

Godiva Rim Member—A New Stratigraphic Unit of the Green River Formation in Southwest Wyoming and Northwest Colorado

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**GODIVA RIM MEMBER—A NEW STRATIGRAPHIC UNIT OF THE
GREEN RIVER FORMATION IN SOUTHWEST WYOMING AND
NORTHWEST COLORADO**



Outcrops of the LaClede Bed of the Laney Member (weathers tan) and Godiva Rim Member (weathers gray) of the Green River Formation and Cathedral Bluffs Tongue of the Wasatch Formation (weathers red, tan, and gray) on the west side of the Little Snake River in the Sand Wash basin. View is west toward The Nipple.

Godiva Rim Member—A New Stratigraphic Unit of the Green River Formation in Southwest Wyoming and Northwest Colorado

By HENRY W. ROEHLER

GEOLOGY OF THE EOCENE WASATCH, GREEN RIVER, AND BRIDGER (WASHAKIE) FORMATIONS, GREATER GREEN RIVER BASIN, WYOMING, UTAH, AND COLORADO

U.S. GEOLOGICAL SURVEY PROFESSIONAL PAPER 1506-C

Description of lithofacies of lacustrine and mudflat origin along the eastern margins of Eocene Lake Gosiute in the Washakie and Sand Wash basins



U.S. DEPARTMENT OF THE INTERIOR

MANUEL LUJAN, JR., *Secretary*

U.S. GEOLOGICAL SURVEY

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**GODIVA RIM MEMBER—A NEW STRATIGRAPHIC UNIT OF THE
GREEN RIVER FORMATION IN SOUTHWEST WYOMING AND
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By HENRY W. ROEHLER

ABSTRACT

The report names and describes the Godiva Rim Member of the Green River Formation in the eastern part of the Washakie basin in southwest Wyoming and the central part of the Sand Wash basin in northwest Colorado. The Godiva Rim Member comprises lithofacies of mixed mudflat and lacustrine origin situated between the overlying lacustrine Laney Member of the Green River Formation and the underlying fluvial Cathedral Bluffs Tongue of the Wasatch Formation. The Godiva Rim Member is laterally equivalent to and grades westward into the LaCledde Bed of the Laney Member.

The type section of the Godiva Rim Member is located on Bald Mountain at the northeast end of Godiva Rim in the Sand Wash basin. The type section is 324 feet thick and consists mostly of gray and green mudstone that is interbedded with brown oil shale, gray-brown silty kerogenaceous shale, gray or tan sandstone and siltstone, and gray shale. Very thin beds of gray limestone and brown algal limestone also are present locally. Fossil mammal determinations indicate that the age of the member is early middle Eocene.

The Godiva Rim Member of the Green River Formation was deposited along the southeast margins of Lake Gosiute and is correlated to similar lithologic units that were deposited along the northeast margins of Lake Uinta in the Parachute Creek Member of the Green River Formation. The stratigraphic data presented provide significant evidence that the two lakes were periodically connected around the east end of the Uinta Mountains during the middle Eocene.

INTRODUCTION

The name Godiva Rim Member of the Green River Formation is herein applied to an interval of 160–375 ft of mudstone, shale, oil shale, sandstone, siltstone, and limestone all of which crop out between the overlying Laney Member of the Green River Formation and the underlying Cathedral Bluffs Tongue of the Wasatch

Formation across the central part of the Sand Wash basin in northwest Colorado and the eastern part of the Washakie basin in southwest Wyoming. The member comprises rocks that were deposited in and adjacent to Eocene Lake Gosiute. Lake Gosiute occupied the intermontane greater Green River basin (fig. 1), which includes the Sand Wash and Washakie basins.

The Godiva Rim Member is named for exposures along the southeast slopes of Godiva Rim in the Sand Wash basin in T. 8 N., R. 96 W., Moffat County, Colo. (fig. 2). The member is easily identified in outcrops by its distinct gray-weathering color, which sharply contrasts with the tan-weathering Laney Member of the Green River Formation and the mostly red- and gray-weathering Cathedral Bluffs Tongue of the Wasatch Formation. The Godiva Rim Member has been mapped previously, but has not been formally named. Recognition of the member as a formal stratigraphic unit completes a stratigraphic framework prepared by the author for the Wasatch, Green River, and Bridger (Washakie) Formations in the greater Green River basin (fig. 3).

PREVIOUS INVESTIGATIONS

The first detailed investigation of the geology of Eocene rocks in the Sand Wash and Washakie basins was undertaken in 1921 and 1922 by J.D. Sears and W.H. Bradley. Sears and Bradley (1925, pl. 24) published a geologic map of the Sand Wash and Washakie basins on which the stratigraphic interval of the Godiva Rim Member was included in the Cathedral Bluffs Tongue of the Wasatch Formation. On later more detailed geologic

