GREEN RIVER AND LOWER UINTA FORMATION SUBSURFACE STRATIGRAPHY IN WESTERN UINTA BASIN, UTAH

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INTRODUCTION

The western portion of the Uinta Basin has been much less explored for oil and gas than other portions. Because of this, there is little published information on that part of it, and the subsurface stratigraphy of the Green River and lower Uinta Formations has been related only in a general manner (Picard, 1955, p. 85) to sections in the central and eastern parts of the Uinta Basin.

The present paper summarizes subsurface stratigraphic information in the western part of the Uinta Basin, and is intended to relate the various Green River and lower Uinta Formation units to other portions of the basin, especially the central Uinta Basin section. These lateral and vertical changes are traced westward from the Duchesne Oil Field, in the central portion of the basin (Fig. 1), to Carter Oil Company's Jack Burnett No. 1 (Sec. 34, T. 4S., R. 11 W., U.S.M.); then northward to Union Oil Company's Strawberry Unit No. 1 (Sec. 35, T. 3S., R. 11W., U.S.M.), and southeastward to The California Company's Slab Canyon Unit No. 1 (Sec. 26, T. 5S., R. 10W., U.S.M.).

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PREVIOUS WORK AND NOMENCLATURE

In the study of Green River Formation stratigraphy in the Uinta Basin, there have been two principal periods of accelerated research. The first of these began about 1925 with the publication of three papers on the origin of the Green River Formation (Henderson, 1924; Bradley, 1925; White, 1926). There then followed a series of papers by Bradley (1928, 1929a, 1929b, 1929c and 1929d), culminating in an extensive report (1931) on the exposed stratigraphy of the various members and facies units of the Green River Formation in the Uinta and Piceance Creek Basins. In 1946, Bradley (1948) reviewed the limnology of the Rocky Mountain Eocene lakes in his presidential address before the Geological Society of Washington.

Approximately 30 years later, coincident with extensive oil exploration, a second group of papers began to appear. In these papers many aspects of the Green River Formation have been discussed. Dane (1954, 1955) has reviewed the exposed stratigraphic and facies relationships of the upper part of the Green River Formation and the lower part of the Uinta Formation in the central and western parts of the Uinta Basin. Milton (1954, 1955, 1957) and his associates have reported on new and unusual minerals found in Green River and lower Uinta beds. Swain (1957) has reported on the ostracods; LaRocque (1956) on the mollusks; and Kay (1934, 1949, 1953, 1957) on the Eocene vertebrates and Tertiary stratigraphy of of the Uinta Basin. The writer, in a series of papers, notes, and discussions, has presented various comments on the subsurface Green River and lower Uinta Formation stratigraphy (1953, 1955, 1957a, 1957b, 1957c, 1957d, 1957e, and 1958). Jones (1957) has discussed the geosynclinal chafacteristics of the basin.

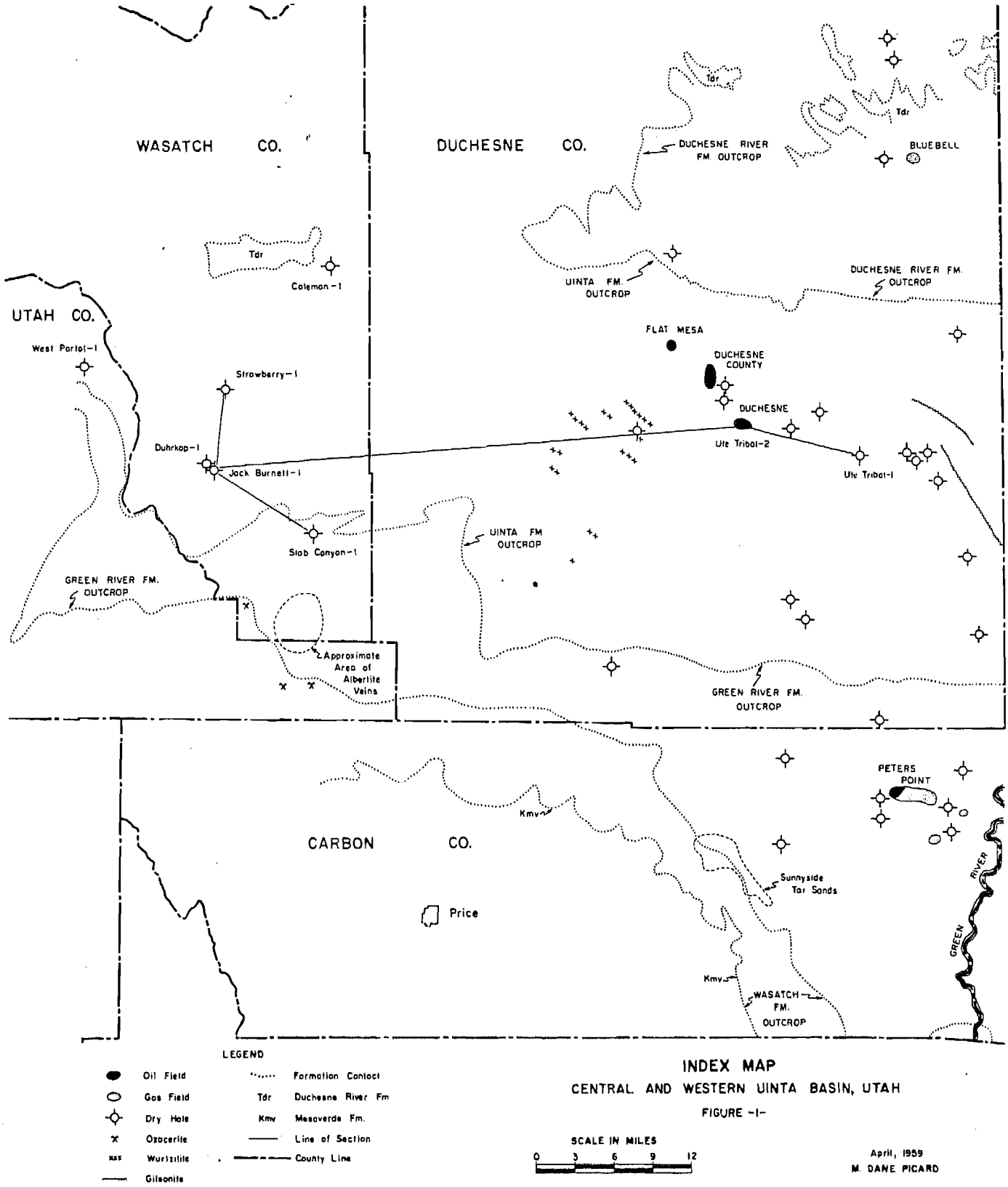
Stratigraphic relationships have also been stressed in four papers primarily concerned with petroleum geology. Hunt, Stewart, and Dickey (1954) recently published a fundamental and interesting discussion on the origin of hydrocarbons in the Uinta Basin. Hendel (1957) has reported on the Peters Point Field; Picard (1957f) has summarized the Red Wash-Walker Hollow Field; and Wells (1958) has discussed the general petroleum geology of the Uinta Basin.

