blackhawk Formation
- Ksp — Star Point Sandstone (see cross-section-subsurface only)
- Kms — Mancos Shale (see cross-section-subsurface only)

SYMBOLS

Contact
*Dashed where approximately located; short dashed where inferred*

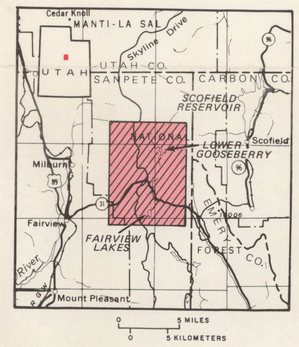
Fault
*Dashed where approximately located; short dashed where inferred; dotted where concealed. U, upthrown side; D, downthrown side*

Anticline
*Showing trace of axial plane and plunge of axis; dashed where approximately located*

Syncline
*Showing trace of axial plane and plunge of axis; dashed where approximately located*

Strike and dip of beds

Structure Contours
*Drawn on top of Blackhawk Formation contour interval 50 feet, dashed where approximate.*




LOCATION MAP

MAP 56

# GEOLOGY OF THE FAIRVIEW LAKES QUADRANGLE: SANPETE COUNTY, UTAH

By Gary G. Oberhansley

1980

Base from U. S. Geological Survey topographic quadrangle: Fairview Lakes, Utah, 1965
PR. 1978

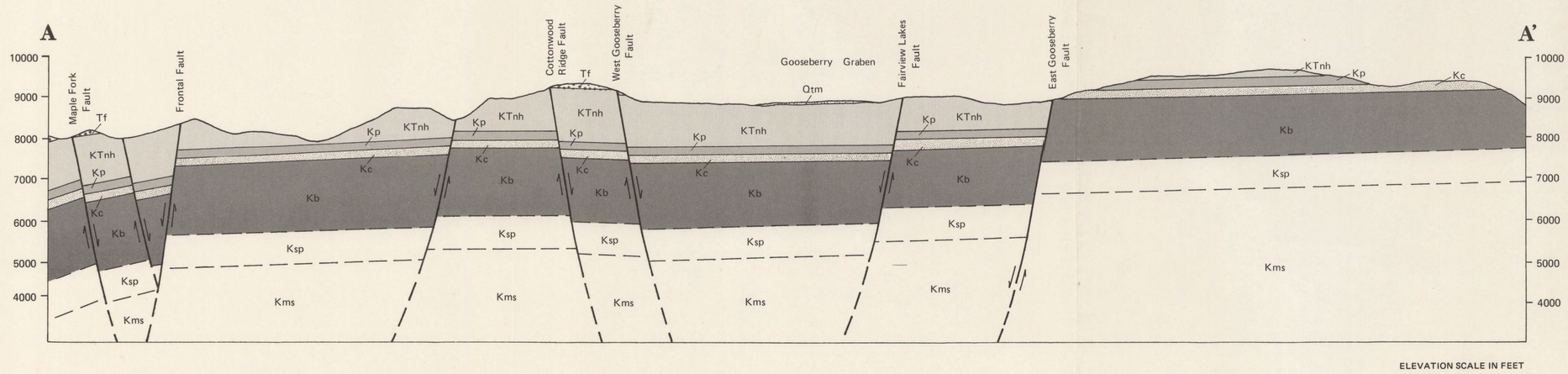
INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1979

Archives Approval 8000220
Appropriations No. 016103

SCALE 1:24 000
1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER

CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 20-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

UTM GRID AND 1978 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET




ELEVATION SCALE IN FEET