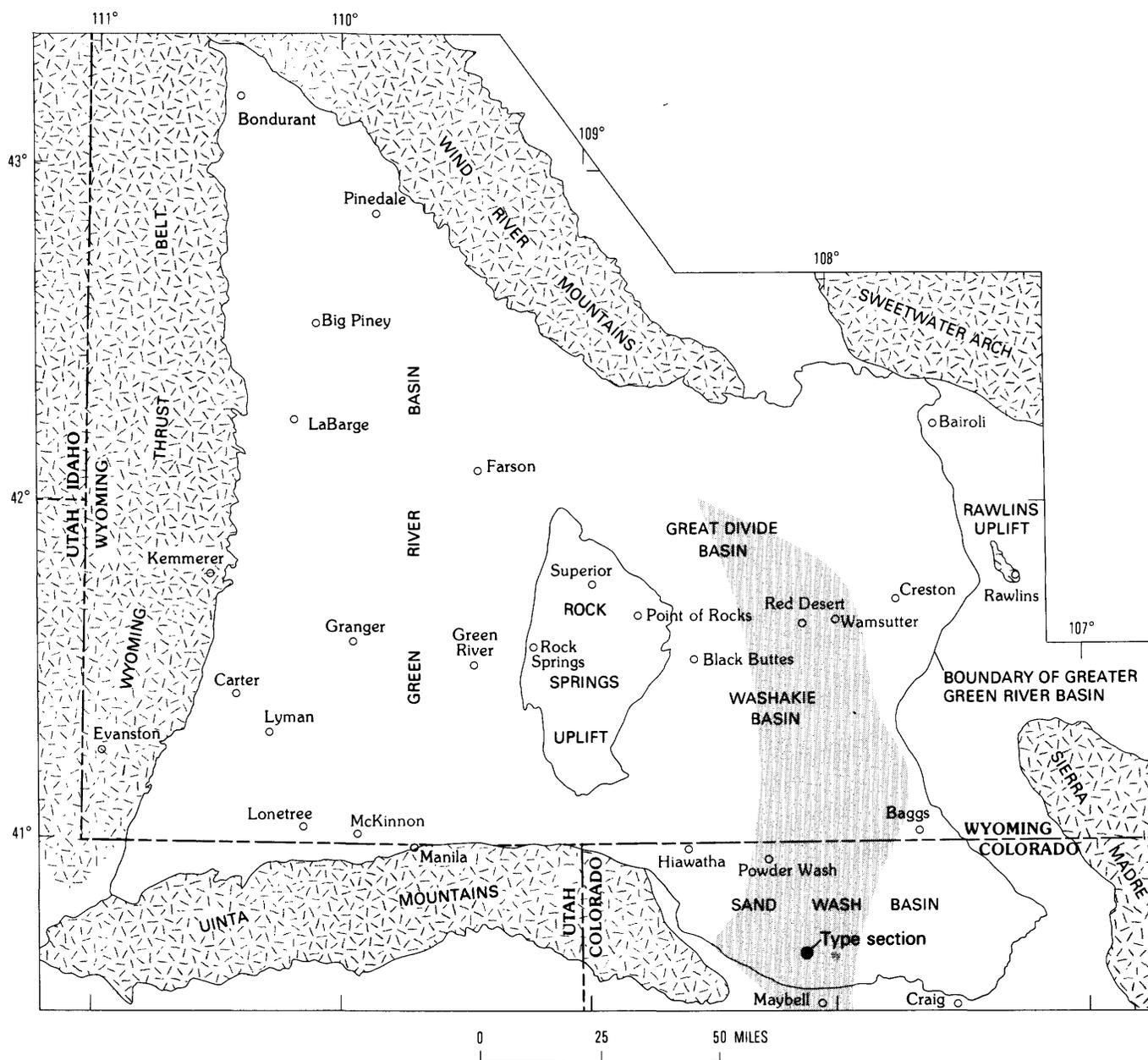


FIGURE 1.—Location of greater Green River basin and the approximate Eocene areal distribution (shaded) of the Godiva Rim Member of the Green River Formation.

maps of the Washakie basin, Bradley (1945; 1964, pl. 1) included the same interval in the basal part of the Laney Member of the Green River Formation. Roehler (1985) assigned these rocks to the basal unnamed tongue of the Laney.

The basal part of the Laney Member of the Green River Formation and the upper part of the underlying Cathedral Bluffs Tongue of the Wasatch Formation are shown to be intertongued in the eastern Washakie basin on a geologic map published by Roehler (1973a, fig. 1,

p. 48). This intertonguing is also shown by Love and Christiansen (1985) on the geologic map of Wyoming. As a result of my recent field work in the area, the intertongued interval is herein designated the Godiva Rim Member.

The Godiva Rim Member was identified and mapped as the "gray zone" at the top of the Wasatch Formation by McKay and Bergin (1974) on the Maybell quadrangle in the Sand Wash basin. A segment of this quadrangle that includes the Godiva Rim area is shown in figure 4. The

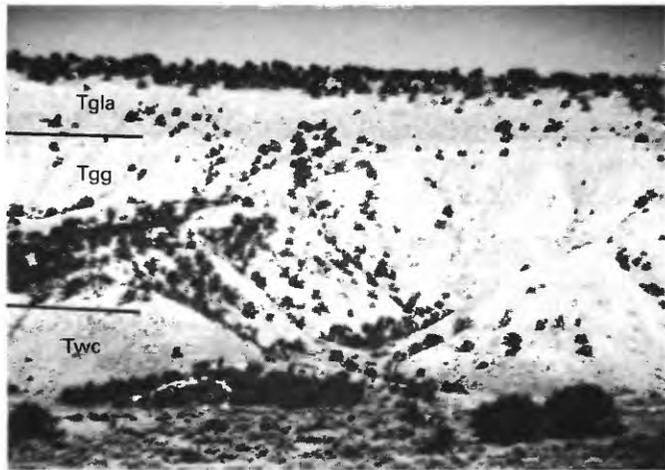


FIGURE 2.—Outcrops of the Laney Member (Tgla) and Godiva Rim Member (Tgg) of the Green River Formation and the Cathedral Bluffs Tongue (Twc) of the Wasatch Formation on the southeast slopes of Godiva Rim. View is to the west in sec. 10, T. 8 N., R. 96 W. The Godiva Rim Member is about 250 ft thick at this location.

gray zone (Tgg, fig. 4) was described by them as about 200 ft of gray interbedded claystone and siltstone, and gray and buff flat-bedded and crossbedded fine-grained sandstone.

My stratigraphic investigations of the Godiva Rim Member began in July 1987, when I measured a section of the Cathedral Bluffs Tongue of the Wasatch Formation and the Laney Member of the Green River Formation on the southeast slopes of Godiva Rim in secs. 20, 27, 28, and 29, T. 8 N., R. 96 W. (fig. 4). In this section the unit mapped as the gray zone of the Wasatch Formation by McKay and Bergin (1974) was discovered to be primarily composed of interbedded lacustrine, shoreline, and mudflat deposits that are normally included in the Green River Formation. Later in 1987, I measured several additional sections along outcrops of the gray zone across the central part of the Sand Wash basin and eastern part of the Washakie basin. The gray zone was consistently present in these sections, but it gradually thinned northward across the basins where it was replaced from the base upward by the Cathedral Bluffs Tongue of the Wasatch Formation. The interbedded lacustrine, shoreline, and mudflat deposits of the gray zone were then correlated in the subsurface by drill holes and coreholes to sections measured along the eastern and western margins of the Sand Wash and Washakie basins. These investigations resulted in my designating a new formal stratigraphic unit in the Green River Formation, the Godiva Rim Member, which supersedes the term gray zone of the Wasatch Formation used by McKay and Bergin (1974).

LOCATION AND DESCRIPTION OF TYPE SECTION

The type section of the Godiva Rim Member lies on the east slopes of Bald Mountain (fig. 5) at the northeast end of Godiva Rim in NE¼ sec. 1, T. 8 N., R. 96 W. (fig. 4). The type section is accessible by Moffat County road 19, which branches northward from U.S. Highway 40 at Maybell, Colo. Twelve miles north of Maybell in SE sec. 32, T. 9 N., R. 95 W., a secondary gravel road joins county road 19 from the southwest. Bald Mountain is located on the west side of this road, 2 miles southwest of the road junction. Rocks composing the type section and adjacent rocks in the Laney Member and Cathedral Bluffs Tongue are illustrated in a columnar section, figure 6. Lithologies, interpreted depositional environments, and thicknesses of rock units are listed in the following descriptions.

Type section of the Godiva Rim Member of the Green River Formation, with parts of the overlying Laney Member of the Green River Formation and underlying Cathedral Bluffs Tongue of the Wasatch Formation

[Measured by Jacob's staff on the east slopes of Bald Mountain in NE¼ sec. 1, T. 8 N., R. 96 W.]