Figure 2 illustrates the various systems of stratigraphic nomenclature used in describing units of the Green River and lower Uinta Formations.

STRUCTURAL ELEMENTS

The sharply asymmetrical Uinta Basin Syncline is enclosed by the west-trending Uinta Mountains on the north, the north-trending Wasatch Mountains on the west, the north-trending San Rafael Swell on the south, the northwest-trending Uncompahgre Uplift on the southeast, and the north-trending Douglas Creek Arch on the east. During the Permian the San Rafael Swell underwent slight movement as indicated by the absence of the Kaibab (Permian) Limestone.* The Uncompahgre Uplift came into being during Pennsylvanian time. The remainder of the positive structural elements were formed during the Laramide Orogeny.

*The major deformation of the San Rafael Swell occurred during the Laramide Orogeny.



INDEX MAP
CENTRAL AND WESTERN UINTA BASIN, UTAH
FIGURE -1-

April, 1959
M. DANE PICARD

PALEOGEOGRAPHY

During Eocene time, the western portion of the Uinta Basin was bounded by the Uinta Mountains, the Wasatch Mountains and the San Rafael Swell. The elevation of the areas between the uplifts cannot precisely be determined, but was sufficient to enclose Lake Uinta. The westrnmost margin of Lake Uinta is difficult to determine, but the writer (1958, pp. 1991-92) believes that the lake did not spread westward between the early Tertiary mountain ranges in northwestern Utah. Shore phases in the western Uinta Basin area delineate the approximate maximum extent of the lake, and indicate that it is unlikely that Lake Uinta ever existed more than 10 miles west of the Strawberry Reservoir area. It is, however, quite probable that a separate lake (or lakes) was present west of the Wasatch Mountains during Eocene time.

During early and middle Green River time (black shale and green shale facies), the western part of the Uinta Basin received sediments from the north, northwest, and southeast. The relative importance of the various borderlands is difficult to determine because of inadequate well control. It is tentatively postulated that the northern sediment source may have been more active.

During middle and late Green River time (Parachute Creek and Evacuation Creek Members), the principal source area was on the northwest. Important amounts of sediment were also derived from the southeast or south, and from the west. The major and minor sediment source areas during late Green River and early Uinta time cannot accurately be determined from existing subsurface evidence.

WATER DEPTH CHART

A preliminary relative water depth chart of the Green River Formation at The Californ.a Company's Slab Canyon Unit No. 1 is herein presented (Fig. 3). In preparing this chart, two sediment groups were used as end members since they are believed to indicate fluvial deposition and deep-water* lake deposition respectively. The fluvial group is characterized by red and maroon, calcareous, shale; generally more poorly sorted sandstone beds; earthy, calcareous, green shale; and a relative scarcity of the sulfides, pyrite and marcasite (Picard, 1957e). The deep-water lake suite is composed of varved, medium to dark brown, shale; related, argillaceous dolomite beds; abun-

*The writer does not believe that Lake Uinta exceeded about 200 feet of water depth, and for most of its duration was much shallower.

