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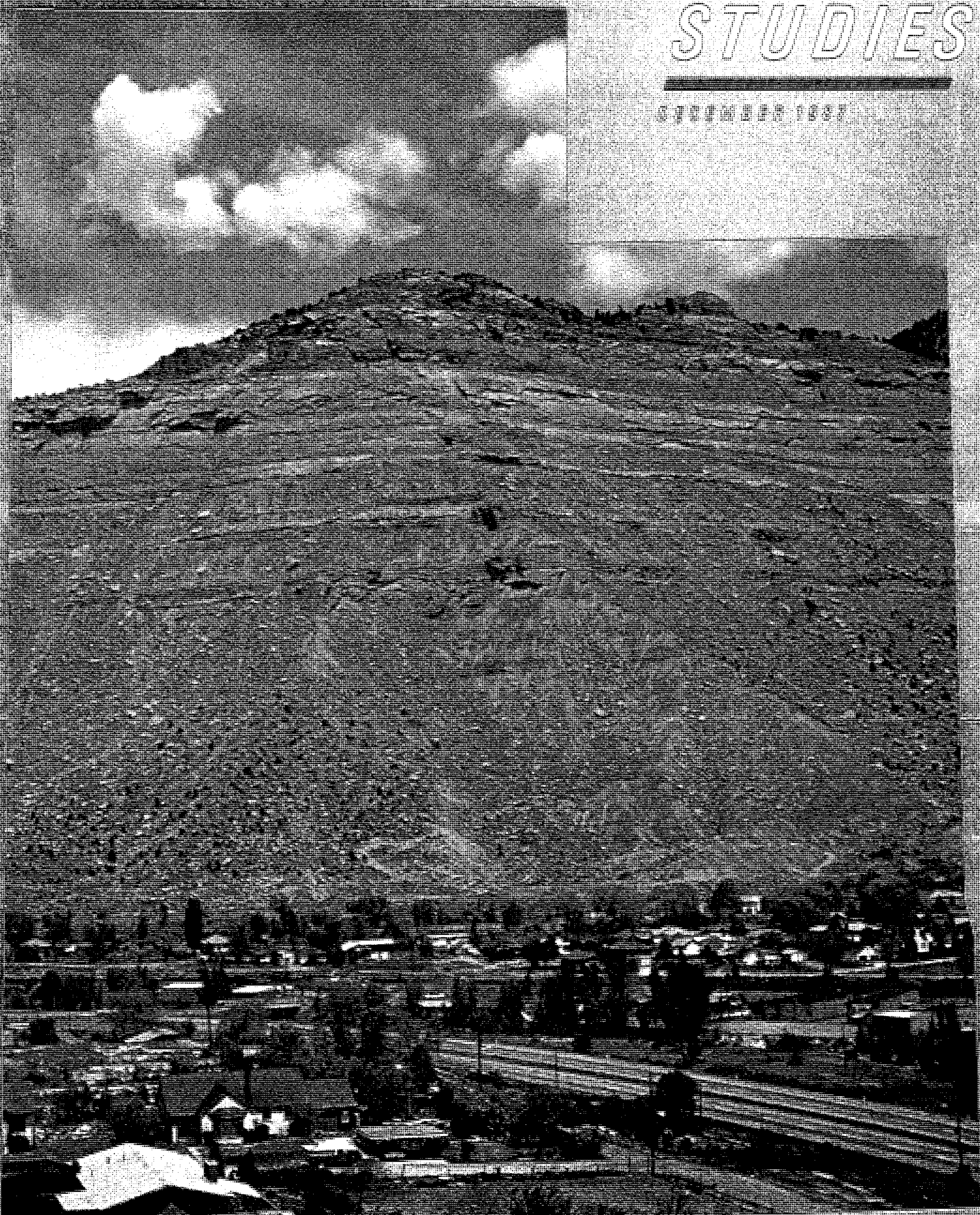

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Paleogeography and Paleoecology of the Myton Pocket, Uinta Basin, Utah (Uinta Formation—Upper Eocene)

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ABSTRACT

The Myton Pocket is an important vertebrate fossil locality 7 miles southeast of Myton, Utah, in an area of badlands composed of shales, siltstones, and sandstones of the lower part of the Myton Member of the upper Eocene Uinta Formation. The sandstones are interpreted as delta plain distributary paleochannel fills formed by avulsion. Current and sediment transport direction was west–northwest. Paleostreams had low-sinuosity patterns, were low in gradient and fairly high in silt and clay content. Siltstones and shale surrounding the sandstones represent over-the-bank deposits on a delta plain of Lake Uinta, where vertebrate fossils and coprolites have been preserved.

The mammalian fauna represents 10 orders of mammals and contains representatives of 26% of the known North American Uintan fauna. A varied vertebrate fauna of fishes, reptiles, and mammals filling various niches of a savanna-type environment with streams lined with streamside forest, some swampy or marshy areas, and forested highland is indicated for Myton Pocket times. Erosion and exposure of new fossil material appears to occur at fairly slow rates.

INTRODUCTION

The Myton Pocket became an important vertebrate fossil collecting locality after its discovery by O. A. Peterson in 1912 (1914, 1919). Collecting and research has continued in this upper Eocene locality intermittently over the past 70 years by researchers at such institutions as Princeton University, U.S. National Museum, Carnegie Museum, Utah Field House of Natural History, and Brigham Young University. Where this work has been published, it has been in individual reports on particular fossils. Nothing has been published providing a review of the paleontology of the Myton Pocket nor has any attempt been made to describe the paleogeography or paleoecology of this area. The present paper is an effort to (1) determine the paleogeography and environments of deposition of the Myton Pocket, (2) review and discuss the paleontology of the Myton Pocket, and (3) determine as much as possible the paleoecology of the Myton Pocket.

Rocks in the Myton Pocket are part of the upper Eocene Uinta Formation. Peterson (in Osborn 1895, p. 72–76) divided the Uinta Formation into three horizons: a lower A horizon, a middle B horizon, and an upper C horizon. Wood (1934, p. 242) combined the Uinta A and B into a single member and called it the Wagonhound Member. He also renamed Uinta C, calling it the Myton Member after the town of Myton, Utah. Wood's nomenclature will be used in this study with occasional reference to horizons B and C when referred to as such by previous authors. The Myton Pocket is part of the Myton Member.

In other work related to the Uinta Formation, Bradley (1931); Dane (1954); Ray, Kent, and Dane (1956) discussed the stratigraphic relationships of the upper Green River Formation and lower Uinta Formation. Picard (1957) described the differences between lacustrine and fluvial sediments in the lower Uinta Formation. The depositional environments of early stages of Lake Uinta were discussed by Ryder, Fouch, and Elison (1976) and Fouch and Dean (1982).

In the present work, sandstone units interpreted as paleochannel fills are mapped and described. Estimates of stream character are made using Schumm's (1968, 1972) formulae. Current and sediment transport directions are determined and a model of the environments of deposition for Myton Pocket sediments proposed. The

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paleontology of the Myton Pocket mammalian fauna is provided. Information and interpretations on the climate and paleoecology of the Myton Pocket are presented. Present rates of erosion and fossil exposure are discussed in relation to future research in the Myton Pocket.

LOCATION

The Myton Pocket is located approximately seven miles southeast of the town of Myton, Utah, along the boundary between Duchesne and Uintah Counties. It is an area of badlands composed of shales, siltstones, and sandstones of the Myton Member of the upper Eocene Uinta Formation (fig. 1).

The original Myton Pocket designation included an area in and adjacent to section 6, T. 4 S, R. 1 E, of the Uintah Special Meridian. For purposes of this report, field research was conducted in an area reaching several miles out from section 6, but particularly to the south and southeast.

METHODS

Originally, this study was to be more concerned with the paleontology of the Myton Pocket. Some preliminary fieldwork was done using standard fossil vertebrate collecting techniques in the summer of 1980, during which attempts at screening small mammal fossils were unsuccessful. C. C. Black (personal communication 1980) indicated similar results from screening efforts in the Myton Pocket. Additional field collecting and access to the immediate study area were limited due to problems with obtaining permission from the Ute Indian tribe, despite every effort made by the author. Emphasis was then changed to include the paleogeography of the Myton Pocket.

A study of the sandstone units interpreted to be paleochannel fills was conducted as part of the present thesis. These were mapped and measured, and cross-beds studied to determine direction of current and sediment transport. A stratigraphic section was also measured and well logs reviewed to determine the stratigraphic position of the Myton Pocket in the Uinta Formation. Collections of Myton Pocket mammalian fossils at Brigham Young University and the Utah Field House of Natural History were studied and identified. Collections at the Carnegie Museum, U.S. National Museum, and Princeton University Geological Museum were visited and briefly studied to aid in compiling the faunal list.

Comparisons of photographs taken 11 years ago and during the present study seemed to show little erosional surface change. To determine the prospects of future fossil collecting and research in the Myton Pocket, the author set up several sediment traps in an attempt to ascertain present erosion rates and exposure of new fossil material.

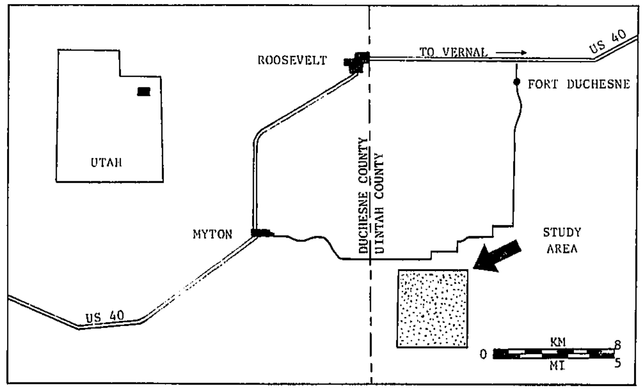

FIGURE 1.—*Index map showing study area.*

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GEOLOGIC HISTORY AND SETTING

HISTORY

Throughout much of Precambrian time, the location of the present Uinta Mountains was the site of a slowly subsiding enlongate basin flooded by shallow marine waters (Hansen 1969, p. 80). The thick wedge of sediments deposited in that basin forms the core of the Uinta Mountains today. According to Childs (1950, p. 51), sediments exposed on the flanks of the Uintas show a geosynclinal shelf or foreland character with alternating periods of marine and subaerial sedimentation.

With the advent of the Laramide orogeny in Late Cretaceous times, the uplifts forming the Rocky Mountains occurred, the largest structure of which is the Uinta Mountain anticline (Hintze 1973, p. 76 and 107–8). Basins formed adjacent to this anticline were occupied by several large freshwater lakes. On the south side of the Uinta Mountains, Lake Uinta formed the environment in which the Green River Formation (middle Eocene) and parts of the Uinta Formation (upper Eocene) were deposited. Fluvial sediments intertongue with and overlie these lacustrine deposits.

By late Eocene time Lake Uinta had diminished somewhat in size. Conditions fluctuated between lacustrine and fluvial, but tended to become more fluvial as this epoch came to an end. The Uinta and Duchesne River

Formations were deposited during this time. The Uinta Formation is composed of alternating beds of shale, siltstone, and lenticular sandstones. It is in these sediments that the bulk of late Eocene vertebrate material has been found. The Uinta Formation is considered late Eocene in time, and the formalized Uintan mammalian age was named for the fauna of these deposits (Wood and others 1941).

The Duchesne River Formation, which conformably overlies the Uinta Formation, is composed of coarser sediments, sandstone with some conglomerates, and minor interbedded siltstone and shale. The Duchesne River Formation overlaps onto formations proressively older than the Unita Formation in an angular unconformity toward the Uinta Mountains. There is some disagreement as to whether the Duchesne River Formation is Eocene or Oligocene in age (Kay 1934, Peterson and Kay 1931, Scott 1945, Simpson 1933 and 1946, Wood and others 1941, Untermann and Untermann 1968).

There was probably some post-Eocene uplift of the Uinta Mountains. This is indicated by upturned Duchesne River beds along the south flank of the mountains and the synclinal structure shown in the formation.

The Uinta Basin and Mountain area received post-Eocene deposits, but these are preserved only as remnants around the foot of the mountains and on old erosional terraces. The Late Tertiary and Quaternary have been times of erosion in the basin. This has been accentuated by the uplift of the Colorado Plateau and surrounding area during the past 10 million years (Hintze 1973, p. 82). Erosion has carried away much of the upper Eocene sediments.

SETTING

The Uinta Basin is a broad, east–west-trending basin south of the Uinta Mountains. It covers approximately 31,000 square km (12,000 square mi) with elevations ranging from 1,465 to 2,130 m (4,800 to 7,000 ft). It forms both a topographic basin and structural basin. The axis of the structural basin lies almost at the foot of the south flank of the Uinta Mountains.

The principal drainage systems are formed by the west-to-east-flowing Duchesne River and its tributaries and the east-to-west-flowing White River and its tributaries. Both these streams enter into the south-flowing Green River near Ouray, Utah. The Green River flows south through the Book Cliffs out of the Uinta Basin.

It is evident from the canyons of the Green River and its tributaries that much basin fill has been stripped away during Pleistocene and Recent times. This has produced extensive badlands in the center of the basin, such as that in the Myton Pocket where much fossil collecting has occurred.

Features in the Myton Pocket include typical badland hills and gullies with little or no vegetation, brush-covered sand dunes, and gravel-covered terraces. Sandstone lenses form caps to ridges with gullies on softer siltstones and shales between. The sandstone lenses are sandwiched between these softer sediments in some areas. Erosion of the softer sediments undercuts the sandstone, and large blocks break loose and slide or roll down the slope.

Topographic relief varies from a few meters to as much as 70 m (200 ft). Elevations range from 1,635 m (5,364 ft) on the ridge at the south to less than 1,524 m (5,000 ft) on the north.

No permanent streams occur in the Myton Pocket. During rainstorms or spring runoff, water collects in several gullies and drains northward into the Duchesne River or is intercepted by irrigation canals. Several intermittent seeps occur on the north side of the ridge that runs east–west along the south side of the Myton Pocket. Annual precipitation is generally 18 cm (7 in) or less.

STRUCTURE

The synclinal axis of the structural Uinta Basin lies about 32 km (20 miles) north of the Myton Pocket (Rizma 1957). Therefore, the Myton Pocket is positioned on the north-dipping flank of the east–west syncline. The actual dip of beds in the Myton Pocket area is difficult to measure due to irregular stratification in the sandstone, siltstone, and shale beds. The sandstones fill channels that have been cut into the finer-grained sediments. Bedding in the siltstones and shales seems to undulate somewhat, giving different dips. There does appear to be an overall dip of about two degrees from north to northeast. Using the bottom of the Uinta Formation, as measured in three separate wells 11 to 18 km (7 to 11 mi) apart, a dip of two degrees toward north, 18 degrees east, was obtained. Thirteen to 16 km (8 to 10 miles) south of the Myton Pocket, Hiko Bell Mining and Oil Company (1982) reported a dip of 19 m per km (100 ft per mi) approximately one to two degrees in a north-to-northeast direction.

No faults or major folds were observed in the Myton Pocket. There are several small east–west-trending faults several miles southeast of the Myton Pocket, off Leland Bench. These show up on aerial photos, and one observed by the writer in the field appeared to be a normal fault, dipping northward, with about 6 m (20 ft) of displacement. This is probably the eastern extension of the Duchesne fault zone mentioned by Ray, Kent, and Dane (1956) and would, therefore, pass south of the study area.