	<i>Thickness Feet</i>
LaClede Bed of Laney Member of Green River Formation (part):	
72. Ostracodal sandstone, gray, very fine grained, limy, hard; in thin parallel beds; nearshore lacustrine deposit; caps ledge at the top of Bald Mountain	4.7
71. Oil shale, brown, flaky, soft; offshore lacustrine deposit	33.0
70. Sandstone, gray, fine-grained, fairly well sorted, very limy; in thin parallel beds; abundant ostracodes, oolites and fish bones; lacustrine shoreline deposit	1.9
69. Oil shale, brown, flaky, soft; offshore lacustrine deposit	129.0
68. Tuff, rust, deeply weathered, soft; airfall volcanic ash deposit	0.8
67. Oil shale, brown, flaky, soft; offshore lacustrine deposit	6.9
66. Tuff, rust, deeply weathered, soft; airfall volcanic ash deposit	0.4
65. Oil shale, brown, flaky, soft; offshore lacustrine deposit	45.8
Total LaClede Bed measured	222.5
Godiva Rim Member (type) of Green River Formation:	
64. Sandstone, tan, very fine grained, argillaceous, micaceous, soft, loose; vague parallel bedding; lacustrine shoreline deposit	4.3
63. Mudstone, gray-green, flaky to shaly, soft; mudflat deposit	2.6

Type section of the Godiva Rim Member, with parts of the Laney Member and Cathedral Bluffs Tongue—Continued

	Thickness Feet
Godiva Rim Member (type) of Green River Formation—Continued	
62. Siltstone, tan, argillaceous, very soft; lacustrine shoreline deposit	3.2
61. Shale, gray-brown, flaky, soft; becomes gray toward the top; low kerogen content; offshore lacustrine deposit	8.7
60. Sandstone, gray, very fine grained, calcareous; abundant muscovite and biotite grains; in thin parallel, partly current rippled laminae; lacustrine shoreline deposit.....	1.1
59. Mudstone, gray, gray-green, partly silty; and interbedded shale, gray, gray-brown, fissile, traces of kerogen; mudflat and nearshore lacustrine deposits.....	34.9
58. Oil shale, brown, flaky, soft; offshore lacustrine deposit	7.8
57. Mudstone, gray-green, soft, a few sandy layers; becomes shaly upwards; mudflat deposit	21.2
56. Sandstone, gray, fine to very coarse grained, poorly sorted, subangular, micaceous, mostly soft and loose; fines upward; vague trough cross-bedding; a local, lenticular fluvial channel deposit	20.2
55. Mudstone, gray-green, silty, soft; mudflat deposit	10.4
54. Sandstone, tan, very fine grained, soft, loose; splay deposit	2.7
53. Mudstone, dark-gray-green, silty, soft; mudflat deposit	2.9
52. Sandstone, gray, very fine grained, calcareous, fairly well sorted; in current rippled laminae; splay deposit	0.4
51. Mudstone, gray-green, flaky, soft; mudflat deposit	8.6
50. Oil shale, brown, flaky, soft; abundant ostracodes; offshore lacustrine deposit	16.1
49. Mudstone, gray, gray-green, silty, soft; mudflat deposit	28.5
48. Shale, gray, gray-brown, fissile, soft; trace of kerogen; nearshore lacustrine deposit	2.0
47. Mudstone, dark-gray-green, blocky, soft; some very silty layers, some shaly layers; mudflat deposits	25.4
46. Oil shale, tan, very silty, soft, deeply weathered; scattered ostracodes; offshore lacustrine deposit	0.7
45. Limestone, tan, silty, hard, dense; scattered small gray clay pebbles; abundant ostracodes; a few algal colonies; weathers to brown ledge; lacustrine shoreline deposit.....	0.8
44. Mudstone, gray-green, blocky, some shaly, silty, soft; mudflat deposit	3.5
43. Limestone, tan, hard, dense, massive; weathers to brown jointed ledge; offshore lacustrine deposit	0.4
42. Oil shale, brown, flaky to papery, soft, partly silty; scattered small plant fragments; offshore lacustrine deposit	6.9
41. Shale, gray-brown, very silty in the lower part, firm; trace of kerogen; offshore lacustrine deposit	2.7

Type section of the Godiva Rim Member, with parts of the Laney Member and Cathedral Bluffs Tongue—Continued

	Thickness Feet
Godiva Rim Member (type) of Green River Formation—Continued	
40. Mudstone, dark-gray-green, soft; mudflat deposit	4.8
39. Oil shale, brown, flaky, soft; scattered ostracodes; offshore lacustrine deposit	1.9
38. Shale, gray-brown, fissile, soft; trace of kerogen; offshore lacustrine deposit	1.5
37. Mudstone, gray-green, very silty to sandy, soft; mudflat deposit	5.5
36. Sandstone, gray, very fine to fine grained, fairly well sorted, slightly calcareous; scattered red and black grains; in thin current-rippled laminae; and a few interlaminated shale beds, gray, the lower 3.0 ft; splay deposit.....	4.9
35. Mudstone, dark-gray-green, blocky, soft, noncalcareous; mudflat deposit	11.9
34. Sandstone, gray, very coarse grained in a very fine grained matrix, poorly sorted, subangular, slightly calcareous; abundant gray and milky quartz grains; scattered black and red grains; in small-scale trough crossbeds; fluvial channel deposit	19.9
33. Mudstone, gray, gray-green, blocky, silty; becomes shaly the top 3.0 ft; mudflat deposit...	14.3
32. Ostracodal sandstone, gray, brown-weathering, very fine grained; in thin undulating beds; some worm trails on the upper surface; lacustrine shoreline deposit	0.4
31. Mudstone, dark-gray-green, fissile to blocky, soft; mudflat deposit	16.4
30. Sandstone, tan-rust, very fine grained, soft, loose; lacustrine shoreline deposit	0.9
29. Ostracodal siltstone, gray, calcareous; in thin sub-parallel wave-rippled laminae; weathers to small bench; lacustrine shoreline deposit	5.9
28. Mudstone, dark-green, blocky, soft, noncalcareous; mudflat deposit.....	9.6
27. Oil shale, brown, flaky, soft; abundant ostracodes; offshore lacustrine deposit	6.7
26. Shale, gray-brown, silty, firm, trace of kerogen; offshore lacustrine deposit	<u>3.4</u>
Total thickness of the Godiva Rim Member...	<u>324.0</u>
Cathedral Bluffs Tongue of Wasatch Formation (part):	
25. Mudstone, gray-green, soft; flood-basin deposit...	30.2
24. Sandstone, gray, very fine grained, slightly calcareous; in parallel laminae; flood-plain splay deposit	0.9
23. Mudstone, gray-green, some mottled maroon the lower 4.0 ft; and two 0.3-ft-thick beds of siltstone, gray, calcareous, in parallel laminae, 6.0 and 15.0 ft above the base; flood-basin and flood-plain splay deposits	21.7
22. Mudstone, maroon, soft; flood-basin deposit	2.8
21. Mudstone, gray-green, silty, soft; flood-basin deposit	7.4
20. Mudstone, maroon, soft; flood-basin deposit	0.9