CORRELATION OF GREEN RIVER AND LOWER UINTA FORMATIONS
UINTA BASIN, UTAH

	Bradley, 1931 (modified slightly)			Dane, 1954, 1955	Picard, 1955, 1957, and this paper				
		GATE CANYON	WATSON, UTAH	CENTRAL UINTA BASIN	*WESTERN UINTA BASIN*	CENTRAL UINTA BASIN	EASTERN UINTA BASIN		
EOCENE	LOWER UINTA FORMATION	shaly facies	lower part of Uinta Formation	sandstone and limestone facies of Uinta Formation	sandstone and limestone facies of Uinta Formation	sandstone and limestone facies of Uinta Formation	lower part of Uinta Formation	LOWER UINTA FORMATION	EOCENE
			?	saline facies of Uinta Fm.	saline facies of Uinta Formation	saline facies of Uinta Formation			
	GREEN RIVER FORMATION		Evacuation Creek Member	Evacuation Creek Member			Evacuation Creek Member	GREEN RIVER FORMATION	
			Parachute Creek Member	Parachute Creek Member	Parachute and Evacuation Creek Members	Parachute and Evacuation Creek Members	Parachute Creek Member		
		delta facies	Garden Gulch Member	not studied by Dane	green shale facies	green shale facies	Garden Gulch Member		
		?			?	?			
		basal member	Douglas Creek Member		black shale facies	WASATCH TONGUE / black shale facies	Douglas Creek Member		
	WASATCH FORMATION	WASATCH FORMATION			"Cotton Formation"	WASATCH FORMATION		WASATCH FORM.	

Note: All of the contacts shown are lithofacies contacts.

FIGURE -2-

dant sulfides; and certain species of ostracods. Three divisions, believed to represent gradations between fluvial and deep-water lake conditions, were used on the chart.

Considering that all the various water depths assigned are qualitative, and that most water depths in this well appear to have been intermediate between the end members (Fig. 3), the interpretation contains some interesting fluctuations which can be summarized as follows. During most of black shale facies time, the lake was relatively constant and moderately deep. There then followed a succession of transgressions and regressions at about 325 foot, stratigraphic intervals during green shale facies time. During Parachute Creek and Evacuation Creek time, there continued a series of transgressions and regressions at about 200 foot, stratigraphic intervals. During this later period, the interval between two transgressive episodes became as little as 65 feet. These fluctuations — if they are as real as they now seem to the writer — were only the major movements of the lake surface through one control point, and any single, thin stratigraphic interval no doubt contains the record of many minor variations.

Unfortunately this approach to one phase of the history of Lake Uinta has not been applied to any of the other wells in the western Uinta Basin area. Further research may indicate that the general method may be greatly refined, and used to portray the paleohistory of smaller units within the various members of the Green River and lower Uinta Formations.

GENERAL STRATIGRAPHY

The portion of this paper on stratigraphy which follows, contains observations on the western Uinta Basin area. Previous work by Bradley (1931), Dane (1954, 1955), and the writer (1955, 1957b) is not repeated unless necessary to the understanding of the present report.

Two cross sections (Figs. 4 and 5) are presented and related to previous subsurface work by correlation with the central Uinta Basin section. The interpreted "time line datum A" was used in a previous study by the writer (1957b). All stratigraphic thicknesses are from wells used in constructing the cross sections.

WASATCH FORMATION

The Wasatch Formation underlies the Green River Formation in the central and eastern Uinta Basin area. The term is used to designate predominantly fluvial beds lying between the Mesaverde (Cretaceous) Formation and the Green River (Eocene) Formation where these beds have not been divided into smaller units. On the western side of the Uinta Basin the section has been divided in descending order into the Colton Formation, the Flagstaff Limestone, and the North Horn Formation, primarily on the basis of work in the Wasatch Plateau area of central Utah by Spieker (1946).

The Colton Formation in the western portion of the Uinta Basin is composed of red, green and gray shale, sandstone, and conglomerate. Bed lenticularity is pronounced, and the sediments are primarily fluvial in origin.

The age of the Wasatch Formation is believed to be Paleocene-Eocene (Stokes, et al., 1955, p. 2015) in the central and eastern Uinta Basin area, but the division between these epochs is best made from vertebrate remains, and this type of evidence has been found only rarely in the Uinta Basin.* The Cretaceous-Tertiary boundary, at a position between the uppermost occurrence of dinosaur remains and the lowermost occurrence of placental mammals, has been placed by Spieker (1946, p. 121) within the North Horn Formation on the Wasatch Plateau.

The Colton, Flagstaff and North Horn divisions of the Wasatch Formation in the western portion of the Uinta Basin have been insufficiently studied by the writer, and only the upper few feet of these beds is included on the cross sections.

GREEN RIVER FORMATION

Black shale facies. — The black shale facies is gradational with the underlying Colton Formation and represents the initial deposition of lacustrine sediments of the Green River Formation. In the western Uinta Basin area the unit is composed of medium-to-dark-grayish, brown, shale beds; dark gray to black, carbonaceous shale beds; tan to light gray, very fine-to-fine-grained (Archie, 1952) sandstone beds; and tan to brown, limestone beds that are very ostracodal in places. Minor quantities of dolomite, green shale, and siltstone are also found.

In The California Company's Slab Canyon Unit No. 1, most of the shale beds are medium-to dark-grayish, brown. Much of this shale is probably low-to medium-grade oil shale in contrast to the central and eastern portions of the Uinta Basin where the percentage of oil shale is generally rather small in the black shale facies.