STRATIGRAPHY

The study area is wholly within the Uinta Formation, and the stratigraphy discussed in this section will deal only with this formation. The emphasis will be on the section of sediments measured in the Myton Pocket that will, hereafter, be called the Myton Pocket section. The Myton Pocket section lies within the Myton Member of the Uinta Formation.

UINTA FORMATION

The upper Eocene Uinta Formation is exposed in an east–west band in the central part of the Uinta Basin. It extends east-to-west about 130 km (80 mi) and ranges from 19 to 24 km (12 to 15 mi) wide in a north–south direction (Peterson and Kay 1931). Williams (1950, p. 111) stated that the Uinta Formation was "a rather monotonous sequence of interbedded sandstone and shale." Ray, Kent, and Dane (1956, p. 1) described the Uinta Formation as follows:

The Uinta Formation comprises a thick sequence of chiefly fluvial red beds in the eastern part of the area but includes a varying percentage of lacustrine beds. Massive channel sands are common throughout the red-bed sequence. The relations recorded suggest that the channel sands represent deposits of streams flowing laterally westward into playa, mudflat, and lacustrine deposits. The base of the red-bed sequence rises stratigraphically westward from the Green River.

From this description it can be seen that the Uinta Formation varies greatly in nature and composition from east to west. The thickness of the formation also varies somewhat. Peterson (in Osborn 1895, p. 73–74) gave 518 m (1,700 ft) as the thickness of the Uinta Formation near the Colorado and Utah state line. Kay (1934) measured 502 m (1,648 ft) in the Ouray area. However, 30 miles north and west of Ouray, at Ute tribal well 1, a thickness of 1,402 m (4,600 ft) was drilled between the Duchesne River and Green River Formations (Miller 1950, p. 149). Dane (1954, p. 424) estimated the thickness of the Uinta Formation in the Duchesne area to be 1,112 to 1,234 m (3,650 to 4,050 ft). The Uinta Formation lies conformably over the Green River Formation (Dane 1954, p. 416) and conformably under the Duchesne River Formation (Kay 1934, p. 358).

Myton Pocket Section

The Myton Pocket section is located in the upper third of the Uinta Formation. Gulf Valley Wash tribal well 1, located one mile southeast of the Myton Pocket, passes through 800 m (2,625 ft) of Uinta Formation. Projecting south 11,090 m (36,380 ft) from the contact between the Uinta Formation and the Duchesne River Formation to a point above this well and using a dip of two degrees north indicates approximately 383 m (1,250 ft) of Uinta Formation has been removed from this area. It is estimated, therefore, that the original thickness of the Uinta Formation in the Myton Pocket area was 1,189 m (3,900 ft).

The well referred to above is approximately 30 m (100 ft) downsection from the lowest point in the Myton Pocket. The writer measured a section of 73 m (240 ft) in the Myton Pocket (see fig. 2 and appendix A). This would mean there is 831 m (2,725 ft) of Uinta Formation below the Myton Pocket section and 285 m (935 ft) above. This places the Myton Pocket section low in the Myton Member, perhaps very near the bottom.

Immediately south of the study area is a large escarpment of approximately 46 m (150 ft). From the top of the escarpment, and for several hundred meters below, the nature of the formation appears to change. The sandstone lenses appear to be larger and somewhat more numerous, particularly to the east. These beds are stratigraphically lower than those exposed in the Myton Pocket and are probably westward extensions of Uinta B or upper Wagonhound Member. These beds were followed southeastward to the Green River. At this point they cannot be followed across the alluvium of the Green River valley, but they lie west across the river from the White River Pocket. The White River Pocket was considered Uinta B (Wagonhound Member) by Kay (1934) in this cross section of the Uinta Formation. Any eastward extension of the Myton Pocket section is hidden by more recent terrace gravels on the Leland Bench. It is here suggested that the top edge of the escarpment be used as a convenient location for the contact between the two members of the Uinta Formation in this area.

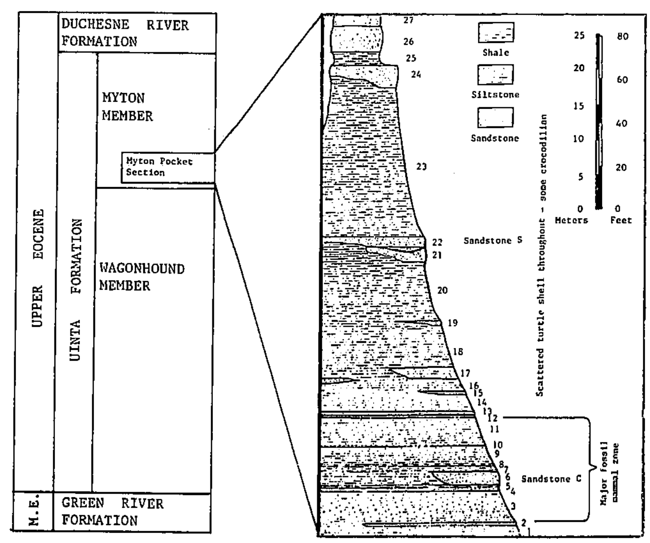


FIGURE 2.—*Stratigraphic column, Myton Pocket section of the Uinta Formation (upper Eocene). Numbers correspond with units on measured stratigraphic section.*

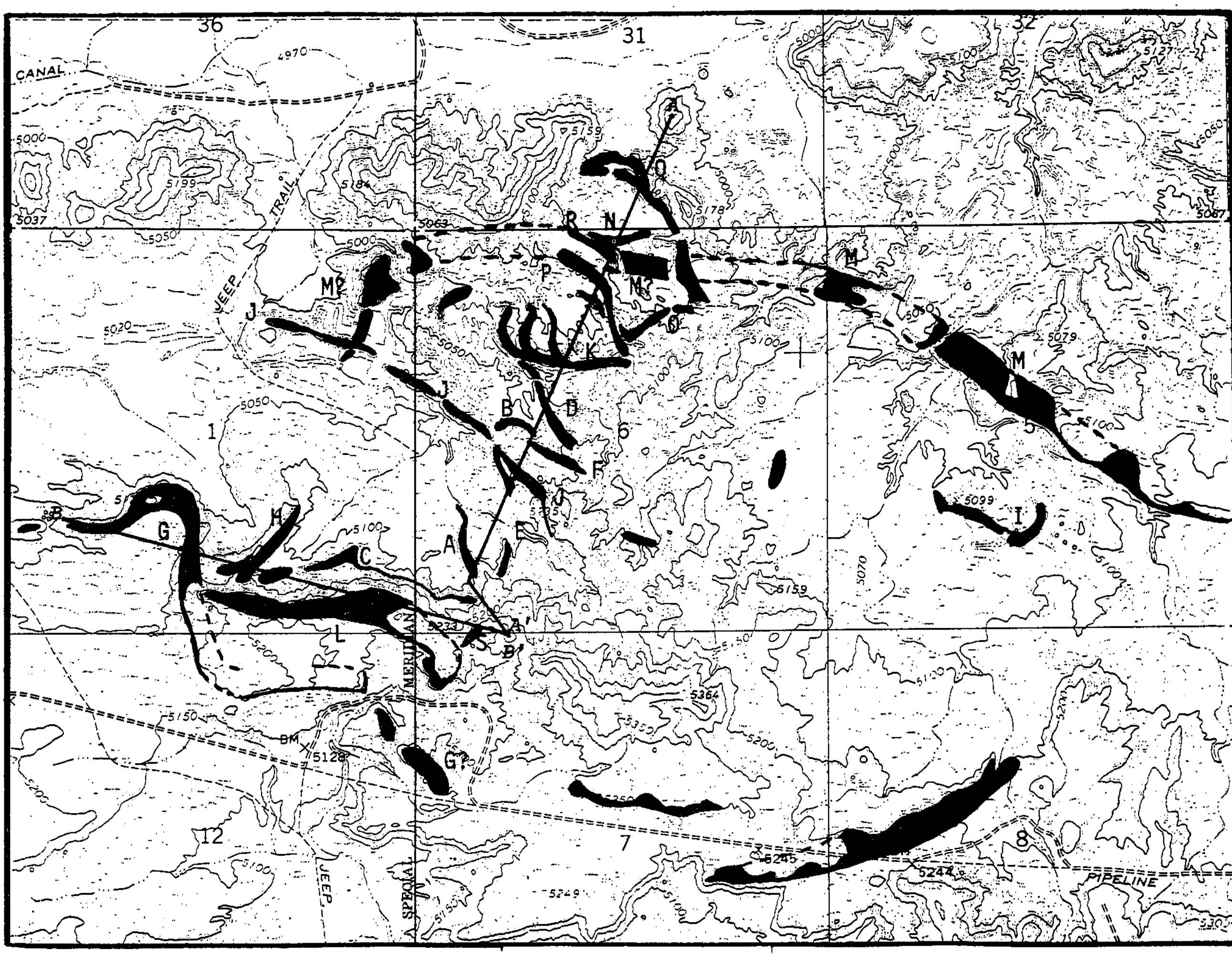


FIGURE 3.—*Mapped sandstone bodies in study area. Listed alphabetically as close as possible in stratigraphic sequence—A being the lowest, S the highest. (Base map is from U.S.G.S. 7½-Minute Windy Ridge Quadrangle.)*

PALEOGEOGRAPHY

SANDSTONE PALEOCHANNELS

Morphology

There are a number of mappable sandstone bodies in and around the study area (figs. 3–6). These sandstones generally form narrow linear outcrops from a few meters to one over 800 m (2,600 ft) long. They are lenticular, usually having trough-shaped erosional bottom surfaces and flat to slightly convex top surfaces. The exact shapes of sides and top surfaces are sometimes hard to determine because of recent erosion and weathering. They range from 8.5 to 130 m (28 to 426 ft) wide and 0.6 to more than 6 m (2 to 20 ft) thick. From the aerial photograph (fig. 5), some sandstone units can be seen to curve and meander. Most, however, have a fairly straight to slightly curved nature. Some of the sandstones appear to intersect other similar units, but usually one sandstone passes beneath or over the other. In some cases, several sandstone units form linear patterns as eroded segments of once-continuous units (channel J on figs. 3 and 6).

There is a general east–west or southeast–northwest trend in the linear direction of the sandstone units as a whole. Very often these units cap ridges where they are underlain by softer siltstone and shale units. Where they intersect other ridges or hills they are surrounded on both sides by these finer-grained sediments and are occasionally overlain by them also.

Lithology

Samples from various sandstone units were studied in the field and under a binocular microscope in the lab. The Wentworth scale was used for grain-size classification. Samples from the larger units were found to have grains ranging from very fine to coarse sand. Medium sand is the

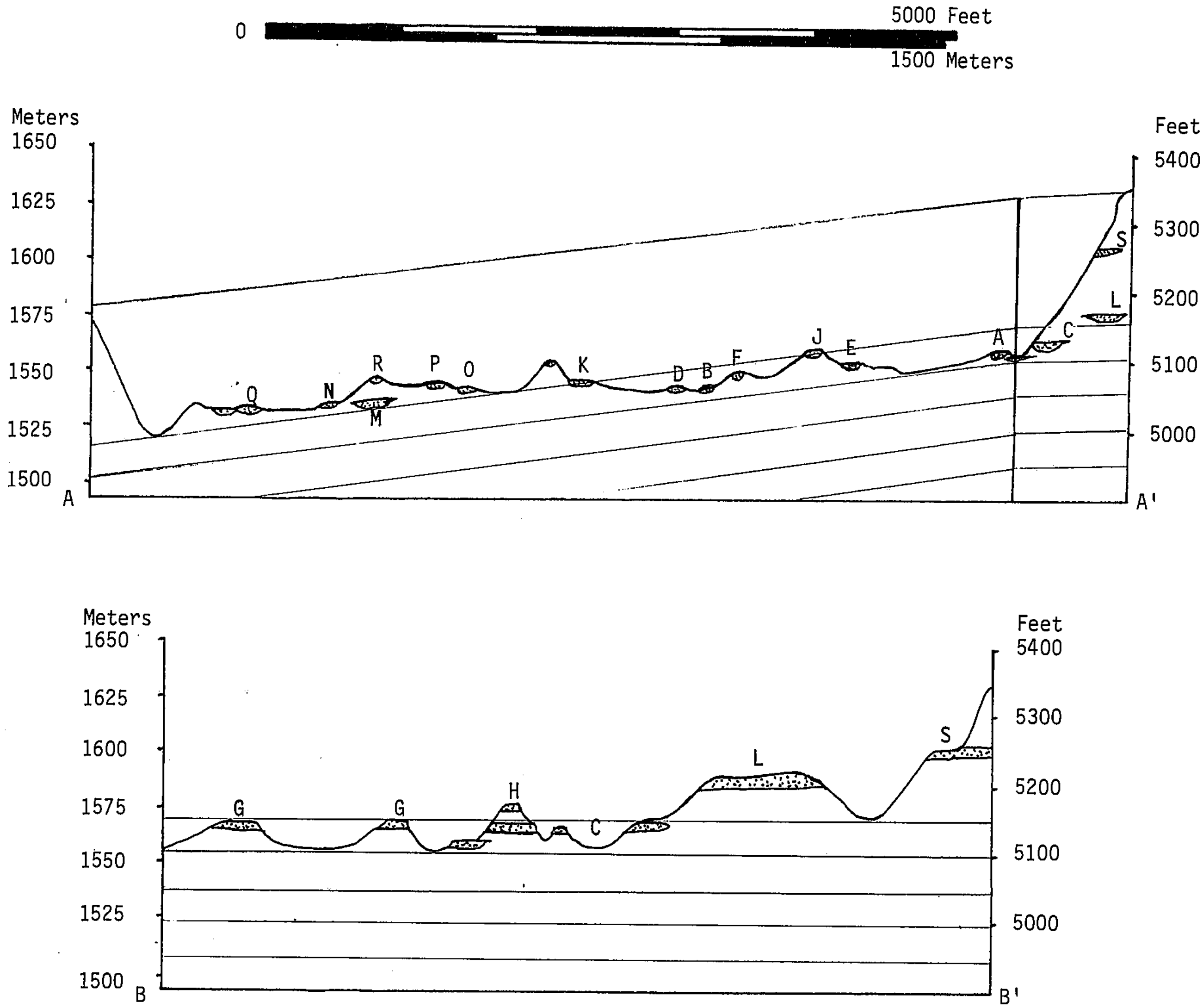


FIGURE 4.—*A-A' is a cross section running south 23 degrees west through the Myton Pocket. B-B' is a cross section running north 15 degrees west along the ridge on the south edge of the Myton Pocket. Refer to figure 3 for location of cross sections in the Myton Pocket and positions of various sandstone units. (Exaggerated horizontal scale.)*

most common. Only occasionally were grains seen in the very coarse or grit sizes. Smaller sandstone units tended to range from medium and fine to very fine, with fine being the most common. All samples contained some silt and clay as matrix, which gave samples a "dirty" appearance. Most samples were poorly cemented, fairly soft, and easily abraded. The silt and clay may have acted as a binding agent. Most samples were composed of approximately 70% quartz, 22% clay and feldspar, and 8% other minerals or grains, including rock fragments, mica, minor amounts of magnetite, and other particles not identified. None of the samples studied reacted to HCl.