Type section of the Godiva Rim Member, with parts of the Laney Member and Cathedral Bluffs Tongue—Continued

	<i>Thickness Feet</i>
Cathedral Bluffs Tongue of Wasatch Formation (part)—Continued	
19. Siltstone, gray, calcareous, crumbly; weathers to small blocks; flood-plain splay deposit	0.2
18. Mudstone, gray-green, soft; flood-basin deposit...	2.4
17. Mudstone, maroon, soft; flood-basin deposit	4.5
16. Mudstone, gray-green, silty, soft; flood-basin deposit	14.6
15. Siltstone, gray, slightly calcareous; in parallel laminae; flood-basin splay deposit.....	2.7
14. Mudstone, gray-green, silty, soft; flood-basin deposit	6.8
13. Mudstone, maroon, blocky, soft; flood-basin deposit	2.6
12. Mudstone, gray-green, silty, soft; flood-basin deposit	6.5
11. Sandstone, gray, very fine grained, silty, slightly calcareous; in thin parallel laminae; flood-plain splay deposit	2.7
10. Mudstone, gray-green, soft; flood-basin deposit...	9.6
9. Mudstone, maroon, soft; flood-basin deposit	6.9
8. Mudstone, gray-green, soft, silty in the lower part; flood-basin deposit	1.7
7. Sandstone, gray, very fine to fine grained, slightly calcareous; abundant dark grains, large grains of muscovite; in very low angle trough cross-laminations; flood-plain splay deposit	5.2
6. Mudstone, gray, silty, soft; flood-basin deposit	2.4
5. Mudstone, maroon, silty, soft; flood-basin deposit	8.0
4. Mudstone, green, silty, soft; flood-basin deposit ..	18.3
3. Mudstone, maroon, silty, soft; flood-basin deposit	6.2
2. Sandstone, gray, fine- to coarse-grained, poorly sorted, subangular, soft, loose; abundant muscovite grains; vague trough crossbedding; fluvial channel deposit	10.9
1. Mudstone, maroon, brick-red, gray, banded, in bands as much as 15 ft thick, silty, soft; flood-basin deposit	84.0
Total Cathedral Bluffs Tongue measured.....	<u>260.1</u>

flowed across the mudflats toward contracted parts of the lake as evidenced by widely spaced channel sandstones. From these stream channels splays fanned outward onto the adjacent mudflats.

The lithologies of the type section of the Godiva Rim Member reveal that Lake Gosiute expanded and contracted across the Bald Mountain area at least 10 times. Periods of maximum expansion are indicated by beds of gray-brown kerogenaceous shale (type section, beds 26, 38, 41, 48, 59, and 61) and brown oil shale (beds 27, 39, 42, 46, 50, and 58). The thickest oil shale bed (bed 50) is 16 ft thick, and its deposition probably took several thousand years. Shorelines in the type section consist of tan or gray, partly ostracode bearing, parallel-bedded siltstone and sandstone (beds 29, 30, 32, 60, 62, and 64) and tan ostracodal limestone and sandstone (bed 45). Most of the rocks in the section consist of gray or green mudflat mudstone (beds 28, 31, 33, 35, 37, 40, 44, 47, 49, 51, 53, 55, 57, 59, and 63). Two gray, fine to very coarse grained, lenticular, trough-crossbedded, fluvial channel sandstones (beds 34 and 56) are present in the lower and upper parts of the section. A few thin gray or tan, current-rippled, splay sandstones (beds 36, 52, and 54) are interbedded with the mudflat mudstone. One thin tan limestone of probable offshore lacustrine origin (bed 43) was also identified.

The lithologic composition and genesis of the Godiva Rim Member are very similar to those of the Wilkins Peak Member of the Green River Formation (fig. 3). The units are not chronostratigraphic equivalents, however, and they occupy different geographic parts of the greater Green River basin.

The climate during deposition of the Godiva Rim Member was subtropical with an average annual temperature of about 70 °F and average precipitation of nearly 60 inches. These estimates were interpreted from plant megafossils collected by H.D. MacGinitie (written commun., 1970). The expansions and contractions of Lake Gosiute across the Sand Wash and Washakie basins undoubtedly are climate related and suggest that within the average temperature and precipitation ranges determined by MacGinitie are numerous cyclic climate changes of lesser duration. The periodicity and extent of the lesser climate changes have not been determined, but I speculate that they occurred every 15 to 25 thousand years and that they were worldwide.