Laterally the number of sandstone and siltstone beds increases to the southeast and north along the line of section (Fig. 5). Both end wells of the cross section (Fig. 5) probably contain an entirely lacustrine black shale facies; no fluvial beds are believed to be present. The thickness ranges from about 892 to 1070 feet.

On the correlation chart (Fig. 2), the upper portion of the black shale facies tentatively has been correlated with the lower half of the Douglas Creek Member (Bradley, 1931, p. 10) of the eastern Uinta Basin area. Well control is still too sparse in the Uinta Basin for a more definitive assignment.

Green shale facies. — The term *green shale facies* was introduced by the writer (Picard, 1957d) as a descriptive designation to avoid the environmental connotation

*Kay (1957, p. 110) has reported fragmental remains from the upper Wasatch Formation along the north side of Raven Ridge which he believes to be early Eocene in age.

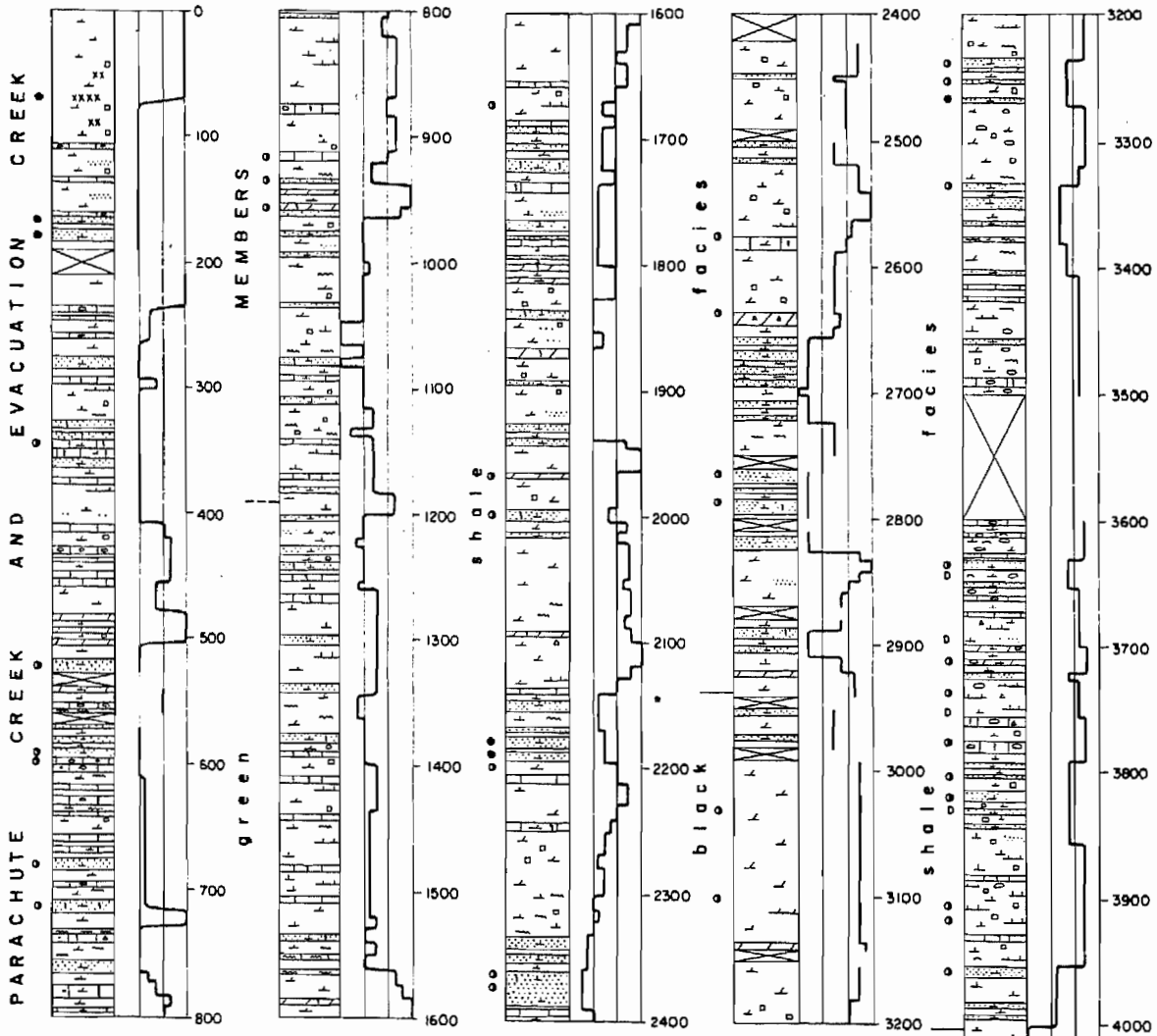
FIGURE -3-

THE CALIFORNIA COMPANY

SLAB CANYON-UNIT NO. 1

SEC. 26, T. 5 S., R. 10 W., WASATCH CO., UTAH

GREEN RIVER FM. LITHOLOGIC LOG AND INTERPRETATED RELATIVE WATER DEPTH CHART



SYMBOLS

LITHOLOGIC

- Calcareous sandstone
- Argillaceous sandstone
- Dolomitic siltstone
- Argillaceous limestone
- Dolomitic limestone
- Sandy limestone
- Oolitic limestone
- Argillaceous dolomite
- Limy dolomite
- Calcareous shale
- Dolomitic shale
- Silty shale
- Ash Bed
- Skip in samples