While pebble-sized fragments of rock are rare, pebble-sized mud lumps were observed. These usually occur near the bottom of a unit and probably represent eroded chunks from the surrounding mudstone. Occasionally fragments of turtle shell, fish scales, and vertebrae and other bone fragments were observed in the sandstones. These generally occur as isolated fragments somewhat worn from stream transport. Flat turtle shell and fish

FIGURE 5.—*Aerial photograph of Myton Pocket area with sandstone paleochannels mapped in white. Scale: Lined squares are one mile by one mile sections (1.6 kilometers by 1.6 kilometers). Photograph from U.S.D.A., 10-21-69, DRY-3KK-29.*

scales usually lie parallel to bedding plains. These fossil fragments likely represent pieces of material buried elsewhere in finer sediments that were later eroded out and carried downstream to be redeposited on the bottom of the stream bed.

Sedimentary Characteristics

Of the large number of paleochannel sandstones, only four were selected for detailed study of sedimentary characteristics. These are channels D, F, J, and K. They were selected because of the range in sizes they exhibit and convenience of exposed surfaces (see fig. 3).

Channel D. Channel D is 1.83 m (6 ft) thick and 14.6 m (48 ft) wide. The lower surface is an erosional surface underlain by a 15 to 20 cm (6 to 8 in) layer of gray-green silty shale. The top surface is fairly flat, somewhat weath-

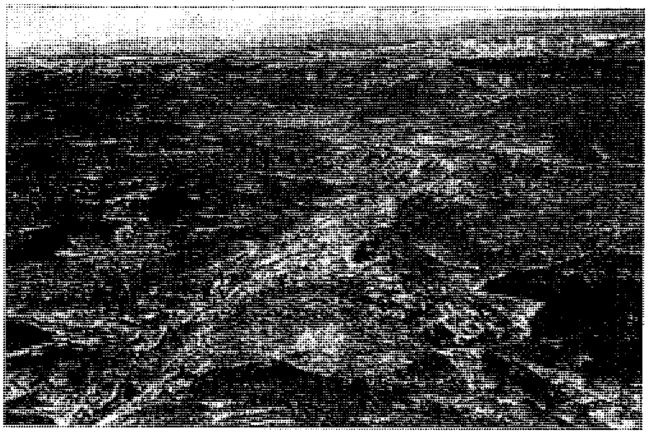


FIGURE 6.—*Exhumed paleochannel J. Direction of photo is west-northwest.*

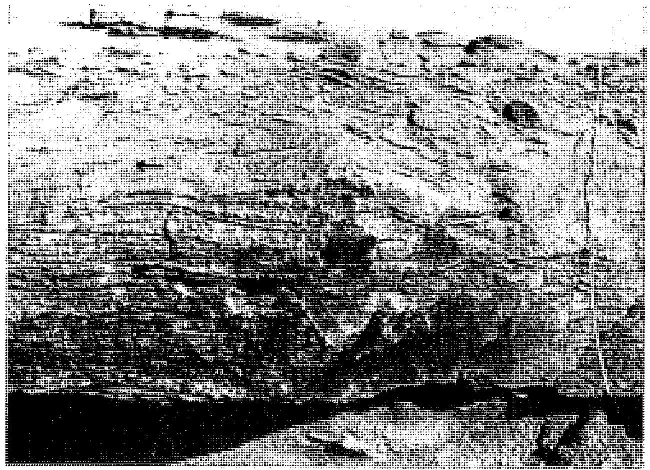


FIGURE 7.—*Photo of sedimentary characteristics of Channel D. Six-foot ruler for scale. Arrow indicates current direction.*

ered, and contains some trough cross-bedding. The vertical surface studied is also parallel to the trend of the whole body (N. 10° W.). In this view, it is difficult to distinguish between planar and trough cross-bedding. Both may be present (fig. 7) with a predominance of trough cross-beds.

Channel D is composed of fine- to medium-grained sand throughout with no fining upward sequence observed. It is light brown to gray green in color.

Channel F. Channel F is 1.52 m (5 ft) thick and 16.4 m (54 ft) wide. The bottom is an erosional surface underlain by 15 cm (6 in) of green silty shale. The vertical surface studied is also parallel to the trend of the whole unit. Bedding appears to be fairly horizontal from this view (fig. 8), but this may represent the elongate edges of trough cross-beds.

Channel F is composed of fine- to medium-grained sand throughout. No observable fining upward sequence was observed.

Channel J. Channel J is one of the more prominently exposed channels (fig. 6). It is made up of several segments covering a distance of 1340 m (4400 ft). The channel is 27.3 m (91 ft) wide in places and 3.3 m (11 ft) thick. Some sections are narrow, probably due to recent erosion of sides. The general trend of the whole body is N 65° W and fairly straight. The top is flat to convex. Trough cross-bedding is present on the top surface with directions close to the general trend of the main body. The bottom is on an erosion surface and contains mud blebs, turtle shell fragments, plant imprints, and some worm burrows.

From the view parallel to the trend, bedding planes are not readily apparent in the lower 84 cm (32 in) (fig. 9). Cross-beds are present for the next 20 cm (8 in) and then are not distinct until 104 cm (41 in) is reached. Again, because of the parallel view, it is difficult to distinguish planar from trough cross-bedding. The characteristics observed above may be those of trough cross-bedding, as seen from either the outer edges of the trough or the center of the trough.

Channel J is composed of fine- to medium-grained sand throughout with no fining upward vertical sequence observed. It is gray green in color.

Channel K. Channel K is fairly straight for 400 m (1312 ft) from east to west where it then curves to the north and appears to divide into three separate sandstone bodies. These then curve back to the west again. This is the largest of the four bodies studied in detail. It measures 3.65 m (12 ft) thick in places and 47.45 m (156 ft) wide. At the study location it measures 3 m (10 ft) thick. The section studied is parallel to the trend of the sandstone body (fig. 10).

The bottom is on an erosional surface and contains mud blebs, turtle shell fragments, and plant imprints (fig. 11). There are several layers of mud blebs (0.5 to 1 cm or 0.25 to 0.50 inches in diameter). Cross-bedding varies from thinly cross-bedded to thickly cross-bedded (terminology of Mckee and Weir 1953, p. 383). Both trough and planar cross-beds appear to dominate and run parallel to direction of sandstone body. These are readily noticeable on the top surface (fig. 12). The top surface is flat to slightly concave. Grain size varies from several layers of mainly fine sand to some with small amounts of coarse sand and even grit-size pebbles. These do not seem to be part of an upward fining sequence. The most common size is medium sand. These variations may represent several cycles of in-channel stream shifting during stages of low stream flow.

Current and Sediment Transport Direction

There is a general east–west alignment of sandstone bodies in the study area. Dip directions of cross-bedding

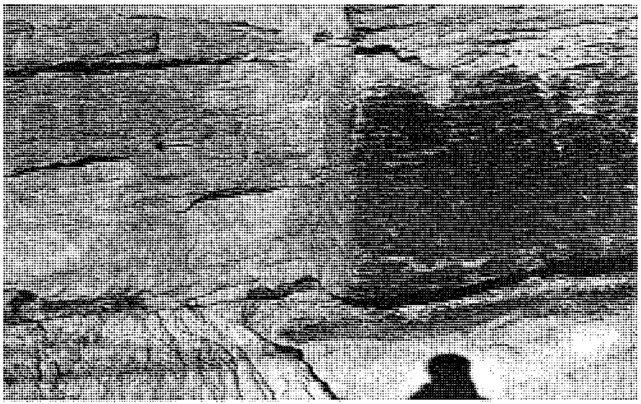


FIGURE 8.—*Photo of sedimentary characteristics of Channel F. For scale, sandstone is approximately 1.5 meters (5 ft) thick. Arrow indicates current direction.*

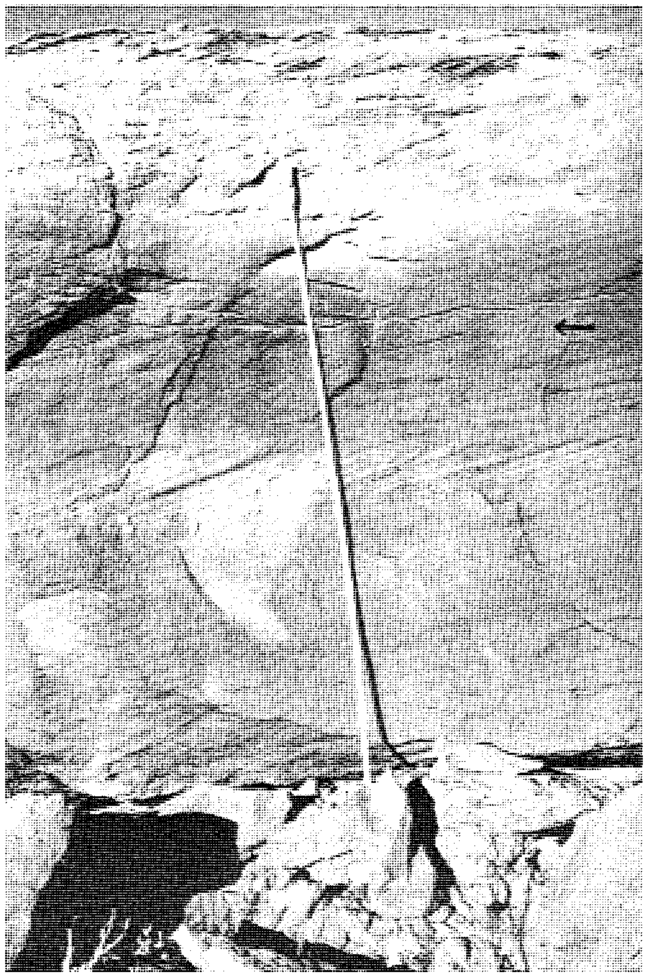


FIGURE 9.—*Photo of sedimentary characteristics of Channel J. Six-foot ruler for scale. Arrow indicates current direction.*

and trough directions were measured on a number of outcrops and the general direction noted on others. Figure 13 shows dip and trough direction on sandstone bodies where measured. The directions correspond closely with the channel trend indicating stream flow straight down the channel. Figure 14 is a rose diagram representing 70 measurements taken on various sandstone bodies throughout the Myton Pocket.

Estimates of Stream Character

Schumm (1968, 1972) developed equations from data collected on modern rivers of the Raverine Plain in New South Wales, Australia, and on the Great Plains of the United States, which permit estimation of paleochannel gradient, meander wavelength, discharge and percent of silt-clay from dimensions of the paleochannel exposed in cross section. He points out that these do not provide exact information, but do give improved estimates of paleochannel character. There are some problems associated with determining the actual dimensions of a paleochannel.

A number of sandstone bodies exposed in and around the Myton Pocket permit measurements and estimates of thickness and width. Measurements were made on these and Schumm's (1972) formulae applied (see table 1). These have been listed by alphabetical figures and arranged as closely as possible in stratigraphic order from A to S (see fig. 3). Several sandstone bodies are located at approximately the same stratigraphic level, but sizes and orientations suggest they represent separate stream channels.

Because Schumm's formulae were developed for use with measurements in feet and miles, the information derived from them is given in feet and miles on table 1. The following is a summary of characteristics determined for ancient streams that flowed through the Myton Pocket area. Meander wavelength (l) ranged from 137 to 1,137 m (450 to 4,500 ft). Stream gradient (s) was generally low, averaging less than 0.76 m per km (less than 4 feet per mile). Mean annual flood flow (Qma) ranged from 1,918 cms (cubic meters per second) (700 cfs—cubic feet per second) to 527 cms (18,600 cfs). Mean annual discharge (Qm) ranged from 0.45 cms (16 cfs) to 68.0 cms (2,400 cfs). Values for percent of silt-clay (M) ranged from 9.4 to 30.

Stream Channel Classification

Channel deposits occur in several different ways. The type of channel deposit is a product of the channel pattern. Leopold and Wolman (1957) discussed three major types of stream patterns. These are braided, meandering, and straight. Schumm (1981, p. 25) identified 14 channel patterns in three major groups based on load (ie., bedload, mixed load, and suspended load). Moody-Stuart (1966, p. 1102–5) described characteristics of high-sinu-

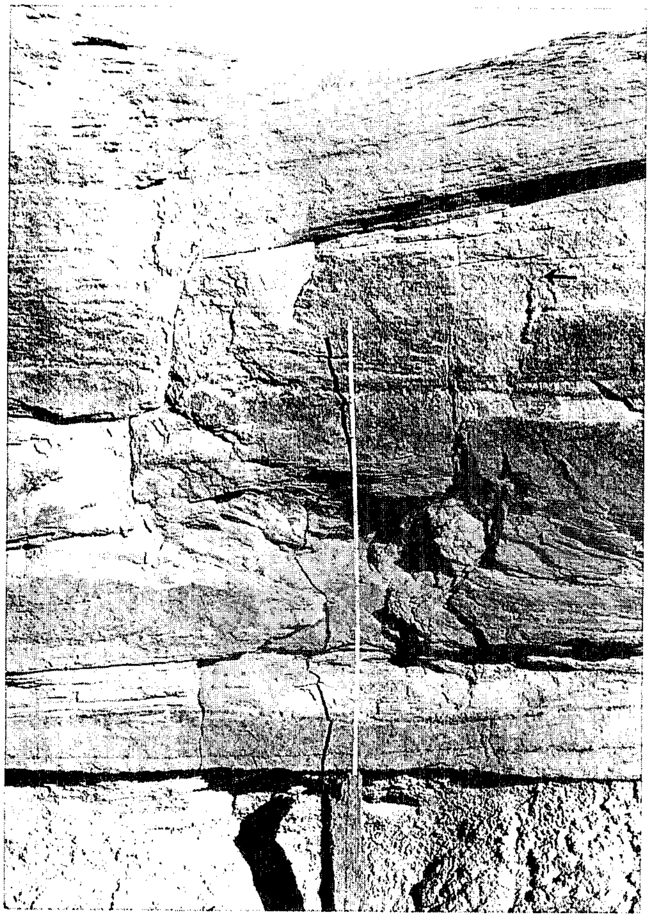


FIGURE 10.—*Photo of sedimentary characteristics of Channel K. Six-foot ruler for scale. Arrow indicates current direction.*

osity streams and low-sinuosity streams (fig. 15). In this classification, braided and straight streams are included under low-sinuosity streams.

According to Moody-Stuart (1966, p. 1102), the dominant features of a high-sinuosity stream are (1) point-bar deposits of coarse material; (2) abandoned meander loops filled with fine-grained, well-laminated sediment; (3) epsilon cross-stratification (with the current direction approximating the direction of cross-stratal strike); (4) meander belt deposits covered by a thin cover of levee deposits; and (5) a wide variety of current direction flow.

Features of a low-sinuosity stream (Moody-Stewart 1966, p. 1104) are (1) an approximately horizontal top and trough-shaped erosional lower surface (meander belts have a tabular-shaped lower surface), (2) no finely filled channels as in meander belts because the whole channel width is abandoned by avulsion (complete abandonment of a stream channel for another location) and any fine-fill is spread across the whole upper surface of the coarser channel deposits, (3) epsilon cross-stratification is absent because there is no lateral migration of the bankfull river, (4) any evidence for levee deposits will be found at the sides of the coarse deposits rather than on top with meander belts, and (5) current direction pattern will be normally distributed about the long axis of the deposit with small deviations due to irregularities of flow.

Based on the classification of Moody-Stuart (1966), the paleochannels of the Myton Pocket would have originated from streams classified as low-sinuosity streams that were periodically abandoned by avulsion. Features of Myton Pocket paleochannel fills that support this interpretation are (1) flat to slightly convex (convex shapes may be due to recent erosion) top surfaces and an erosional trough-shaped lower surface, (2) the Myton Pocket channel deposits are composed of coarse-fill (fine to medium sand) rather than fine-fill (siltstone and shale), (3) Myton Pocket channels lack epsilon cross-stratification, and (4) current direction is parallel with the channel rather than varying widely across the channel.