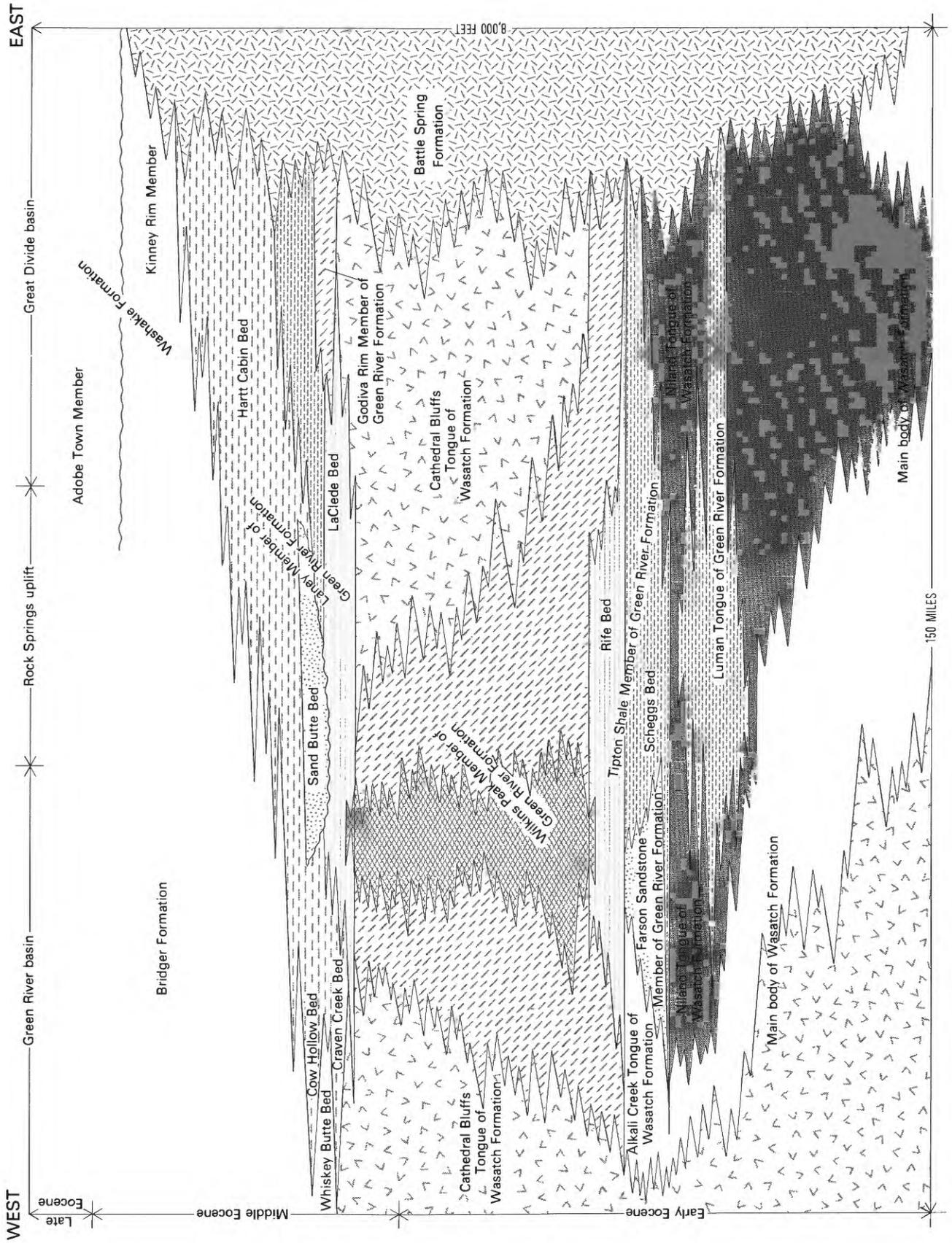
DEPOSITIONAL ENVIRONMENTS AND LITHOFACIES

The Godiva Rim Member comprises rocks that were deposited along the eastern margins of the basin of Lake Gosiute during east-west expansions and contractions of the lake waters across the Sand Wash and Washakie basins. Oil shale was deposited in offshore and nearshore areas during expanded phases of the lake, and as the lake waters retreated, the exposed featureless parts of the former lake bottom became broad mudflats on which muds were deposited. Ephemeral shoreline sandstone, siltstone, and limestone occur intermittently in association with the oil shale and mudstone. At times streams

AREAL DISTRIBUTION AND CORRELATION

The Godiva Rim Member was deposited across an area of about 2,600 mi² that comprises the central part of the Sand Wash basin, the eastern part of the Washakie

WASATCH, GREEN RIVER, AND BRIDGER (WASHAKIE) FORMATIONS



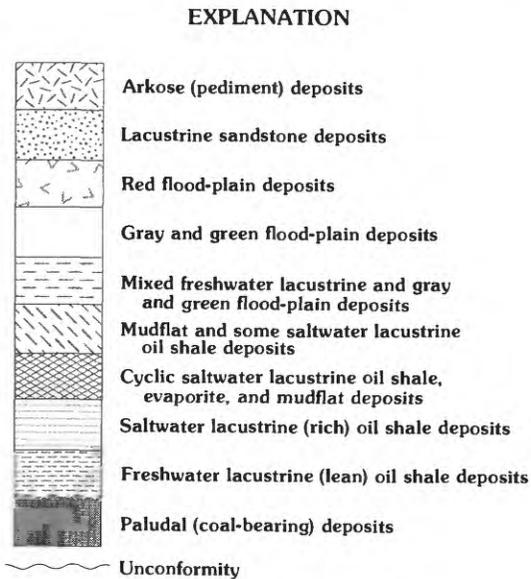


FIGURE 3 (above and facing page).—Generalized cross section of Eocene rocks in greater Green River basin showing stratigraphic nomenclature and depositional environments.

basin, and the south-central part of the Great Divide basin. The precise areal distribution of the Godiva Rim Member cannot be determined, because it has been eroded from the Great Divide basin and from the areas east of where it crops out in the Sand Wash and Washakie basins. Moreover, the member intertongues with and grades laterally westward into the LaCledde Bed of the Laney Member, making its western boundary arbitrary. Its approximate Eocene areal distribution is shown in figure 1.

The stratigraphic relationships of the Godiva Rim Member with the overlying Laney Member of the Green River Formation and the underlying Cathedral Bluffs Tongue of the Wasatch Formation in the Sand Wash and Washakie Basins are illustrated in figure 7. In the three transbasin cross sections shown in figure 7, the Godiva Rim Member is replaced laterally westward by the lower part of the LaCledde Bed of the Laney Member. Along Kinney Rim in the western part of the Washakie basin (nos. 1 and 4, fig. 7), and along Lookout Mountain in the western part of the Sand Wash basin (no. 8, fig. 7), the lower part of the LaCledde Bed is composed of oil shale and interbedded tuff and tuffaceous sandstone and siltstone. The thickest of the tuffaceous sandstone and siltstone beds in this part of the section is called the buff marker bed (Roehler, 1973b, p. E6-E7), which is easily correlated in outcrops and on electric logs. Along Kinney Rim the buff marker is locally more than 50 ft thick and forms a distinct massive buff band in outcrops between

overlying and underlying parallel-bedded oil shale beds that weather brown and gray (fig. 8). Eastward across the Sand Wash and Washakie basins, the oil shale in the lower part of the LaCledde Bed grades laterally into the mudstone, shale, sandstone, and limestone that compose the Godiva Rim Member (fig. 7). Where the Godiva Rim Member crops out across the central part of the Sand Wash basin (fig. 9) and across the eastern part of the Washakie basin, it bears little resemblance to its lateral equivalents in the lower part of the LaCledde Bed (compare figs. 8 and 9).

AGE OF THE GODIVA RIM MEMBER

The age of the Godiva Rim Member is early middle Eocene based on the stratigraphic occurrence of age-diagnostic fossil mammals collected in the eastern part of the Washakie basin. No fossil mammals have been collected from the Godiva Rim Member itself, but they have been collected from overlying and underlying rocks that bracket the member. McGrew and Roehler (1960, p. 158) collected *Sciuravus nitidus* from a 15-ft-thick sandstone bed located 75 ft below the top of the Cathedral Bluffs Tongue of the Wasatch Formation in NW¼ sec. 8, T. 15 N., R. 93 W. (near section 7, fig. 7, this report). In 1969 I collected (unpublished data) the mammals *Nyctitherium serotinum* and *Omomyys* sp. from a 0.4-ft-thick bed of mollusk-bearing black chert situated 9.5 ft below the base of the green shale marker bed in the upper part of the LaCledde Bed of the Laney Member of the Green River Formation in NE¼ sec. 36, T. 18 N., R. 95 W. (section 3, fig. 7).