ACCESSORY

- Pyrite or marcasite
- Chert

PALEONTOLOGIC

- Ostracod
- Pelecypod

OIL STAIN

- Good to uniform saturation
- Spotty saturation
- Dead

INCREASING WATER DEPTH

Fluvial

SCALE IN FEET

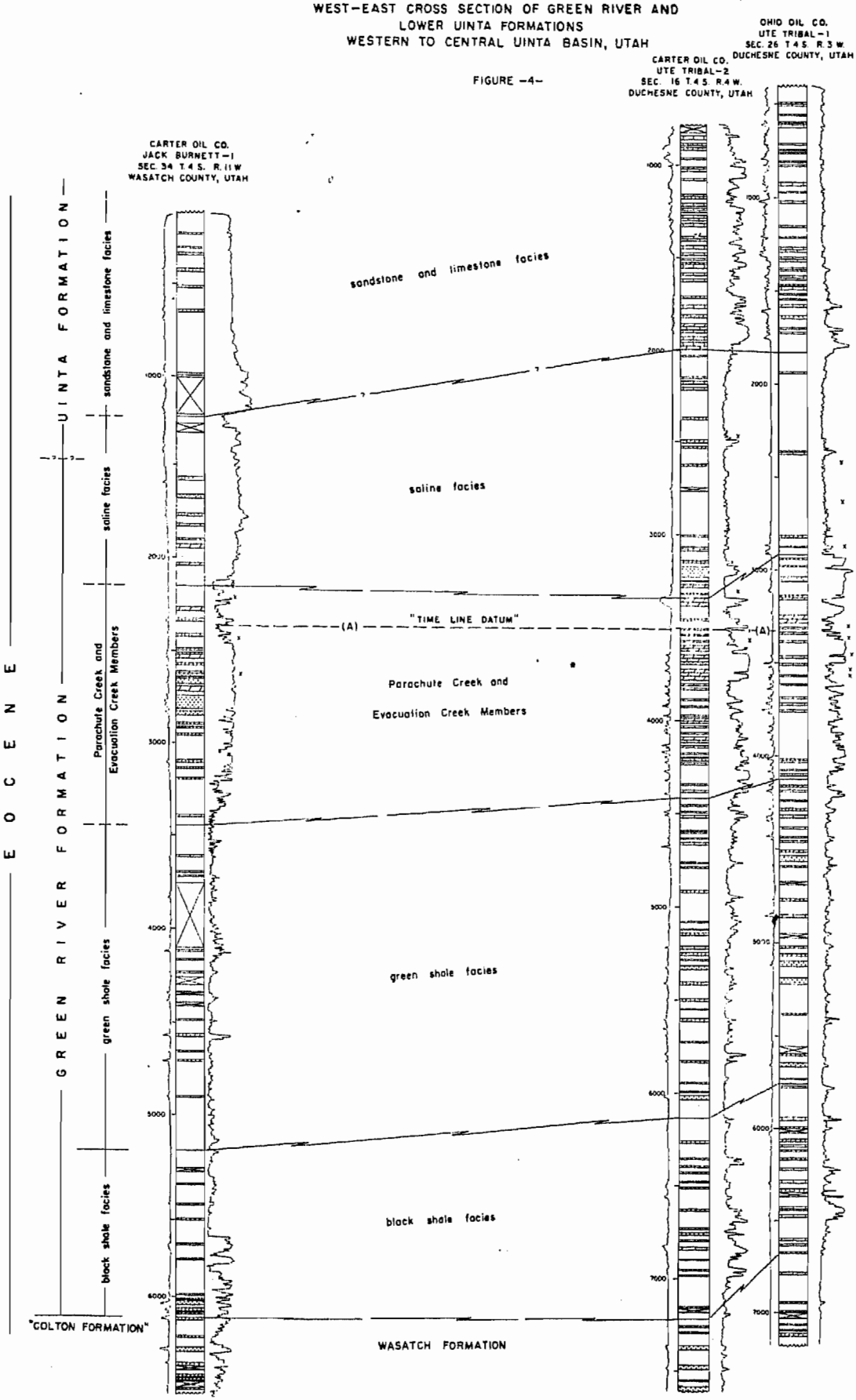
100
50
0

March, 1959
M. DANE PICARD

41 Miles — 8 1/2 Miles

WEST–EAST CROSS SECTION OF GREEN RIVER AND LOWER UINTA FORMATIONS WESTERN TO CENTRAL UINTA BASIN, UTAH

FIGURE –4–



of the previously used *delta facies* (Picard, 1955). The base of the unit is not as gradational with the underlying blackshale facies in the western Uinta Basin area as it is in other portions of the Uinta Basin.

The unit is characteristically composed of light to medium, calcareous, green shale beds. Very fine-to fine-grained, subrounded, moderately sorted, calcareous sandstone beds occur closely associated with the green shale beds. Tan to brown, shale beds; tan to brown, earthy to crystalline, dolomite beds; tan to brown, microcrystalline to very finely crystalline, limestone beds; and siltstone beds are present in varying proportions depending upon the location of a particular section with respect to the positions of the ancient shore lines and varying depths of lake waters.