SILTSTONE AND SHALE UNITS

Morphology

Interspersed among the sandstone bodies are deposits of siltstone and shale interpreted as overbank deposits. These often appear banded and range from light brown or tan through gray, gray green, maroon, and brown. Generally, the upper 15 cm (6 in) or so below a layer of sandstone is dark gray green. This is attributed to reduction of ferric iron by water migrating from the overlying channels (Ryder, Fouch, and Elison 1976, p. 508). Other differences in the color may also be due to environments of reduction (greens—poorly drained areas) and oxidation (reds—well-drained areas) (Ryder, Fouch, and Elison 1976, p. 508).

These units are slope formers and are up to 20 m thick (65 ft). They sometimes form round-topped mounds (fig. 16). The slopes are dissected by numerous small gullies. Erosion is relatively rapid in comparison to sandstone lenses. Where capped by sandstone, erosion and undercutting of the siltstones and shales releases the sandstones as blocks. Where these fine sediments are covered by more recent terrace gravels, erosion is greatly retarded. Fresh surfaces exposed through digging are somewhat hard but highly fractured. This material rapidly disintegrates upon exposure to the weather.

Vertebrate fossils are usually found in these fine-grained units in the Myton Pocket. Turtle shells are most common and are often seen weathering out on top of small mounds where they have retarded erosion some. All fossil material is highly fractured like the rock in which it occurs. As weathering proceeds, individual fragments tend to separate. If fossil material is exposed on slopes, pieces move down slope from the site of origin leaving a string of scattered pieces. The remains of fossil mammals

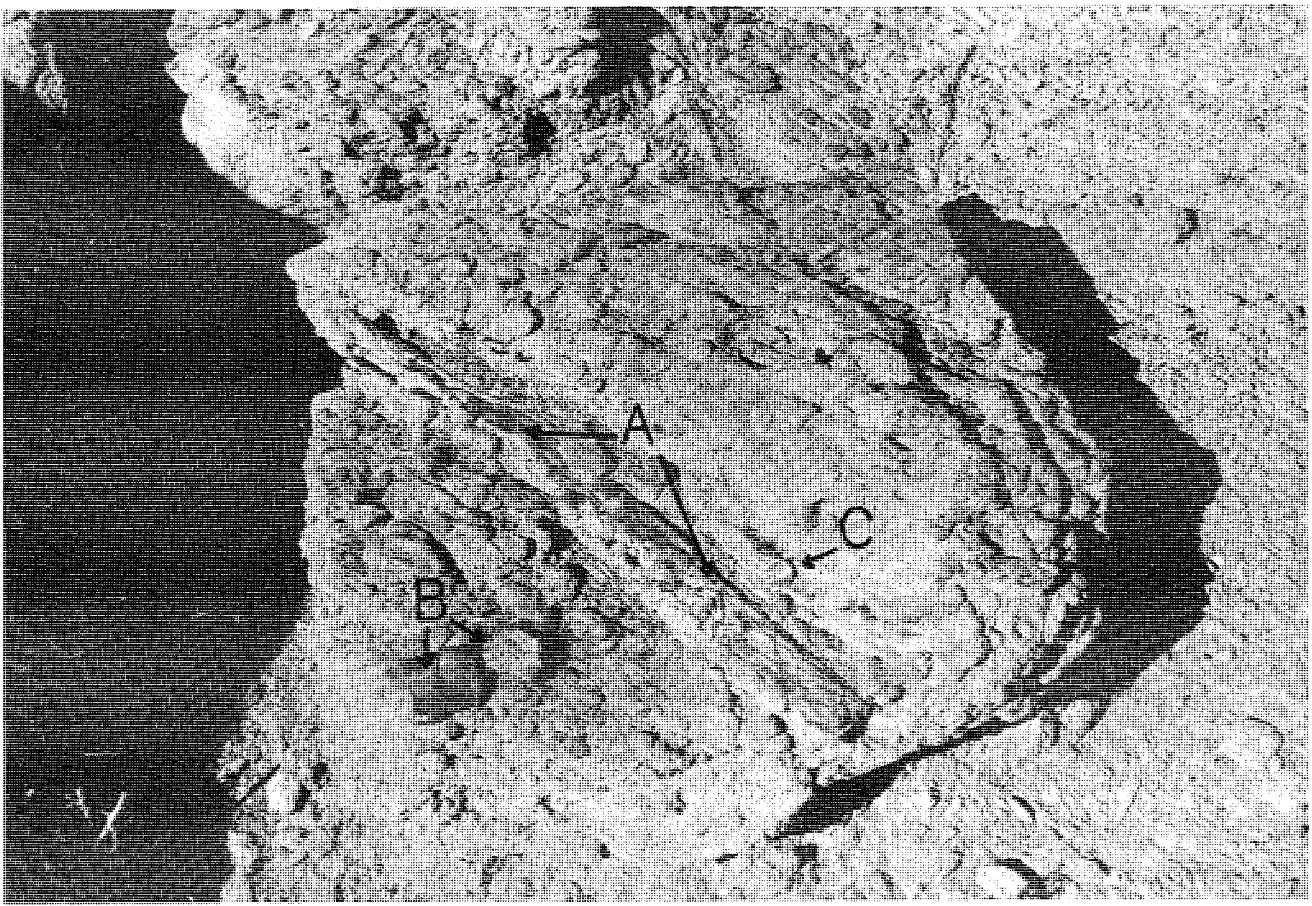


FIGURE 11.—*Piece of bottom surface of Channel K. Note plant imprint (A), turtle shell fragments (B). The coin (C) is a penny for scale.*

and crocodilians are usually seen as individual limb bones, teeth, or skull and jaw fragments. Turtle shells are usually separated into plastron or carapace sections. Only rarely are bones found articulated. This and the fact that some bones have worn edges, indicates scattering after death, prior to burial in the silts and clays.

DEPOSITIONAL MODEL

During the time of Myton Pocket deposition, the Uinta Basin had rather low relief, was elongate east–west, with the ancestral Uinta Mountains to the north and a gentle slope up to the south onto the San Rafael Swell. There were undoubtedly alluvial fans along the foot of the Unita Mountains and small streams probable carried sediments from these mountains into Lake Uinta. The fine to medium-grained quartz sand with fairly abundant feldspar in the Myton Pocket sediments suggest a source other than the Uinta Mountains. Stagner (1941) suggested that streams of Uinta B time were flowing westward across the Uinta Basin from and eastern source. Picard (1957, p. 374) stated that lower Uinta sediments were derived from a granitic terrane exposed east of the Uinta Basin in Central Colorado. Apparently, some streams continued to flow in a westward direction when the sandstone channels in the Myton Pocket were deposited as illustrated by the general trend of paleochannel fills and current directions in those fills. The Myton Pocket was then a site of deposition or aggradation by streams flowing toward a remnant of Lake Uinta from the east.

The model (fig. 17) the writer proposes for the Myton Pocket is one involving a delta plain on the east side of a small remnant of Lake Uinta. The sandstone channels are interpreted as distributary channels on this delta plain. As streams aggraded on the delta plain, their beds became elevated above the surrounding plain floor. Smaller streams, ponds and marshy areas probably existed in the low areas between larger streams. During floods these lower areas received water and finer sediments. Eventually, usually during a flood, avulsion would occur. A stream would cut through the elevated bank and form a new channel while abandoning the old one. The new

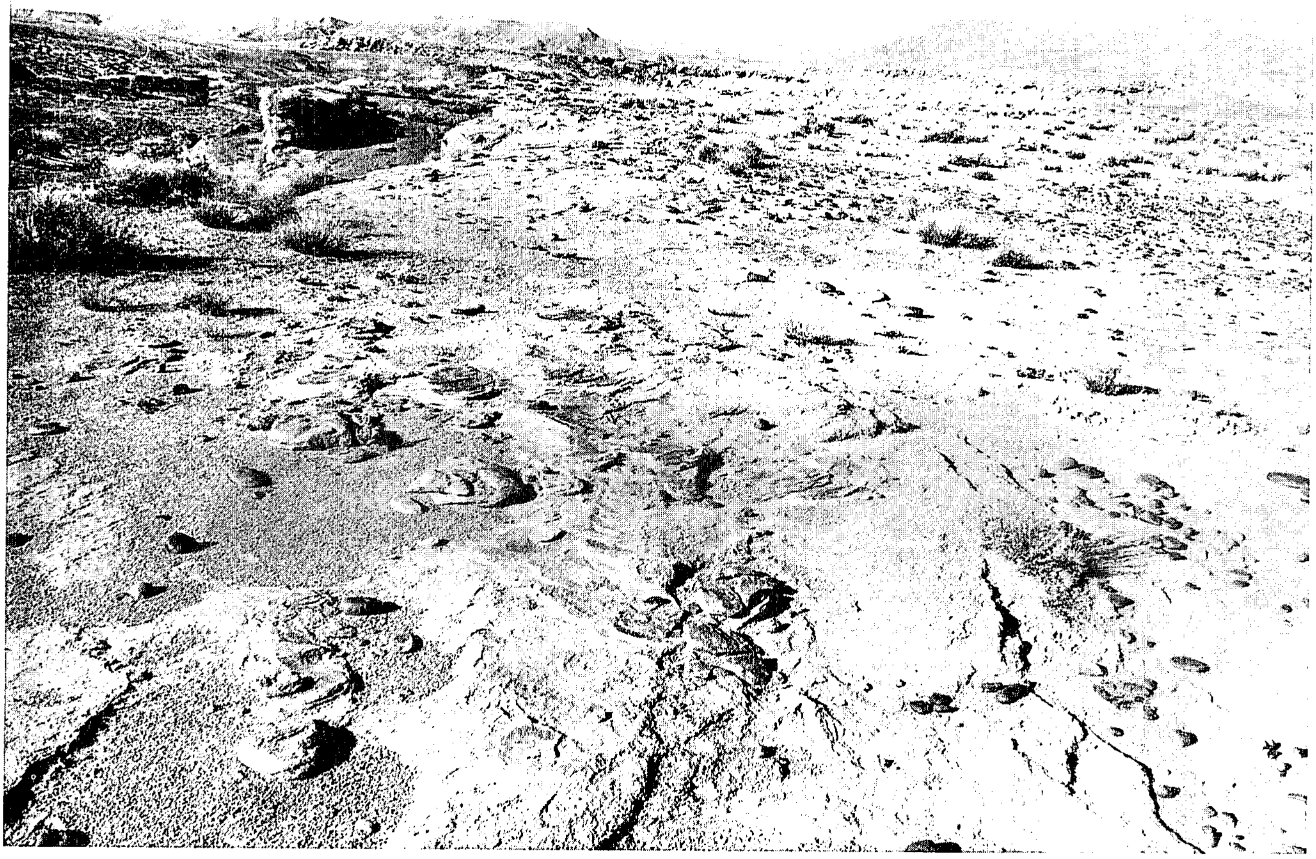


FIGURE 12.—*Top surface of Channel 12 showing trough cross-beds and flat, slightly concave surface.*

channel would flow down through the lower parts of the plain between old channels. This process of avulsion occurred over and over creating the pattern of sedimentary deposits seen in the Myton Pocket. The pattern is one of numerous east–west-trending shoestring sandstone bodies of old stream channels each surrounded by the finer siltstones and shales of overbank deposits.

Galloway (1981, p. 131) described a situation of extrabasinal rivers on the Texas Gulf Coastal Plain where "A record of inland fluvial avulsion is preserved in the late Holocene deposits of the Colorado and Brazos Rivers." While Galloway's study dealt with larger streams flowing on to a delta of the Gulf Coast, there are similarities. He stated, "Upon reaching the aggradational, unconfined lower coastal plain environment, channel avulsion occurs repeatedly, resulting in construction of a fanlike apron of interspersed channel fill and overbank facies across the lower coastal plain."

Fossil vertebrates are found in the finer sediments that were deposited between distributary stream channels on the deltaic plain. That bones of animals were exposed on the surface at times before burial is indicated by the fragmental and scattered nature of fossil material as well as presence of worn or weathered edges of some bone fragments. This may only have been for the period between flood seasons as carnivorous animals could rapidly disarticulate and scatter skeletal parts. Flood waters then brought finer sediments that helped bury remaining bone material.

PALEONTOLOGY

As discussed earlier, O. A. Peterson (1919) was the first person on record who collected fossils in the Myton Pocket area. This was in 1912. The specimens consisted only of vertebrate material. Collecting of vertebrate material from the Myton Pocket has continued intermittently since Peterson's first discovery. No mention in the literature is made of material other than vertebrate skeletal remains, although collections at the Carnegie Museum, Brigham Young University, and the Utah Field House of Natural History each have several coprolite specimens.

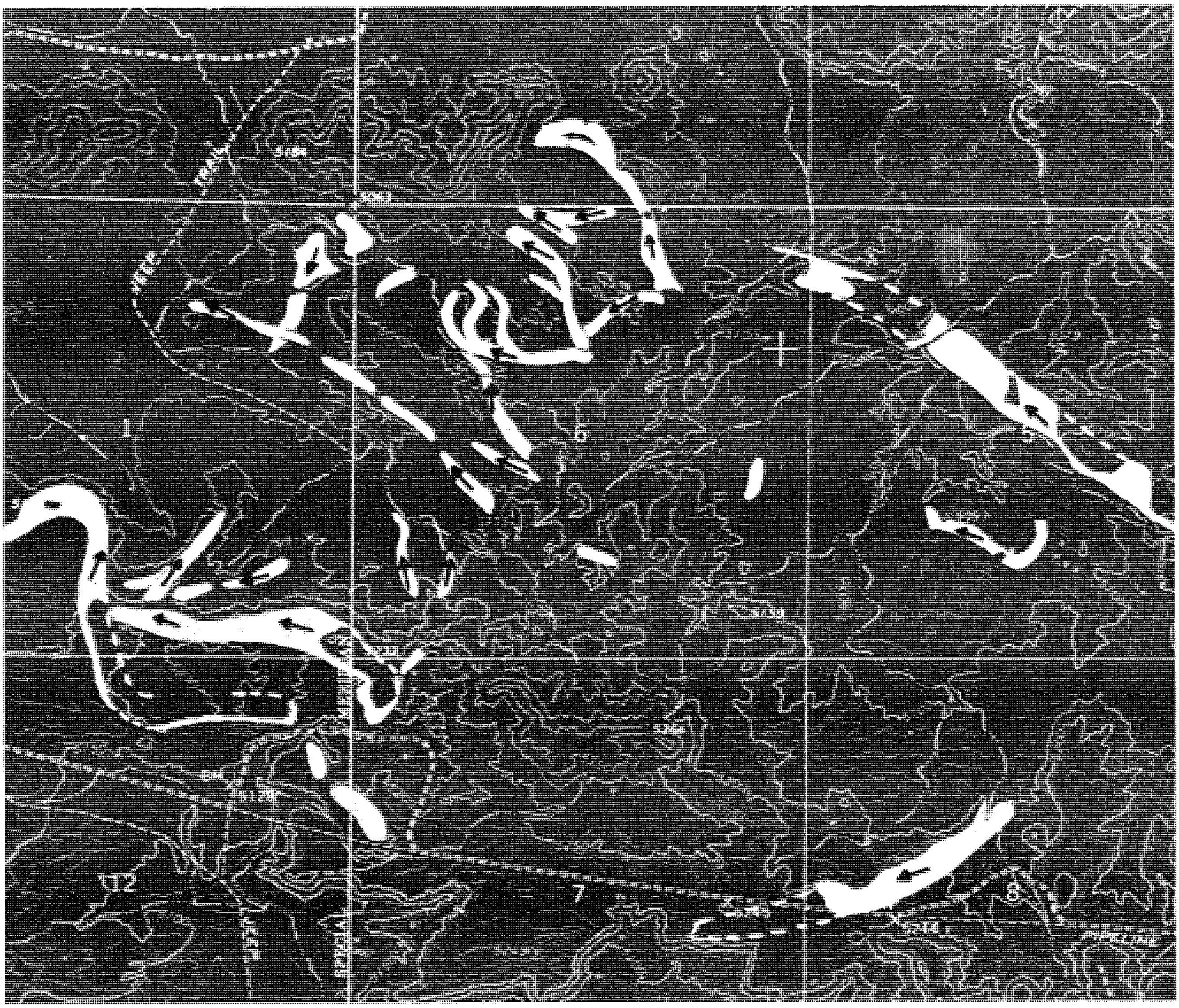


FIGURE 13.—*Map of sandstone channels showing trough and dip directions measured at various locations. (Base map is U.S.G.S. 7½-Minute Windy Ridge Quadrangle.) Arrows indicate current directions.*

INVERTEBRATES AND PLANTS

No invertebrate fossils have been reported from the Myton Pocket, and none were found during the present study in the Myton Pocket area. Several fossil gastropods were observed several miles southeast of the study area in the Uinta Formation, but these are from approximately 180 m (600 ft) below the Myton Pocket section.