PALEOGEOGRAPHY

The Godiva Rim Member, as discussed previously, thickens from north to south along the eastern part of the Washakie basin and the central part of the Sand Wash basin (figs. 1 and 7). The thickening occurs in directions away from the deep parts of Lake Gosiute where kerogenaceous shale and oil shale were deposited (no. 1, fig. 10) but toward the basin margin south of Godiva Rim where the member is eroded around the east end of the Uinta Mountains. These relationships suggest that during the middle Eocene, equivalents of the Godiva Rim Member were deposited continuously around the east end of the Uinta Mountains through a broad depression or channel that connected Lake Gosiute to the north with Lake Uinta to the south (index map, fig. 10). The presence of a channel there is further suggested by the occurrence of mudflat mudstones at the stratigraphic interval of the Godiva Rim Member in the Pieancee Creek basin 33 miles south of Godiva Rim on the south

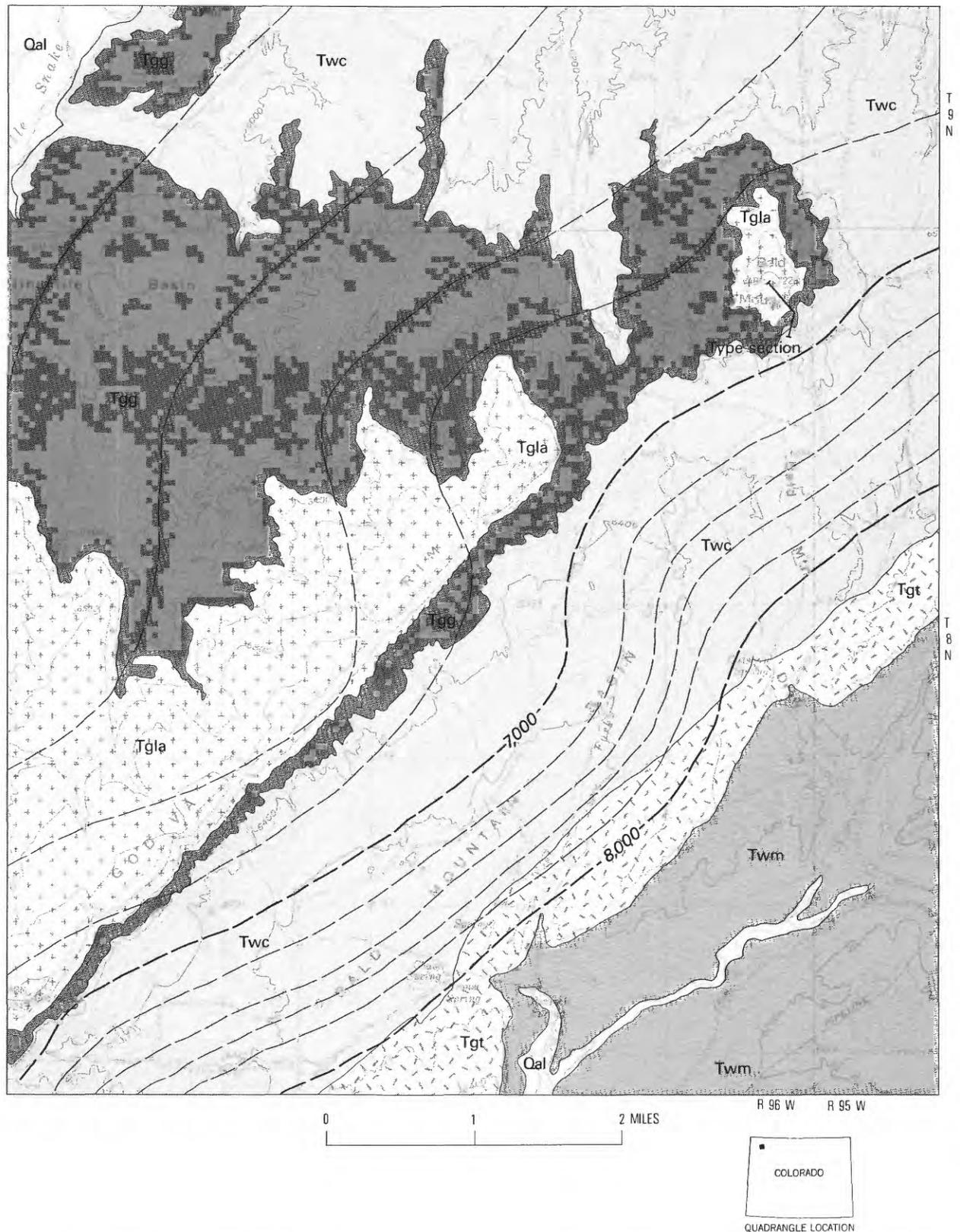


FIGURE 4.—Geologic map of the Godiva Rim area showing location of the type section of the Godiva Rim Member of the Green River Formation on Bald Mountain in sec. 1, T. 8 N., R. 96 W. (Modified from McKay and Bergin, 1974.) Qal, Quaternary alluvium; Tgla, Laney Member of Green River Formation; Tgg, Godiva Rim Member of Green River Formation (the gray zone); Twc, Cathedral Bluffs Tongue of Wasatch Formation; Tgt, Scheggs Bed of the Tipton Tongue of Green River Formation; Twm, main body of Wasatch Formation. Structure contour interval 200 ft; dashed where approximately located; datum is the base of the Laney Member. Base from Maybell 1:62,500 (1958).

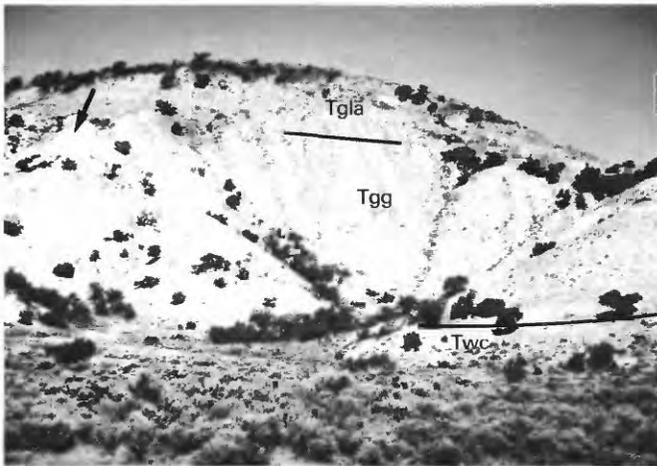


FIGURE 5.—Type section of the Godiva Rim Member of the Green River Formation, east slopes of Bald Mountain, NE¼ sec. 1, T. 8 N., R. 96 W. (fig. 4). Arrow indicates sloping ridge where the type section was measured. Tgla, Laney Member of Green River Formation; Tgg, Godiva Rim Member of Green River Formation; Twc, Cathedral Bluffs Tongue of Wasatch Formation. The Godiva Rim Member is 324 ft thick at this location.

side of the Uinta Mountains (Roehler, 1974). These mudflat deposits, informally called the green facies, are situated in the Parachute Creek Member of the Green River Formation at the mouth of Yellow Creek (no. 3, fig. 10). A few miles southeast of the mouth of Yellow Creek, at the U.S. Bureau of Mines Yellow Creek Corehole No. 1 (no. 4, fig. 10), these mudflat mudstones have graded laterally into oil shale that was deposited in deep parts of Lake Uinta. Correlation of the buff marker in the LaClede Bed to part of the interval between A Groove and B Groove in the Parachute Creek Member, shown in figure 10, was first proposed by Roehler (1974, p. 64, fig. 4).