The number of sandstone and siltstone beds increases to the southeast and north along the line of section (Fig. 5) as they do in the black shale facies. The increase of clastic beds is greater northward than it is southeastward. A further reflection of this clastic increase is the presence of minor amounts of red shale in both end wells of the cross section (Fig. 5), probably indicating minor fluvial sedimentation during green shale facies time. North of the Strawberry Unit No. 1, the section probably changes very rapidly to predominantly fluvial sediments. South of the Slab Canyon Unit No. 1, the change to coarser clastic beds may have been more gradual, and a predominantly fluvial section may not now be present due to erosion of the Book Cliffs. The thickness of the green shale facies is from 1652 to 1760 feet in the western Uinta Basin area.

Parachute Creek and Evacuation Creek Members. — The Parachute Creek and Evacuation Creek Members of the Green River Formation west of the Green River are recognized in the subsurface as one unit (Picard, 1955, p. 91) because of the difficulties involved in separating the members on lithologic differences or electric-log characteristics. Dane, however, distinguishes between the two in surface work (Dane, 1955; Ray, *et al.*, 1956) in the central and western Uinta Basin area. On the cross sections (Figs. 4 and 5), the base of the unit has been placed at the bottom of a generally higher resistive electric-log zone, a procedure previously used in subsurface studies (Picard, 1957b, p. 125). In most places this contact is gradational with underlying beds of the green shale facies.

Oil shale beds are characteristic of this unit in other portions of the Uinta Basin. In the western portion, however, they are not as abundant; and in the Jack Burnett No. 1 there is only one bed (near the base) that would yield 10 gallons of oil per ton (Stanfield, *et al.*, 1954, p. 99). According to the same writers (p. 97), there are no oil shale beds in the Parachute Creek and Evacuation Creek Members in the Strawberry Unit No. 1. The lithologic log of this latter section shows the interval to be a clastic sequence composed predominantly of sandstone, siltstone, and variegated shale. In the Jack Burnett No. 1, and in the Slab Canyon Unit No. 1, the interval contains numerous dolomite and limestone beds, more especially in the Slab Canyon Well. Green shale, medium to dark gray shale, and siltstone are also found within this unit in the western portion of the Uinta Basin. Tuff beds, although difficult to detect in well samples, are found and have been used in both cross sections (Figs. 4 and 5) to determine the "time line datum A". The Parachute Creek and Evacuation Creek Members range from about 1103 to 1297 feet in thickness in the western Uinta Basin area.

UINTA FORMATION

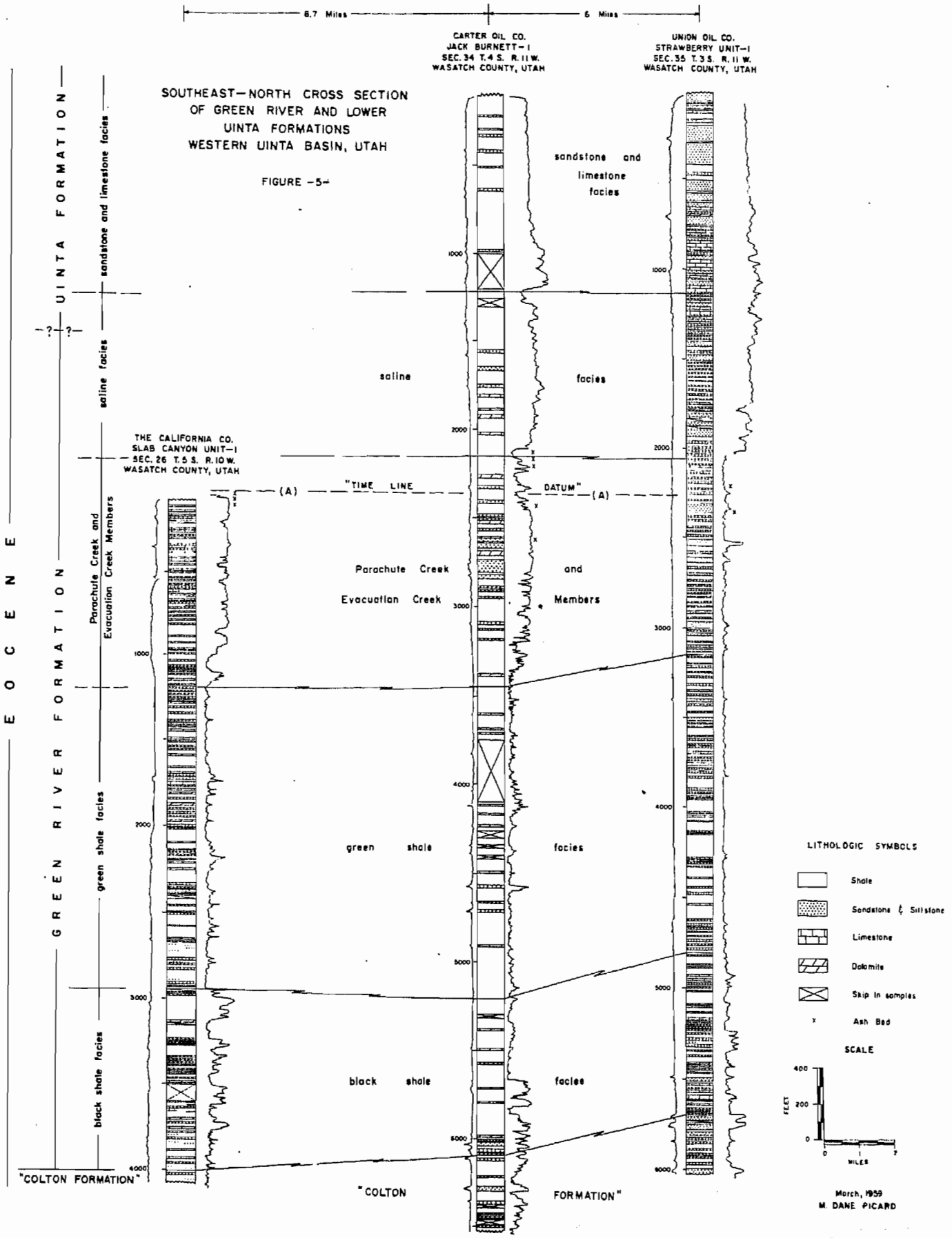
The base of the Uinta Formation has been placed near the middle of the saline facies (which overlies the combined Parachute Creek and Evacuation Creek Members) on both cross sections (Figs. 4 and 5). This position approximately corresponds to the top of the Evacuation Creek Member of the eastern Uinta Basin section (Fig. 2), a placement previously (Picard, 1957b, p. 128) tentatively suggested for the base of the Uinta Formation in the central and eastern Uinta Basin area. However, this assignment is preliminary, and it is possible that it may be stratigraphically too high. There is insufficient subsurface control in the western Uinta Basin area for a more nearly precise determination.