Plant imprints were observed in several locations. These are in thinly bedded sandstone layers on the outer edges of larger channel-fill sandstone units. They usually were a dark rust color and contrasted with the lighter yellow parent rock. Trunks, roots, branches, or stems of trees may be represented. The imprints, however, were not good enough to permit identification even as to family (Tidwell personal communication 1980).

The only mention of fossil plants in the Uinta Formation was by Douglas (1914) and Miller and Webb (1980). Miller and Webb (1980) indicated the lack of literature on Uinta plants, but listed conifers, palm, sycamore, and unidentified angiosperms in the lower part of the Uinta Formation that were observed during a survey for the White River Dam Project south of Bonanza, Utah.

VERTEBRATES

Skeletal Remains

The Myton Pocket local vertebrate fauna includes fish, turtles, crocodilians, and representatives of ten orders of mammals. There is nothing in the literature specifically referring to fishes from the Myton Pocket, although

Table 1. Stream Character Relationships.

Channel	F(w/d)	w (ft.)	d (ft.)	l (ft.)	s (ft./mi.)	Qma (cfs)	Qm (cfs)	M (%)
S	5.6	28	5	450	5.9	900	26	30.0
R	13.2	66	5	1300	5.7	2100	80	13.8
Q	12.6	126	10	1900	2.9	3700	400	14.4
P	15.0	150	10	2400	2.9	6600	500	12.3
O	9.6	48	5	900	5.8	1500	50	18.6
N	13.5	108	8	1800	3.6	4300	260	13.5
M	18.7	318	17	4500	1.7	18600	2400	10.0
L	13.0	156	12	2300	2.4	7800	700	14.0
K	13.0	156	12	2300	2.4	7800	700	14.0
J	8.2	90	11	1200	2.7	4500	300	21.5
I	13.5	135	10	2100	2.9	6000	400	13.5
H	6.7	80	12	1000	2.5	4200	300	25.9
G	20	180	9	3200	3.2	7300	600	9.4
F	10.8	54	5	1000	5.8	1700	60	16.6
E	8.5	50	6	800	4.8	1800	70	21.2
D	9.6	48	5	900	5.8	1500	50	18.6
C	12.0	120	10	1700	2.9	5400	400	15.1
B	10.0	30	3	650	9.5	700	16	17.9
A	12.2	55	4½	1100	6.4	1600	60	14.9

$l = 18(F^{.53}W^{.69})$ where l = meander wavelength in feet
F = width to depth ratio of channel
w = channel bank—full width in feet

$s = 30\frac{F^{.95}}{w^{.98}}$ where s = channel gradient in feet per mile

$Qma = 16\frac{w^{1.56}}{F^{.66}}$ where Qma = flow during mean annual flood in cubic feet per second

$Qm = \frac{w^{2.43}}{18F^{1.13}}$ where Qm = mean annual discharge in cubic feet per second

$F = 225M^{-1.08}$ where M = percent silt-clay (0.074 mm) in the channel perimeter

Schumm (1968, 1972)

Note: This table is presented in the English system rather than metric system because Schumm's formulae were developed for use with measurements in feet and miles. Use of metric measurements in the equations gives wrong information.

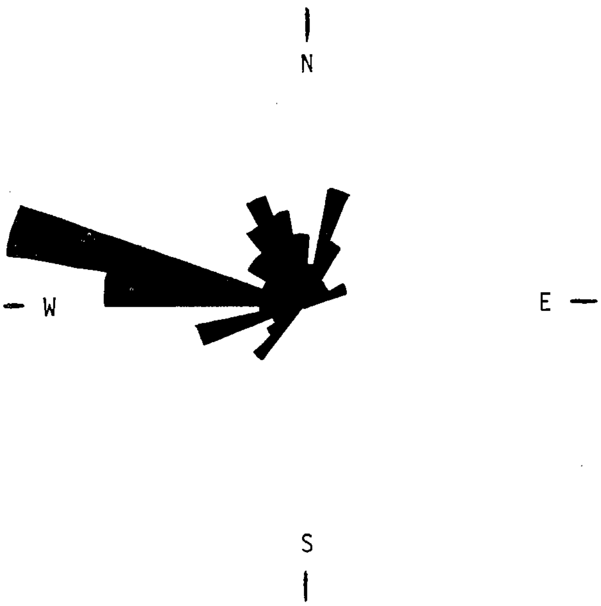


FIGURE 14.—*Rose diagram representing 70 measurements of cross-bedding dips and trough direction on sandstone bodies, which indicate a composite of stream current direction for the Myton Pocket.*

ganoid scales of the gar are quite common. Peterson (1919, p. 40–41) mentioned several fish from the Uinta Formation and one, *Amia*, is listed as from horizon C (Myton Member) and could have come from the Myton Pocket, but Peterson did not state this specifically. Turtle scutes are the most common vertebrate fossil in the Myton Pocket, as well as throughout the whole Uinta Formation. Crocodilian material is sparse, but present, and consists mostly of skull and jaw fragments, some containing teeth, and a few isolated teeth.

Reptiles from the Myton Pocket have received very little attention in the literature. Gilmore (1916, p. 139 and 141) described two turtles collected from the Myton Pocket by Peterson in 1912. These were *Echmatemys depressa* and *Hadreanus* [=*Testudo*] *Corsoni*, Carnegie Museum specimens 2936 and 3403, respectively. Remains of only two crocodilians have been published from the Myton Pocket, both from a new genus and species, *Procaimanoidea utahensis*, described by Gilmore (1946). These specimens are in the U.S. National Museum collection as specimens 15996 and 15997.

Mammalian remains have been found mostly as fragments of skulls and jaws with teeth. Most fossil occurrences are highly fractured and, if exposed on the surface very long, separate into numerous pieces. Some postcranial material has also been found, usually as isolated individual limb bones and separate vertebrae or parts thereof. Occasionally partially articulated skeletal material has been encountered.

Mammals are represented by 10 orders, 20 families, 35 genera, and 40 species (classification after Savage and Russell 1983). Artiodactyls are by far the most common. Of 320 specimens in various collections of Myton Pocket material, 69% are artiodactyls. (The genus *Protoreodon* makes up 29% of the total number.) Perissodactyls are second most common with 12.5%, followed by Lagomorpha with 6.3%, Rodentia with 6%, Carnivora with 3.4%, Creodonta with 1%, and Pantolesta, Insectivora, Primates, and Acreodi all with less than 1%.

The following is a list of the Myton Pocket fauna prepared by the writer from a review of the literature and known collections (classification after Savage and Russell 1983):

LAGOMORPHA
  Leporidae
    Mytonolagus petersoni Burke, 1934B
PANTOLESTA
  Pantolestoidea, inc. sed.
    Simidectues magus (Peterson, 1919A)

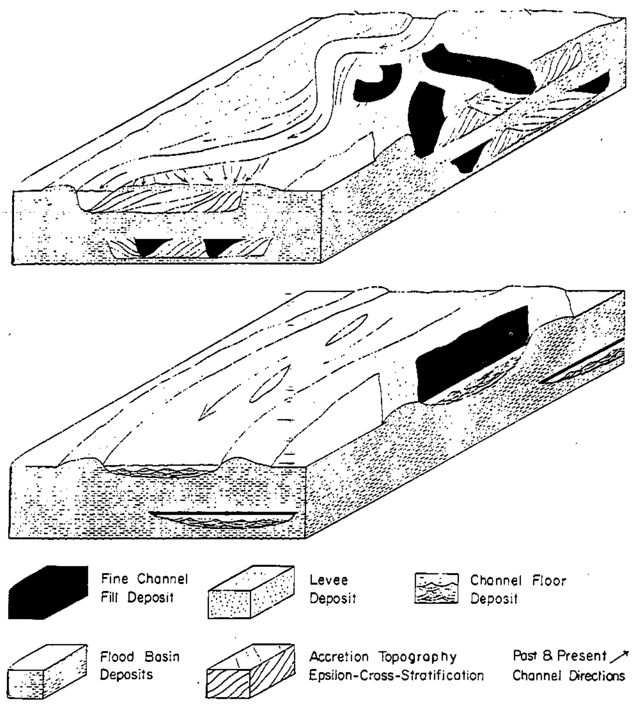


FIGURE 15.—*Hypothetical models illustrating the diagnostic characteristics of the deposits of high-sinuosity streams (above) and low-sinuosity streams (below). (From Moody-Stuart, 1966, p. 1103.)*

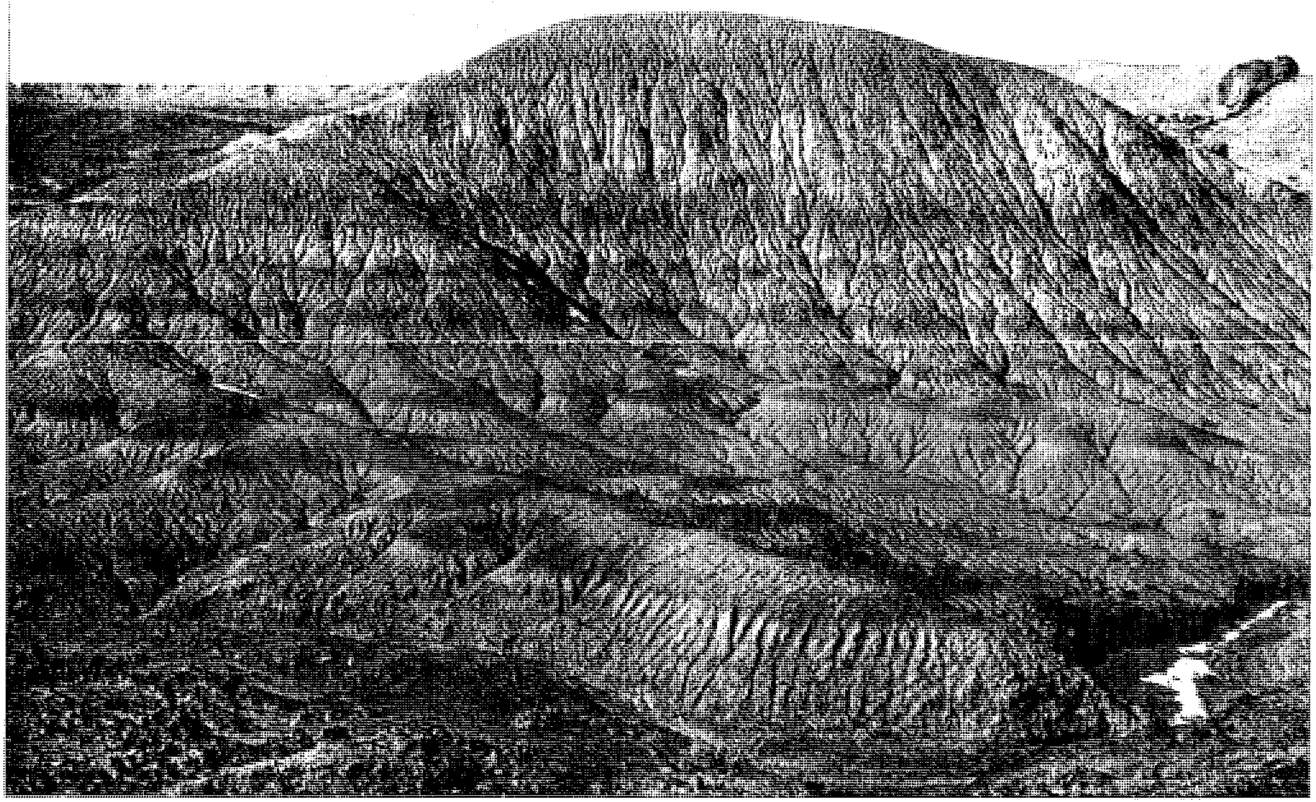


FIGURE 16.—*Photo of siltstone and shale deposits in the Myton Pocket.*

CREODONTA
  Hyaenodontidae
    Limnocyon sp. Marsh, 1873
CARNIVORA
  Miacidae
    Miacis gracilis Clark, 1939D
    M. longpipes (Peterson, 1919A)
    Uintacyon robustus (Peterson, 1919A)
    Prodaphaenus scotti Wortman and Matthew, 1899A
    Procynodictis sp. Wortman and Matthew, 1899A
INSECTIVORA
  Erinaceoidea
    Talpavus dupus Krishtalka, 1976A
PRIMATES
  Omomyidae
    Mytonius hopsoni Robinson, 1968B
ARTIODACTYLA
  Dichobunidae
    Pentacemylus progressus Peterson, 1932
    Mytonomeryx scotti Gazin, 1955
    Hylomeryx quadicuspis (Peterson, 1919A)
    Auxontodon pattersoni Gazin, 1958A
    Bunomeryx elegan Wortman, 1898A
  Agriochoeridae
    Protoreodon pumilus (Marsh, 1875B)
    P. petersoni Gazin, 1955
    Diplobunops matthewi Peterson, 1919A
  Protoceratidae
    Leptotragulus proavis Scott and Osborn, 1887A
    L. medius Peterson, 1919A
    L. clarki Gazin, 1955
    Leporeodon sp. Wortman, 1898A
  Camelidae
    Oromeryx sp. Marsh, 1894L
    Poebrodon kayi Gazin, 1955
    Protylopus? annectens Peterson, 1919A
ACREODI
  Mesonychidae
    Harpagolestes leotensis Peterson, 1931A
PERISSODACTYLA
  Equidae
    Epihippus gracilis Marsh, 1871D

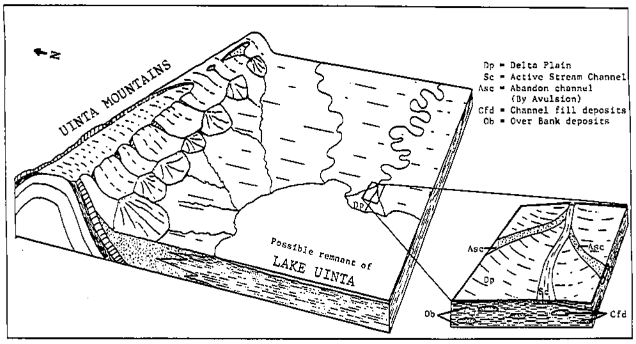


FIGURE 17.—*Proposed model for environments of deposition for Myton Pocket sediments.*

Brontotheriidae
Diplacodon sp. Marsh, 1875
**Eotitanotherium osborni* (Peterson, 1914A)
Isectolophidae
Isectolophus annectens Scott and Osborn, 1887A
Helaletidae
Dilophodon leotanus (Peterson, 1919A)
Amynodontidae
Amynodon sp. Marsh, 1877
Hyracodontidae
Triplopus obliquidens Scott and Osborn, 1887A
Epitriplopus uintensis (Peterson, 1919A)
RODENTIA
Ischyrotomyoidea
Ischyrotomus compressidens (Peterson, 1919A)
I. eugenei Burke, 1935B
Mytonomys robustus (Peterson, 1919A)
Thisbemys medius (Peterson, 1919A)
Janimus rhinophilus Dawson, 1966
Cylindrodontidae
Pareumys milleri Peterson, 1919A

*Peterson (1914A) gave the location of *Eotitanotherium osborni* as "on the Duchesne River near Myton, Utah, Uinta Co., Upper B." However, on their map, Peterson and Kay (1931) marked the location of Eotitanotherium in the Myton Pocket area and it would therefore be from horizon C (Myton Member).