The lithologic units shown in the columns on figure 10 suggest that Lake Gosiute and Lake Uinta were joined as a single body of open water at least three times during the middle Eocene. The earliest juncture of the lakes probably occurred at interval A, which consists of oil shale and slightly kerogenaceous shale beds located at the base of the Godiva Rim Member on Godiva Rim

(no. 2, fig. 10) that correlate to similar oil shale beds situated about 320 ft below the Mahogany Bed at the mouth of Yellow Creek (no. 3, fig. 10). The second juncture of the lakes probably occurred at interval B, which consists of oil shale beds underlying the buff marker (nos. 1 and 2, fig. 10), that correlate to the Mahogany Bed (nos. 3 and 4, fig. 10). The third and most prolonged juncture of the lakes took place during deposition of the beds in interval C (nos. 1, 2, 3, and 4, fig. 10).

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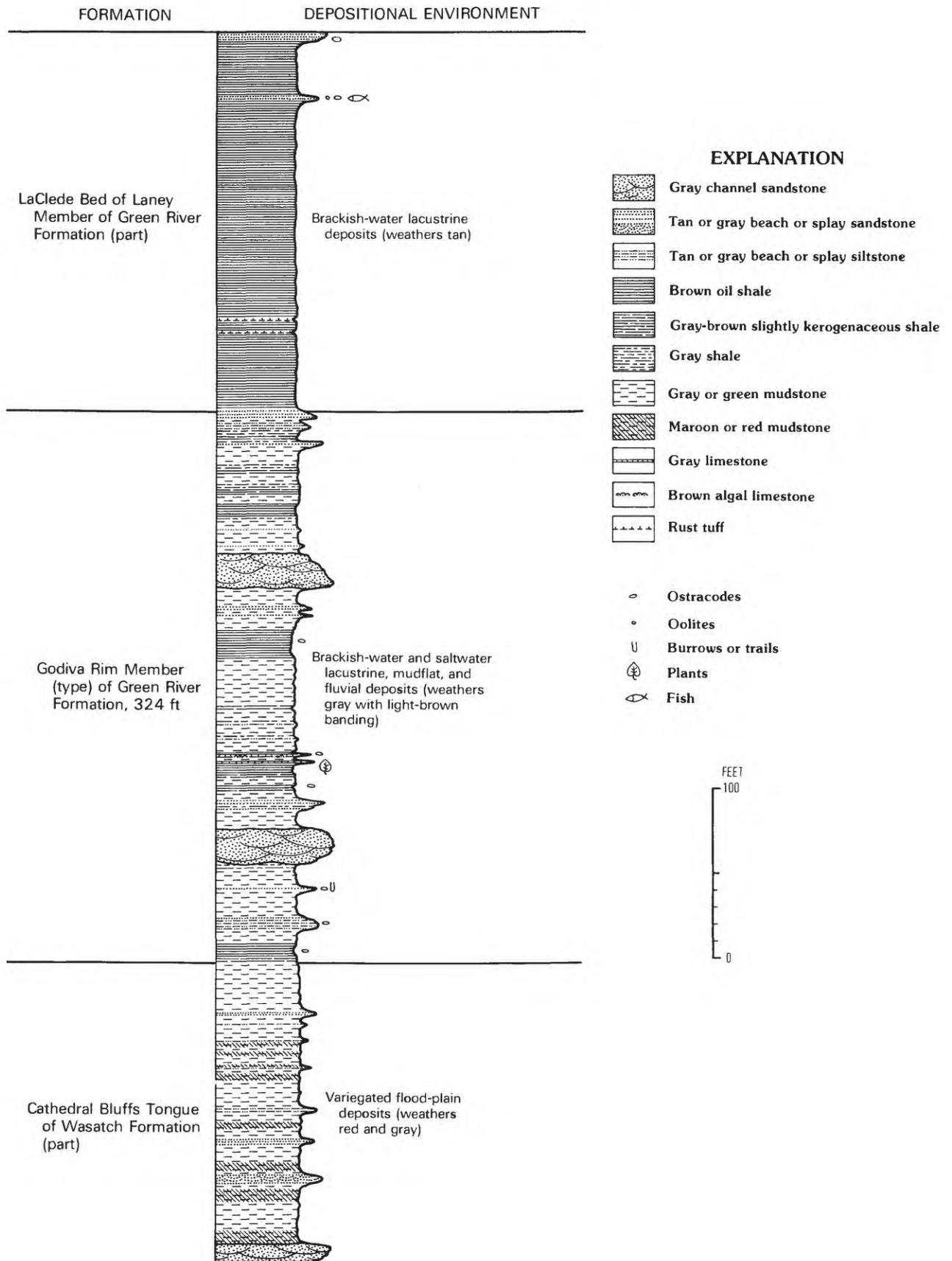


FIGURE 6.—Columnar section of the Godiva Rim Member and adjacent rocks in the Green River and Wasatch Formations. Location of the section is shown in figure 4.