Saline facies. — In the central portion of the Uinta Basin, the base of the saline facies corresponds with the top of a highly resistive zone on electric logs (Fig. 4). This position, however, is not so evident in the western Uinta Basin area (Fig. 5).

The unit is predominantly composed of dolomitic, gray, green, and brown, lacustrine, shale in the Jack Burnett No. 1. Minor amounts of sandstone, siltstone, and dolomite are also present. Northward this interval is predominantly sandstone and siltstone, with minor variegated shale. The latter section is believed to have been deposited in a fluvial environment in part. The thickness in both wells is about 925 feet. A general description of a complete central Uinta Basin section of the saline facies has been previously published (Picard, 1957b, p. 127).

Sandstone and limestone facies. — The descriptive phrase "sandstone and limestone facies of the Uinta Formation" has been used by Dane (1954, p. 422) for those lacustrine sediments overlying the saline facies in the central Uinta Basin area. These are the youngest beds deposited in Lake Uinta.

The unit, in the western part of the Uinta Basin, is somewhat difficult to separate from the underlying saline facies. However, an approximately equivalent section appears to be present in the Jack Burnett No. 1, and in the Strawberry Unit No. 1. The placement of the base of this unit, in the Jack Burnett No. 1, is questionable (Fig. 4), and it may be stratigraphically higher than has been indicated.


8.7 Miles
6 Miles
CARTER OIL CO.
JACK BURNETT-1
SEC. 34 T. 4 S. R. 11 W.
WASATCH COUNTY, UTAH
UNION OIL CO.
STRAWBERRY UNIT-1
SEC. 35 T. 3 S. R. 11 W.
WASATCH COUNTY, UTAH
SOUTHEAST-NORTH CROSS SECTION
OF GREEN RIVER AND LOWER
UINTA FORMATIONS
WESTERN UINTA BASIN, UTAH
FIGURE -5-
EOCENE
GREEN RIVER FORMATION
UINTA FORMATION
sandstone and limestone facies
saline facies
green shale facies
black shale facies
Parachute Creek and Evacuation Creek Members
"COLTON FORMATION"
THE CALIFORNIA CO.
SLAB CANYON UNIT-1
SEC. 26 T. 5 S. R. 10 W.
WASATCH COUNTY, UTAH
(A) "TIME LINE"
"DATUM" (A)
sandstone and limestone facies
saline facies
Parachute Creek and Evacuation Creek Members
green shale facies
black shale facies
"COLTON FORMATION"
1000
2000
3000
4000
5000
6000
LITHOLOGIC SYMBOLS
Shale
Sandstone & Siltstone
Limestone
Dolomite
Skip in samples
Ash Bed
SCALE
400
200
0
FEET
0
1
2
MILES
March, 1959
M. DANE PICARD

The sandstone and limestone facies is composed of medium to dark-gray, and tan to brown, calcareous or dolomitic, carbonaceous, hard, brittle shale beds which are interbedded with brown, crystalline to chalky, microcrystalline to fine, argillaceous limestone and dolomite beds; and grayish-green, sandy, calcareous or dolomitic shale beds. Tan, light gray, and light grayish-green, calcareous sandstone beds composed of very fine to fine, subrounded to rounded quartz grains are characteristic. The upper half of the unit in the Strawberry Unit No. 1 contains red shale and other sediments indicative of deposition in a fluvial environment (Picard, 1957e). The lower half of the section in this well, and the entire interval in the Jack Burnett No. 1, appears to be predominantly lacustrine in origin. It is believed that the unit becomes entirely fluvial in origin on the north. About 1150 feet of beds in the two wells are assigned to the sandstone and limestone facies.