This list includes only taxa known to have come from the Myton Pocket locality. Other taxa are represented in the Myton Member of the Uinta Formation (upper Eocene) but have not as yet been found at the Myton Pocket.

According to Savage and Russell (1983, p. 117), 132 genera are presently recognized in the North American Uintan fauna. Of these, 46 are known from the Myton Member of the Uinta Formation in the Uinta Basin (Black and Dawson 1966, Krishtalka 1976, and Robinson 1968). The Myton Pocket fauna includes representatives of 26% of the known North American Uintan fauna and 76% of that recognized as from the Myton Member of the Uinta Formation in the Uinta Basin.

Savage and Russell (1983) included within the Uintan mammalian age all the time represented by the Uinta Formation, as well as that from the overlying Brennan Basin Member and lower part of the Dry Gulch Creek Member of the Duchesne River Formation. They indicated that the Uintan fauna spanned a time interval of 9 million years. Work by Mauger (1977), however, showed this time interval to be closer to 5 million years. Mauger's (1977, p. 17) data came from K-Ar dating of biotites in air-fall tuffs and some reworked tuffs in Eocene lacustrine basins of Utah, Wyoming, and Colorado. Mauger (1977, p. 32 and 37) said deposition of basal Uinta Formation (beginning of the Uintan mammalian age) began about 44 m.y. ago. He also stated that the age of the Duchesne River Formation is at least 39 m.y. old and not older than 40–41 m.y. If the beginning of the Uintan mammalian age was 44 m.y. ago and the Duchesne River Formation is roughly 39 million years old as Mauger claimed, then the time interval for the Uintan fauna would be closer to 5 million years than 9 million years.

Savage and Russell (1983, p. 118) said concerning this span of time that the " 'Explosive' taxonomic radiation of artiodactyls and rodents was well under way." Gazin (1955, p. 1) stated,

Perhaps the most significant feature of life during upper Eocene time in North America is the striking diversity and relative abundance of the Artiodactyla among the mammalian groups. At this time the even-toed ungulates made their first bid for a dominant role in the Tertiary sequence. Their new prominence is in marked contrast to the insignificant position occupied in the preceding middle Eocene Bridgerian interval, during which the perissodactyls appear to have been unchallenged as the predominating ungulates.

This is substantiated by the Myton Pocket local fauna, although it is only a limited view of the whole picture. Artiodactyls are represented by 12 genera in the Myton Pocket compared to the next most abundant genera—8 of perissodactyls, 5 of rodents, and 4 of carnivores.

Savage and Russell (1983, p. 117) made the following speculations on the Uintan fauna.

1. *Mytonolagus, earliest record of rabbitlike mammals in North America, immigrated into North America from eastern Asia in Uintan time.*

2. *The Uintan creodonts, miacids, insectivorans, omomyids, Uintatheriids, artiodactyls, brontotheriids, helaletids, and rodents, also recorded in the later Eocene of eastern Asia, were endemics.*

3. Harpagolestes *(mesonychid), entelodonts?* Helaletes *(tapiroid),* Triplopus *(hyracodontid),* Forstercooperia *(hyracodontid),* Amynodon *(rhinocerotids), and*

Eomoropus *(chalicothere) dispersed from Asia to North America or from North America to Asia (or both ways) during Uintan time.*

4. There was a filtered dispersal between northwestern North America and northeastern Asia during the Uintan; perissodactyls were the most successful of the filterers.

5. Multiberculates, marsupials, lepticidants, cimolestians, pantolestans? apatotheres, taeniodonts, dermopterans, primates, leptochoerids, agriochoerids, protoceratids, camelids, leptomerycids, hyopsodontids, equids, isectolophids, ischyromyoids, cylindrodontids, aplodontids, protoptyphids, geomyids(?), and zapodids of the Uintan can be derived by evolution in situ from preexisting North American stocks.

Representatives of most of the Myton Pocket fauna were either present during earlier Uintan times or derived from mammals that were (Black and Dawson 1966; Dawson 1966; Gazin 1955, 1958, 1968; Radinsky 1963, 1967; Savage and Russell 1983). The one exception was that of *Mytonolagus*, which apparently came from Asia during Myton time (Savage and Russell 1983).

The Myton Pocket has 10 genera in common with the Duchesne River Formation, but all these would be included in the Uintan mammalian age as defined by Savage and Russell (1983, p. 118). These are *Mytonolagus, Pareumys, Mytonomys, Epihippus, Epitriplopus, Amynodon, Dilophodon, Pentacemylus, Protoreodon,* and *Diplobunops*. The Myton Pocket has 18 genera in common with the Wagonhound Member of the Uinta Formation. These are *Ischyrotomus, Mytonomys, Thisbemys, Pareumys, Miacis, Harpagolestes, Limnocyon, Epihippus, Isectolophus, Triplopus, Amynodon, Hylomeryx, Bunomeryx, Protoreodon, Diplobunops, Leptotragulas, Leporeodon,* and *Protylopus*. Based on this relationship and the stratigraphic position of the Myton Pocket, the Myton Pocket local fauna probably represents a sample from the earlier part of the late Uintan fauna.

Concerning the composite Uintan paleofauna, Savage and Russell (1983, p. 117) said it "shows provincial variation from the intermontane lacustrine and fluvial basins of the northern Rockies to the intermontane volcaniclastic depositional areas of southwest Texas and on to the near-sea shoreline lithotopes of southwestern California. Nevertheless, there is a strong, overall faunal-taxonomic similarity through these districts, and there is no reason to suspect anything but relatively unrestricted land-vertebrate dispersal cross North America during this interval." The Myton Pocket supports this view by the fact that 21 genera from the Myton Pocket have also been reported from areas outside the Uinta Basin. These are *Mytonolagus, Ischyrotomus, Mytonomys, Pareumys, Harpagolestes, Limnocyon (?), Procynodictis, Miacis, Epihippus, Dilophodon, Triplopus, Amynodon, Epitriplopus, Mytonomeryx, Hylomeryx, Auxontodon, Protoreodon, Diplobunops, Leptotragus, Leptoreodon,* and *Pentacemylus*. The Myton Pocket has four genera that have not been reported from any other area: *Mytonius, Janimus, Eotitanotherium,* and *Poebrodon*.

Figure 18 shows the locations of known mammalian sites in the Myton Pocket. Most locations occur between the stratigraphic position of sandstone A and sandstone K (refer to figs. 2 and 4). Several sites are located above sandstone K and one above sandstone S. Several sites are located below sandstone A, south of the main pocket. The stratigraphic position between sandstones A and K may represent the major fossil mammal zone in the Myton Pocket. This might also just be a reflection of the fact that less surface is available to collect fossils above and below this zone. But observations made during this study of areas exposed above and below this zone do appear to contain less mammalian material.

Rock exposures south of the Myton Pocket (stratigraphically below sandstone A) were examined and very little mammalian material was encountered. Turtle fragments were present but spotty. Exposures 2 miles north of the Myton Pocket, across the Duchesne River, were also examined, and only turtle material was found. This area is stratigraphically above the Myton Pocket. A more thorough search of theses areas might show more material, but fossils are definitely less abundant here.

Coprolites

In the Myton Pocket, and several other locations in the Uinta Formation, a number of cigar- and kidney-shaped concretions have been observed. These vary from 10 to 50 mm (1/2 to 2 in) in diameter and range from 10 to 125 mm (1/2 to 5 in) in length. Where freshly exposed, they are commonly coated with dark reddish brown material; otherwise they are generally cream colored. Their interiors vary from light to dark olive green with cream-colored splotches. Occasionally they include small clear areas of crystalline material. Bone fragments can be seen in some of them. One fragment appears to be a small toe bone, possibly from an animal the size of a rabbit. A number of these were collected at the site of the old "Kay" quarry located in the W 1/2, NE 1/4, SE 1/4, NW 1/4, of section 6, T. 4 S, R. 1 E, of the Uintan Special Meridian in October 1979.

Objects similar to those described above have been seen in collections at Brigham Young University, Carnegie Museum, and the Utah Field House of Natural History. These have generally been labeled as coprolites. However, no mention of coprolites from the Myton Pocket or from the Uinta Formation was found in the literature. The objects collected at the "Kay" quarry (fig. 19) were studied and are thought to be coprolites based on

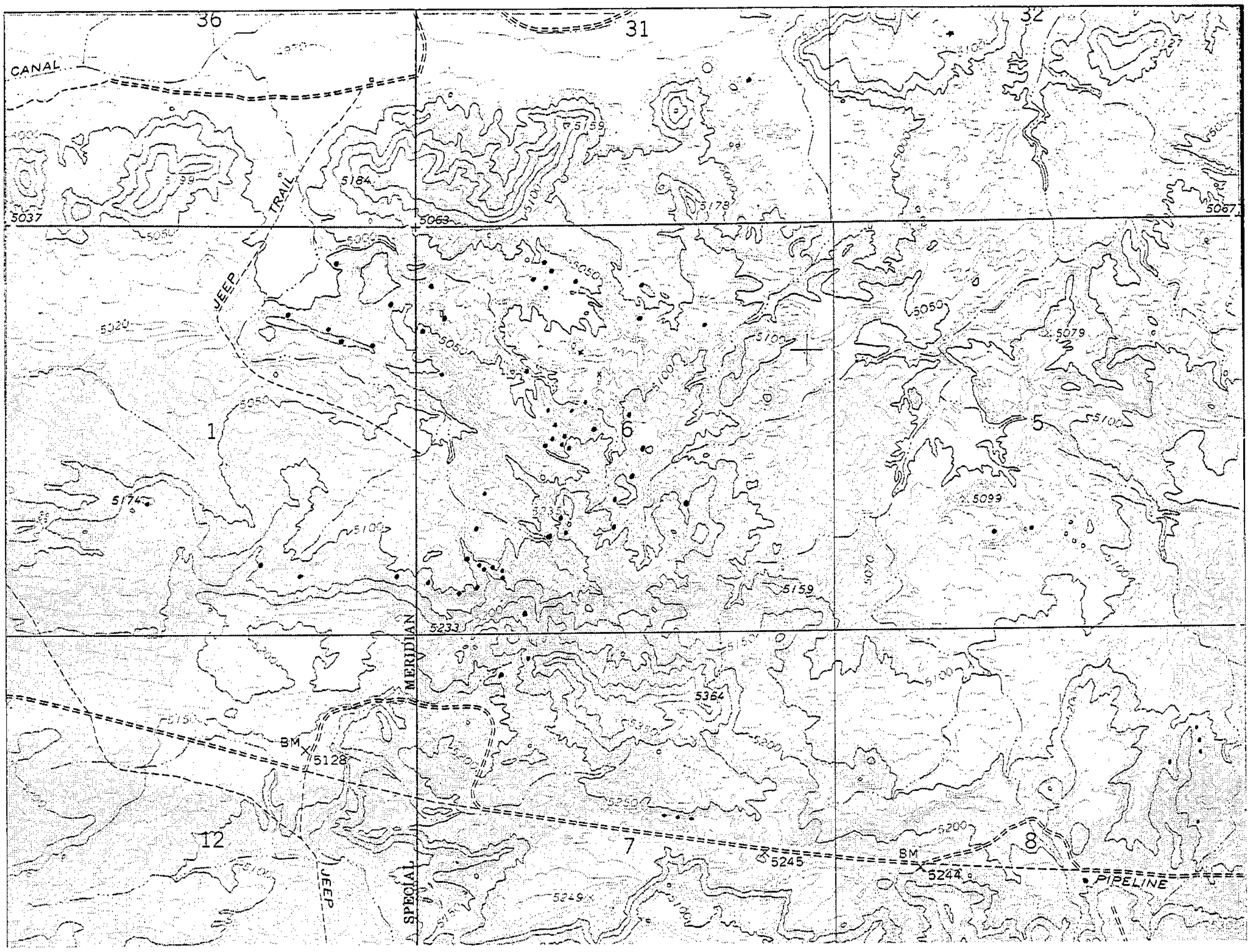


FIGURE 18.—*Dots indicate known fossil sites in and around the Myton Pocket. (Base map is U.S.G.S. 7½-Minute Windy Ridge Quadrangle.)*

the following data: (1) shape, (2) surface markings, (3) composition, (4) structure, and (5) contents.

The shapes listed above are characteristic of similar-shaped known coprolites, particularly those described by Bradley (1946). The shapes also closely resemble examples of modern dung such as that of the coyote (fig. 19 F).

Surface markings such as striations, grooves, and indentations are present on these specimens. These markings are thought to be formed during extrusion and represent sphincter indentations and striations (Edwards and Yatkola 1974).

Samples of the presumed coprolites and samples of fossilized bone were both examined by X-ray powder defraction on a General Electric XRD-5 machine. The pattern produced was that of an apatite structure in both cases. Apatite is commonly the chief mineral of phosphate, and according to Hantzshel, El-Baz, and Amstutz (1968), calcium phosphate is the most common composition of coprolites. Edwards (1973 and 1976), Waldman (1970), and Waldman and Hopkins (1970) all reported coprolites composed of apatite.

The specimens are different from the rock surrounding them. The parent rock is composed of grains of silt and clay, whereas the specimens examined have a homogeneous structure. Under magnification small pockets filled with a clear solid substance can be seen. In examples of other known coprolites these crystalline pockets are thought to represent gas pockets in the original dung (Waldman and Hopkins 1970, Edwards and Yatkola 1974).

Some of the specimens examined have fragments of bones in them, indicating that either an omnivorous or carnivorous animal produced at least some of them. Edwards and Yatkola (1974) interpreted the presence of coarse bone and tooth material and the smooth usually unsegmented "cigar shape" as adequate proof that the White River coprolites they studied were from carnivo-

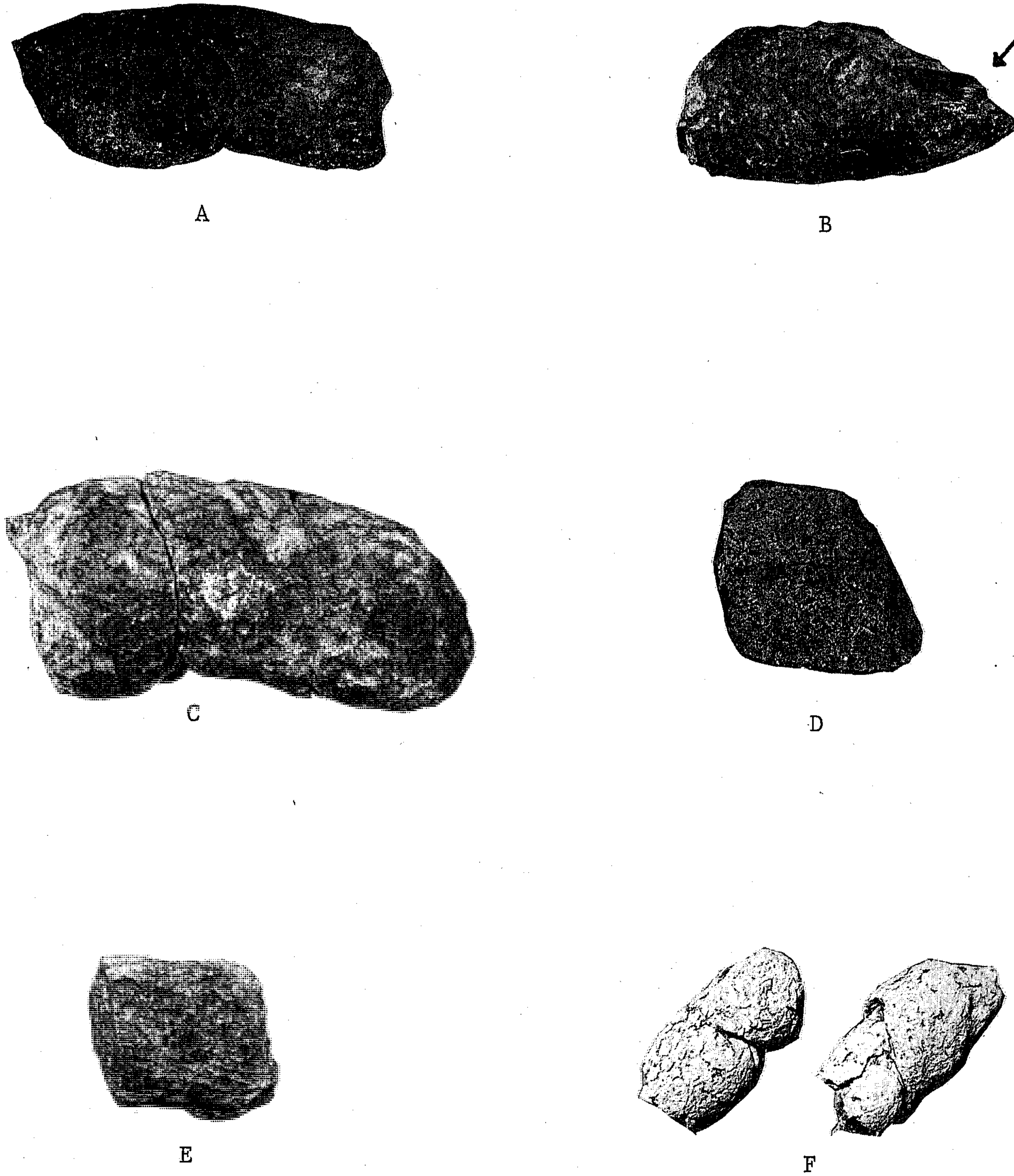


FIGURE 19.—*A–E—coprolite specimens from "Kay" Quarry. D is a section from C showing interior. Bone fragment in B. F is modern coyote dung.*

rous mammals. Some omnivores, such as bear and man, also produce dung that could fit the description given by Edwards and Yatkola (1974).

It was from the "Kay" quarry, where the coprolites were collected, that Gazin and party from the Smithsonian Museum of Natural History collected numerous specimens of *Pentacemylus*, *Protylopus*, and *Leptotragulus* in 1938. Not knowing the circumstances surrounding the excavations in this quarry, it can only be speculated what this may imply. Such a large number of small mammal bones associated with coprolites, a number of which contain bone fragments, could indicate the location of a den or feeding site of some carnivorous or perhaps omnivorous animal. Modern crocodiles are known to eat small- to medium-sized mammals, but they generally catch them at watering holes and drag them into deeper water to drown and eat (Guggisberg 1972). With that sort of habit, it seems unlikely a large number of skeletal remains would accumulate in one location by crocodilians. Also, the sediments appear to be overbank deposits rather than stream channel deposits at the "Kay" quarry site.

Several carnivorous mammals have been reported from the Myton Pocket that might be responsible for the coprolites. These include *Limnocyon, Miacis, Uintacyon, Prodaphaenus,* and *Procybodictis.* A possible omnivorous source for the coprolites might be the wolf-sized *Harpagolestes.* Recent work by West (1981) indicated an omnivorous habit for *Harpagolestes,* specimens of which have been found in the Myton Pocket. There is no evidence to rule out any of the five genera mentioned above as a source for the coprolites.

While in the field, other objects that are different from those studied from the "Kay" quarry were observed that could also be coprolites. These were not collected and studied, but their smaller size indicates, if they are coprolites, that they are probably from smaller mammals or possibly turtles.

Edwards and Yatkola (1974, p. 70) quoted Wanless (1923), who considered the presence of coprolites in the lower nodular zone of the Chadron Formation as supporting evidence for a floodplain origin of those sediments. Edwards and Yatkola suggested "that the variation in abundance of coprolites of carnivores during White River time is a function of the grain-size of the burial sediments and to some extent a function of the depositional environment and climate." They claimed that the depositional environment required for coarse clastics or even silty sand tends to destroy the fecal mass, whereas it can more easily be preserved in fine-grained, low-energy deposits. They did not find coprolites in the channel sandstones of the White River Group. Coprolites were not observed by the writer in sandstones of the Myton Pocket. Nonaquatic, but humid, conditions tend to promote rapid decay of terrestrial fecal material. Crocodilian coprolites would be more likely to be preserved under aquatic humid conditions, such as in marshes and swamps where burial prevents decay.

The fact that coprolites have been preserved in the fine-grained sediments of the Myton Pocket supports the delta plain depositional environment in a climate without high humidity. The preservation of coprolites in a site where a large number of small fossil artiodactyls were found suggests the coprolites are probably of mammalian origin, either omnivore or carnivore.

CLIMATE AND PALEOECOLOGY

It is readily apparent that the climate and paleoecology in the Myton Pocket were very different in late Eocene times than they are today. MacGinitie (1969, p. 40) stated that "Both plant and animal life at middle latitudes during the Eocene indicate more equable climates than those which prevail today." In his study of the Eocene Green River flora, MacGinitie discussed the climatic conditions of this area at that time. Without any direct evidence from a fossil flora in the Myton Pocket, it can only be speculated that conditions may have been somewhat similar to that during Green River times. The shrinking and eventual disappearance of Lake Uinta may indicate some climatic changes from middle Eocene. Wolfe (1978, p. 699) concluded there was a worldwide gradual warming from Paleocene into middle Eocene, and then a gradual cooling into late Eocene, before the rapid cooling he referred to as the terminal Eocene event. Wolfe further suggested that the mean annual range of temperature during middle Eocene was about half that of today and that this range saw a decrease from early into middle Eocene and possibly a slight increase until the end of the Eocene. In spite of these slight differences between Green River and Uinta times, a discussion on the Green River climate and flora may be useful in understanding conditions during the time represented by the Myton Pocket.

According to MacGinitie (1969, p. 49–50) a savanna-type climate, with rainfall in the warm season, is indicated by the flora of the later Green River beds. He described a Tertiary savanna "as a region of low or moderate relief, in a tropical or subtropical climate characterized by a marked dry season, occupied by an open forest of shrubs and small trees, and traversed by streams whose floodplain supported a relatively luxuriant mesic forest of many species." He further said:

I visualize a modified monsoon type of precipitation regime for the Uinta Lake Basin during the Middle Eocene. The early springs were probably warm to hot, and dry; the late spring and early summer weather would be characterized by afternoon thundershowers. We should expect that lake basins would receive the least rainfall, and that amounts would increase steadily with elevation in the surrounding mountains. The vegetation at low levels seems to have been of the savanna type, with relatively rich vegetation in areas of high water table, along streams and lake borders, and a subhumid shrub or low open forest in areas of lower water table, at low elevations around the lake.

The low-ground vegetation of lake borders, swamps, and connecting floodplains would have included "cattail, fern, and horsetail swamps, with various swamp monocots such as *Sparganium,* and *Potamogeton;* and bordering these a floodplain forest of *Platanus, Populus, Salix,* *Zelkova, Sapindus, Cardiospermum, Allphylus, Rhus,* shrubs and trees of Leguminosae, and scattered laurels" (MacGinitie 1969, p. 33).

Bradley (1929, p. 93) said the flora of the Green River Formation indicated a climate comparable to the Gulf States today, 19° to 20° C (66° to 67° F). MacGinitie's (1969, p. 40) floral information also agreed with this. He said, "The climate was not necessarily frostless, but the extreme minima could not have fallen much below freezing, as shown by the present tolerances of such genera as *Aleurites, Allophylus, Astronium, Engelhardtia, Eugenia,* and *Menispermites.*"

MacGinitie (1969, p. 47) estimated annual precipitation during middle Eocene times to be 61 to 76 cm (24 to 30 in) near lake level and as much as 114 cm (45 in) at higher elevations. He based this in part on Bradley's 1963 estimates concerning a precipitation and evaporation balance for Lake Gosiute (north of the Uinta mountains during middle Eocene time) and in part on the flora of the Green River Formation.

The climate during Myton Pocket time was probably somewhat like that of earlier Green River times except that it may have been slightly cooler according to Wolfe (1978, p. 699) and possibly slightly dryer (Black and Dawson 1966, p. 331; and Gazin 1955, p. 1), as shown by the decrease in size of Lake Uinta.

The fauna of the Myton Pocket provides some climatic and paleoecology information. Gar scales are quite common in Myton Pocket sediments. The genus *Lepisosteus* is fairly well represented in the Green River Formation, and this genus still survives today in the Mississippi River drainage as well as in Cuba and Central America south to Costa Rica (Grande 1980, p. 37–38). According to Grande (1980, p. 37), "Modern gar prefer shallow, weedy areas, swampy areas, streams, or rivers, which explains the scarcity of the gar in the deep water lacustrine deposits . . . and their abundance in the deltaic and stream channel deposits of Lake Uinta."

Another fish genus, *Amia,* mentioned by Peterson (1919, p. 41) as from the Myton Member, is represented in the Green River Formation (Grande 1980, p. 51). *Amia* is the bowfin or freshwater dogfish and is still represented by one species in fresh waters of the eastern Untied States (Grande 1980, p. 50). According to Scott and Crossman (1973, p. 113), the optimum temperature for nest construction for *Amia* is 16.0°–19.0° C (60.8°–66.2° F) and their northern range is limited by the 18.3° C (65° F) isotherm. This may indicate minimal water temperatures for Myton Pocket waters. Grande (1980, p. 51) said, "Modern bowfins are voracious, feeding on all kinds of animal life, although fish (including other bowfins) form a large portion of their diet."

The presence of the two fish mentioned above indicates a continuance of similar climatic conditions from Green River times through Myton Pocket times. The habits of the gar also support the fluvial and delta plain environment suggested for the Myton Pocket.

Crocodilians were present during both Green River time and Myton Pocket time. Though not identified as to genus and species, the Utah Field House of Natural History has specimens of an alligator and crocodile from the Uinta Formation. The distribution of modern American crocodilians suggests a climate similar to that of the Gulf Coast today. According to Guggisberg (1972, p. 42), modern alligators are able to tolerate slightly colder water temperatures than crocodiles and a crocodile will become helpless and drown in water of 7.2° C (45° F). This indicates a possible minimum water temperature for crocodiles to be present in the Myton Pocket area.

Of the two turtles described by Gilmore (1916, p. 139 and 144) from the Myton Pocket, one, *Ectmatemys depressa,* is one of the family Emydidae. Gilmore (1916, p. 102) said this group of turtles were suggestive of swamp conditions. Auffenberg and Iverson (1979, p. 541) listed the Emydidae as pond turtles. The other turtle from the Myton Pocket, *Testudo corsoni,* is from the family Testudinidae, the true tortoises. According to Auffenberg and Iverson (1979, p. 542), "Most testudinid species are found in xeric habitats, ranging from tropical deciduous forests, thorn bush, beach scrub, savanna of several types, and steppe, to near desert conditions. These species (predominantly grazers) are found in both tropical and subtropical areas." Auffenberg and Iverson (1979) stated further that "During the Tertiary the range of tortoises extended throughout what are now temperate latitudes. This is believed due to a high degree of climatic equability, enabling "tropical" and "temperate" biotas to intermingle."

Gilmore (1916, p. 102) mentioned the discovery in the Uinta Formation of a lizardlike reptile, *Glytosaurus,* and quoted Osborn (1910, p. 160) as saying that it "hints as to the Floridan or south temperate conditions of climate."

The reptilian fauna, from the evidence listed above, supports the interpretation of a warm temperate to subtropical climate with high equability for Uinta time.

The mammalian fauna indicates a variety of habitats. The amynodons, which have been reported from the Myton Pocket but occur more abundantly farther east in the sandstone stream channels of the Wagonhound Member, are thought to have been water-lovers with hippopotamus habits. This interpretation is based on their large build, strong limbs, and short broad feet and the fact that they are found frequently in stream channel deposits (Colbert 1969, p. 409). The brontotheres (*Diplacodon* and *Eotitanotherium*) were fairly large, slow-moving upland dwellers with habits similar to modern elephants. Like elephants, the marrow cavities of their limb bones were filled with sponge bone for strength (Scott 1937, p. 425). They were replacing the more primitive uintatheres

(Kurten 1971, p. 64). The primitive little horse, *Epihippus*, was a forest-living, leaf-eating animal (Kurten 1971, p. 63). The tapirs (*Isectolophus* and *Dilophodon*) were browsers (Romer 1966, p. 270). Artiodactyls were represented by a variety of forms. Some were piglike, while one group retained 5 digits and claws, instead of hooves, with which they may have dug tubers (*Protoreodon* and *Diplobunops*). The dichobunids were hooved plant eaters (Colbert 1969, p. 420). Small mammals such as the primitive rabbitlike *Mytonolagus*, rodents, and primates inhabited the low undergrowth or lived in trees as similar mammals do today. Mammalian carnivores were present in several sizes ranging up to the large wolf-sized creodont *Harpagolestes*. West (1981) suggested *Harpagolestes* may have had an omnivorous diet based on basicranial structure.

Speaking of general Uintan conditions in North America, Savage and Russell (1983, p. 118) said: "We visualize that savannas with forest stream valleys were the predominant habitat for Uintan mammals, but the abundant micromammals of probable arboreal adaptation testify to the presence of extensive woodlands also." Based on the information presented above, those general conditions described by Savage and Russell seem to have prevailed in the Myton Pocket also.