OIL AND GAS POSSIBILITIES*

SOURCE BEDS IN THE UINTA BASIN

The most important attribute of a petroleum province is the presence of good source beds. Without source beds, or with inadequate source beds, all other factors involved in petroleum accumulation are meaningless. However, because source beds are difficult to evaluate, or even to recognize, this factor is usually given a plus value if there are some showings of oil (seeps, tar sands, etc.) in the area, and if there is a dark shale unit (or units) of probable marine origin located somewhere within the prospective stratigraphic sequence. Once the presence of source beds has been thus assured, most investigations proceed to an evaluation of traps, reservoir beds, and impermeable caps.

The source bed factor, until recently, could not be so readily dismissed in considering the petroleum potential of the Tertiary beds of the Uinta Basin since this sequence is entirely continental (lacustrine and fluvial). Until a few years ago, this condition would have been considered fatal to successful petroleum exploration in the area. Recent work, however, has done much to support the view that continental sediments may contain adequate petroleum source beds.

Hunt, Stewart and Dickey (1954) have demonstrated the correlation between certain solid hydrocarbons of the Uinta Basin and extracts from Tertiary beds believed to be their source. Smith (1954, p. 377) has found in recent sediments, "liquid hydrocarbons in a wide variety of salty, brackish, and fresh-water deposits." Similarly, Swain (1956, p. 600) has noted hydrocarbons from bottom deposits of five lakes in central and northern Minnesota.

Other workers, using less quantitative data, have advocated an indigenous origin for various Tertiary hydrocarbon accumulations of the Rocky Mountain region. Felts (1954, p. 1668) viewed the Green River Formation oils of the Uinta Basin as having had an indigenous origin; Nightingale (1930, 1935) believed an *in situ* hypothesis of origin necessary to explain the non-marine Tertiary accumulations at Hiawatha and Powder Wash in northwestern Colorado and Wyoming; and the writer (1956, p. 2960) stated his belief that "oil and gas in the Tertiary fields of Utah and Colorado are indigenous to the continental formations, and that probably lacustrine facies were largely responsible for their formation."

Considering the past productive history of Tertiary rocks in the Uinta Basin, the geology of the various fields, the distinctive character (high pour point and wax content) of the oils, the previously cited work of Hunt, *et al.*, and the problems that would be involved (Picard, 1956, p. 2960), "in attempting to hypothetically migrate any large volume of oil or gas, vertically or laterally, from older stratigraphic units," it seems certain that there are a number of "source bed zones" within the Tertiary units of the Uinta Basin. The writer's view, perhaps more philosophic than even qualitative, of the special environments responsible for formation of these stratigraphic zones is as follows. Gas was primarily formed in the shallow marsh and pond environment, and to some extent in the shallow lacustrine environment. Oil and associated gas were generated in the deeper-water, lacustrine environment. Both environments were characterized by restricted conditions, and the amount of either hydrocarbon formed was dependent upon the salinity of the water, the amount of organic material initially present in the environment, the type and degree of bacterial action, the amount of geologic time during which the environment persisted, the proximity and volume of reservoir beds during the time the oil and gas was being formed,* and other factors. Without the initial restriction in environment, the amount of oil and gas formed would have been negligible.

STRATIGRAPHIC EVALUATION OF WESTERN UINTA BASIN AREA

The western Uinta Basin area contains no known oil or gas fields and there have been a very limited number of testings for oil and gas. The stratigraphic factors involved, however, would not seem to warrant a pessimistic view of the possibilities.

In this area there is a complete Green River and lower Uinta Formation sequence; there are pronounced vertical and lateral stratigraphic changes within this section (Fig. 5); there have been numerous transgressions and regres-

*The Currant Creek (Cretaceous-Paleocene) Formation of the west part of the Uinta Basin is not considered in the discussion of oil and gas possibilities. As described by Bissell (1952, pp. 613-614) the formation does not seem to possess favorable source bed properties. However, the writer is not familiar with the detailed stratigraphy of this unit.

*The writer believes that the actual volume of storage space available at the time of formation, and before complete lithification occurred, was an important factor in the Uinta Basin. If insufficient space was available, it is probable that the generative process was retarded and the orgaanic material was incorporated into oil shales, dark gray to black, carbonaceous, shales, and related sediments.

sions of the shore line (Fig. 3); there are source beds; and there are reservoir beds (principally sandstones).

All the various members of the Green River Formation, that produce oil† in other parts of the Uinta Basin, are present. There is an adequate impermeable cover for the potentially productive zones over much of the area. Further, there are solid hydrocarbons (ozocerite, albertite) exposed on the southwestern edge of the Uinta Basin (Fig. 1).

Although they probably have little present significance, because of the limited well control in the area, two negative factors should be mentioned. First of all, the sandstone beds, which are the most likely reservoir rocks, are generally moderately to poorly sorted, contain much argillaceous material in many instances, are often found to be silty, and are not very porous. However, these beds have shown moderate to good oil staining (Fig. 3) in the subsurface. The second negative factor is the absence of any free oil on drill stem tests in any of the dry holes.

The total of the favorable stratigraphic factors, plus the unfavorable factors just mentioned, leads to the view that the stratigraphy appears favorable for future oil and gas production from units of the Green River Formation and possibly from the lower part of the Uinta Formation in the western Uinta Basin area.

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