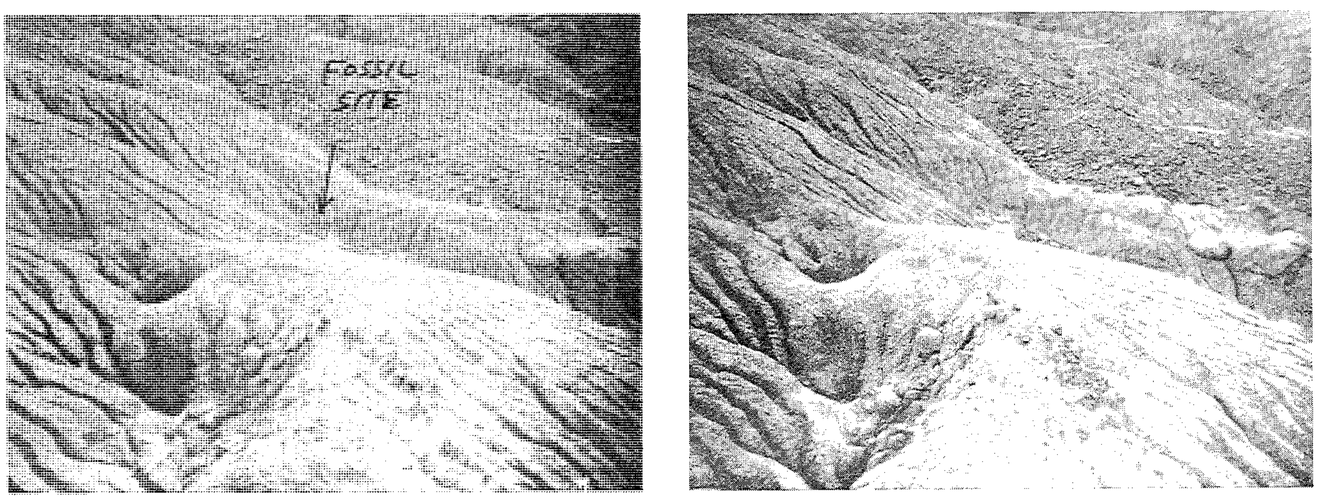
PRESENT RATES OF EROSION AND EXPOSURE

While doing fieldwork in the fall of 1983, the writer observed that there had been very little change due to erosion when areas were compared to several photos taken eleven years earlier (fig. 20). Because the rate of erosion and exposure of new material will have an effect on future collecting and research in the Myton Pocket, several sediment traps were set up to determine how fast erosion was occurring on some of the softer siltstone and shale slopes where fossil material is generally found (fig. 21).

The two sites selected for the traps were chosen because of the differences they exhibited in slope angle as well as having the same sediment type. A trap (a small dam lined with canvas) was set up in a small gully below each site. Test site 1 is below an area with approximately 44.2 square meters (475 square ft) of drainage. Part of the area is on the side of a round knoll with about 32.6 square meters (350 square ft) of surface area on a slope of 40°. The remaining slope, 11.6 square meters (125 square ft), averages about 14° and is dissected by a small gully that caught runoff from the steeper slope above.

Site 2 is below another somewhat smaller knoll and is surrounded by a miniature pediment. There is approximately 93 square meters (1,000 square ft) of drainage at this site. The pediment makes up about 76.7 square meters (825 square ft) of drainage with a 5° slope. The drainage off the knoll is about 16.3 square meters (175 square ft) with a slope of 40°.

These two sediment traps were set up in October 1983 and examined in April and October of 1984. In April the catchment basin of site 1 was nearly full of sediment. It was cleaned out and the contents totaled approximately 36 liters (2,200 cubic in). The catchment basin at site 2 contained very little sediment and only a small amount of clay. Clay was also present in the bottom of site 1. When the traps were examined again in October, site 1 was nearly full again and contained the same amount as in the



A B

FIGURE 20.—*Photos of same fossil site taken 11 years apart. For comparison of amount of erosion and change. Photo A was taken October 1972. Photo B was taken October 1983.*

A

B

FIGURE 21.—*Sediment traps for measuring amount of erosion. Photo A is test site 1. Photo B is test site 2.*

spring (36 liters). Site 2 contained about 42 liters (2,600 cubic in) of material (total for the year). The total for site 1 for the year was 72 liters (4,400 cubic in).

The clay in the bottom of each catchment basin in the spring indicates that the first trickles of winter snowmelt bring down fine clay material that settles out in the traps. As snowmelt proceeds, water tends to saturate and soften material on the slopes. Spring freezing and thawing may help to further loosen slope material. When snowmelt increases, runoff increases and washes more coarse material (fine sand and silt) down the slope. If a miniature pediment is present below steeper slopes, spring runoff tends to dump its sediment load there. Summer rains, which come with more force and energy than snowmelt, clean off any residual loose material from the slopes and works on material deposited at the top of the miniature pediment as well as the miniature pediment slope below.

Site 1 lost an average of 1.6 mm (0.064 in) of sediment for the surface area measure during one year's time. Site 2 lost an average of 0.5 mm (0.02 in) during the year. The two averaged 0.84 mm (0.033 in) of sediment loss together for the year. It is difficult to tell how accurate in a long-term sense these results are and how they would apply to the whole Myton Pocket. The past year's precipitation was above normal.

Schumm (1956) found in the Badlands of South Dakota that the role of rainwash and creep varied according to the type of sediments being eroded. He found that some slopes were reduced by as much as 50 mm (2 in) over a two-year period with 92.3 cm (36 in) of precipitation. The average annual precipitation for the Myton area is 81 cm (7 in). Schumm (1956) did note a buildup of sediment on the miniature pediment itself.

Several surface occurrences of fossils were also monitored during the period of October 1983 to October 1984. Some minor downslope movement (8 cm in one case) of pieces was noted on steeper slopes. Those on gentle slopes or miniature pediments showed little change.

Some pieces located at the base of a slope were covered or partially covered with sediment.

Much more data is needed for any valid conclusions on the rate of erosion and exposure of new material, but it seems that exposure of new fossil material is rather slow. Areas that were known to have produced fossil material several years ago reveal very little new material now.

CONCLUSIONS

The Myton Pocket in the Uinta Formation (upper Eocene) has been an important fossil vertebrate collecting site since 1912. It is an area of badlands exposing fluvial sediments in the form of paleochannel fills and overbank deposits. It is located two-thirds of the way up in a 1,189 m (3,900 ft) section of the Uinta Formation in the lower part of the Myton Member (Uinta C).

Paleochannel fills studied in the Myton Pocket show a current and sediment transport direction of west–northwest during Myton Pocket time, a continuation of conditions described earlier by Stagner (1941) for the Wagonhound Member.

Stream character estimates, using formulae of Schumm (1968, 1972), showed streams with a generally low gradient and a mean annual discharge ranging from 19.8 cms (700 cfs) per second to 527 cms (18,6000 cfs). The silt-clay content was fairly high.

Using the two-model classification (high-sinuosity and low-sinuosity) of streams by Moody-Stuart (1966), Myton Pocket stream patterns are classified as low-sinuosity streams that periodically changed locations by avulsion. Evidence in the Myton Pocket supporting this interpretation are the flat tops and trough-shaped erosional bottoms of channels, channels of coarse-fill rather than fine-fill, lack of epsilon-cross-stratification, and current directions in the same direction as the main channel trend.

A distributary stream system on a delta plain environment model is proposed for the Myton Pocket. This interpretation is supported by the presence of numerous avulsion-type paleochannel fills that are surrounded by argillaceous sediments representing over-the-bank deposits on the delta plain. This is similar to the example studied by Galloway (1981) on the Texas Gulf Coast. Further evidence from the preservation of coprolites also suggests a delta plain or floodplain environment.

The fine-grained delta plain deposits contain a fairly abundant and varied vertebrate fauna of fishes, turtles and tortoises, crocodilians, and mammals. Turtles and tortoises are the most common vertebrate fossils, but have been studied very little. Ten orders of mammals are represented with 35 genera and 40 species. This is 26% of the known North American Uintan fauna and 76% of the fauna known from the Myton Member of the Uinta Formation. There are 320 identified specimens in collections from the Myton Pocket. Artiodactyls make up 69% of these with 26% for the genus *Protoreodon* alone.

Several concretionlike structures from the "Kay" quarry are identified as coprolites. Some of these contain bone fragments and were preserved at a site where numerous small fossil artiodactyl remains have been found, suggesting a possible feeding site or den of some carnivorous or omnivorous mammal. The fact that coprolites were preserved at all suggests a low-energy environment like that of a floodplain or delta plain (Edwards and Yatkola 1974).

No invertebrates and only a few unidentifiable plant imprints were seen in the Myton Pocket. A brief description of the Green River flora is presented with the speculation that plant ecology may have persisted into Myton Pocket time with few changes. This speculation is based on the climatic interpretations of Wolfe (1978) for Eocene times and on evidence from the fauna in the Myton Pocket—particularly the fishes, turtles and tortoises, and crocodilians. Representatives of these same groups, which could not have tolerated an extreme change in climate, were also present during Green River times.

Based on this and floral information from MacGinitie (1969), the environment is thought to have been a savanna type with streams lined with streamside forests, some swampy or marshy areas, and forested highlands. The vertebrate fossils show there was a varied fauna of fishes, reptiles, and mammals filling the various niches in that environment.

Today, geologically speaking, the Myton Pocket is subject to fairly high rates of erosion because of the soft nature of the siltstones and shales. This may be at a rate of 2.5 cm (1 in) or more every 30 years. Exposure of new fossil material, however, is rather slow in human terms.

APPENDIX A

MEASURED STRATIGRAPHIC SECTION OF THE MYTON POCKET SECTION OF THE UINTA FORMATION

SE1/4, SW1/4, SW1/4, of Section 6, T. 4 S, R. 1 E, Uintah Special Meridian

Unit	*Description*	*Feet/ Unit*	*Meters/ Unit*
27	Sandstone: medium grained, rusty yellow, platy, forms top of hill point.	5.0′	1.52
26	Sandstone: medium grained, cross-bedded, rusty yellow.	11.0′	3.35
25	Siltstone: soft slope former, gray green.	7.0′	2.13
24	Sandstone: medium grained, massive, medium brown gray.	10.0′	3.05

23	Siltstone: banded series of dark to medium brown with lighter streaks of fine-grained silty sandstone, top foot is a green shaly material, slope former.	69.0′	21.03
22	Sandstone: (Sandstone S) medium grained, light brown to gray, platy, cross-bedded.	5.0′	1.52
21	Sandstone: medium grained, light brown to gray, massive.	7.0′	2.13
20	Siltstone: slope former, lower 10′ light pink to maroon with less banding, upper part distinct banding of alternating browns and gray greens, sandy at 123′	26.5′	8.08
19	Sandstone: medium to fine grained, tan, thins out to left (east), thickens to right (west).	2.5′	0.76
18	Siltstone: banded series, mostly brown or maroon with lighter layers of tan, green.	20.0′	6.10
17	Sandstone: fine to very fine grained, silty, light gray green, cut diagonally left to right by 3″ hard, pink, very fine sandstone (seems to be on bedding plain).	4.0′	1.22
16	Siltstone: gray green with top foot dark green, 3″ sandstone midway.	6.0′	1.83
15	Sandstone: fine grained, brown gray, platy, disappears to left (east), continues to right where becomes more solid.	2.0′	0.61
14	Siltstone: banded, alternating between maroon and green, slope former.	8.0′	2.44
13	Sandstone: fine to very fine grained, soft, light tan to gray.	1.5′	0.46
12	Sandstone: fine grained, tan, 6″ bed.	.5′	0.15
11	Siltstone: lower 6′ maroon, second 6′ banded maroon and light gray green, top foot dark gray to green, slope former.	13.0′	3.96
10	Sandstone: medium to fine grained, layered with silt, tan to gray.	1.0′	0.30
9	Siltstone: brown to maroon with streaks of light gray, top foot darker green than light gray, slope former.	8.0′	2.44
8	Shale: green gray, weathers out into small pieces of grainy feeling shale.	1.0′	0.30
7	Siltstone: maroon to brown slope.	2.5′	0.76
6	Sandstone: (Sandstone C) fine to medium grained, light gray to tan, thins out to left (east), run on to right (west).	7.0′	2.13
5	Shale: silty, dark brown, platy, hard.	.5′	0.15
4	Sandstone: very fine grained to silty, brown.	1.5′	0.46
3	Siltstone: light gray to tan with layers of maroon or brown.	14.5′	4.42
2	Sandstone: fine to very fine grained, brown to gray.	1.0′	0.30
1	Siltstone: lower 3.5′ light gray, top 1.5′ maroon.	5.0′	1.52
	Total exposed thickness	240.0′	73.12

APPENDIX B

MYTON POCKET COLLECTIONS

Brigham Young University

LAGOMORPHA	
Leporidae	
Mytonolagus petersoni	3950, 4023?
CARNIVORA	
Unidentified	3259?, 3989
ARTIODACTYLA	
Dichobunidae	
Pentacemylus progressus	054?, 3265?, 3962, 3975, 3992, 3998, 073, 4019?
Mytonomeryx scotti	054?, 0769?
Agriochoeridae	
Protoreodon pumilus	047?, 072?, 3252?, 3951, 3952, 4025, 3865, 3965, 3966?, 3982?, 4021
Protoreodon petersoni	027, 3953, 3987, 3958?, 3977, 3978
Protoreodon sp.	031, 3255, 3958, 3967, 4022, 3970, 3983, 3999?
Diplobunops matthewi	3252, 3960
Protoceratidae	
Leptotragulus medius	045?, 3955, 3957, 3973?, 3990, 3991?, 3996
Leptotragulus clarki	097, 3991?
Camelidae	
Protylopus? annectens	3969b
other artiodactyl material	030, 039, 049, 067, 073, 3993, 4467
PERISSODACTYLA	
Brontotheriidae	
Diplacodon sp.	4020
Isectolophidae	
Isectolophus annectens	043, 3251, 3271, 3459, 3959?, 3968
Amynodontidae	
Amynodon sp.	070?
Hyracodontidae	
Triplopus sp.	4018
RODENTIA	
Unidentified	042?, 3993, 3994, 3974
other unidentified material	015, 038

Question mark means identification tentative.

Utah Field House of Natural History

LAGOMORPHA	
Leporidae	
Mytonolagus petersoni	51.9.1, 80.7.1
ARTIODACTYLA	
Dichobunidae	
Pentacemylus progressus	53.22.1
Agriochoeridae	
Protoreodon pumilus	51.19.1–2, 52.14.1, 52.44.1?, 53.24.1.1–3, 50.37.2, 50.38.1, 80.6.1, 80.7.2.1–2, 80.7.3.1–4
Protoreodon petersoni	53.29.1–2
Protoreodon sp.	50.23.1, 50.23.2, 50.26.1, 52.23.1–2, 52.35.1, 53.18.1–2
Diplobunops matthewi	53.23.1
Protoceralidae	
Leptotragulus medius	49.8.1, 51.10.1, 51.11.1, 52.23.1–2, 52.28.1, 52.42.1, 52.42.2, 52.42.3
Leptotragulus clarki	49.9.1, 52.43.1?, 80.6.2.1–2
Camelidae	
Protylopus? annectens	50.37.1
PERISSODACTYLS	
Isectolophidae	
Isectolophus annectens	52.29.1 (113 in Radinsky 1963) 52.30.1–3 (114 in Radinsky 1963)
RODENTIA	
Ischyromyoidea	
Mytonomys robustus	52.32.1
other unidentified material	52.20.1, 80.1.1

Other museums with significant Myton Pocket collections: Carnegie Museum, Princeton University Geological Museum, and United States National Museum.

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