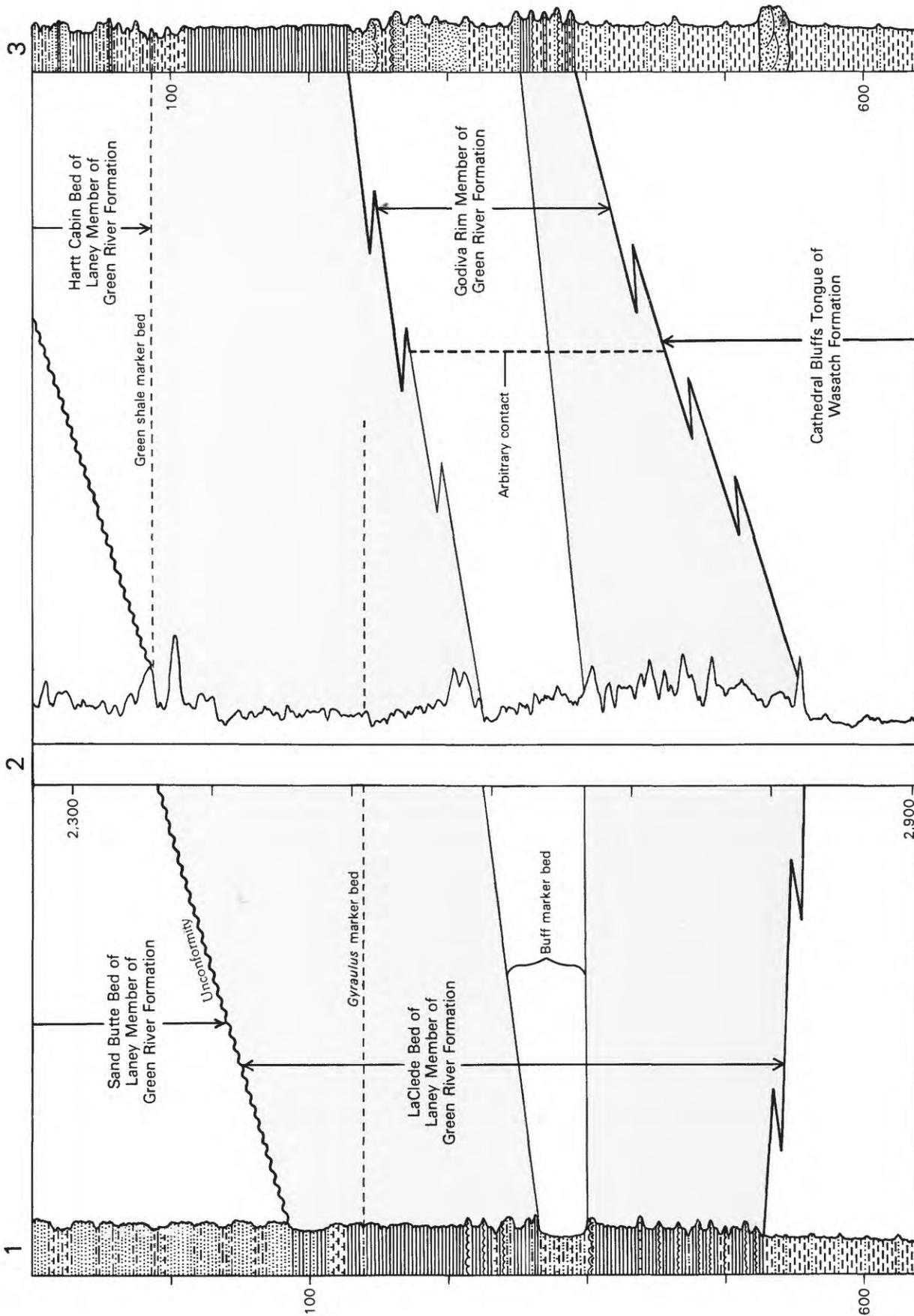
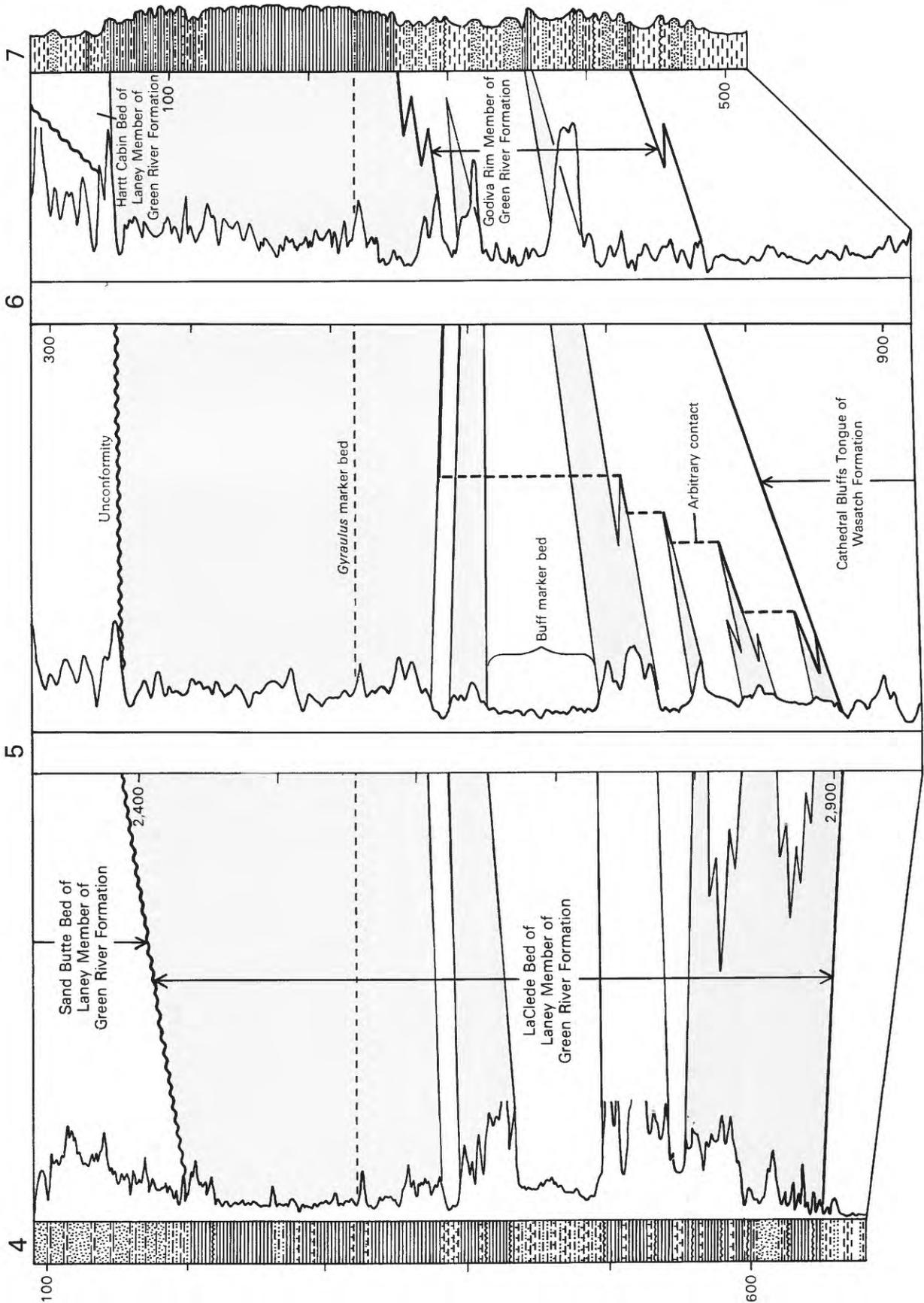


FIGURE 7. — Cross sections showing the stratigraphic relationships of the Godiva Rim Member to adjacent parts of the Green River and Wasatch Formations in the Washakie and Sand Wash basins. Sections composed mostly of oil shale are shaded. Thicknesses shown are drill-hole depths or measured section intervals.

WASATCH, GREEN RIVER, AND BRIDGER (WASHAKIE) FORMATIONS



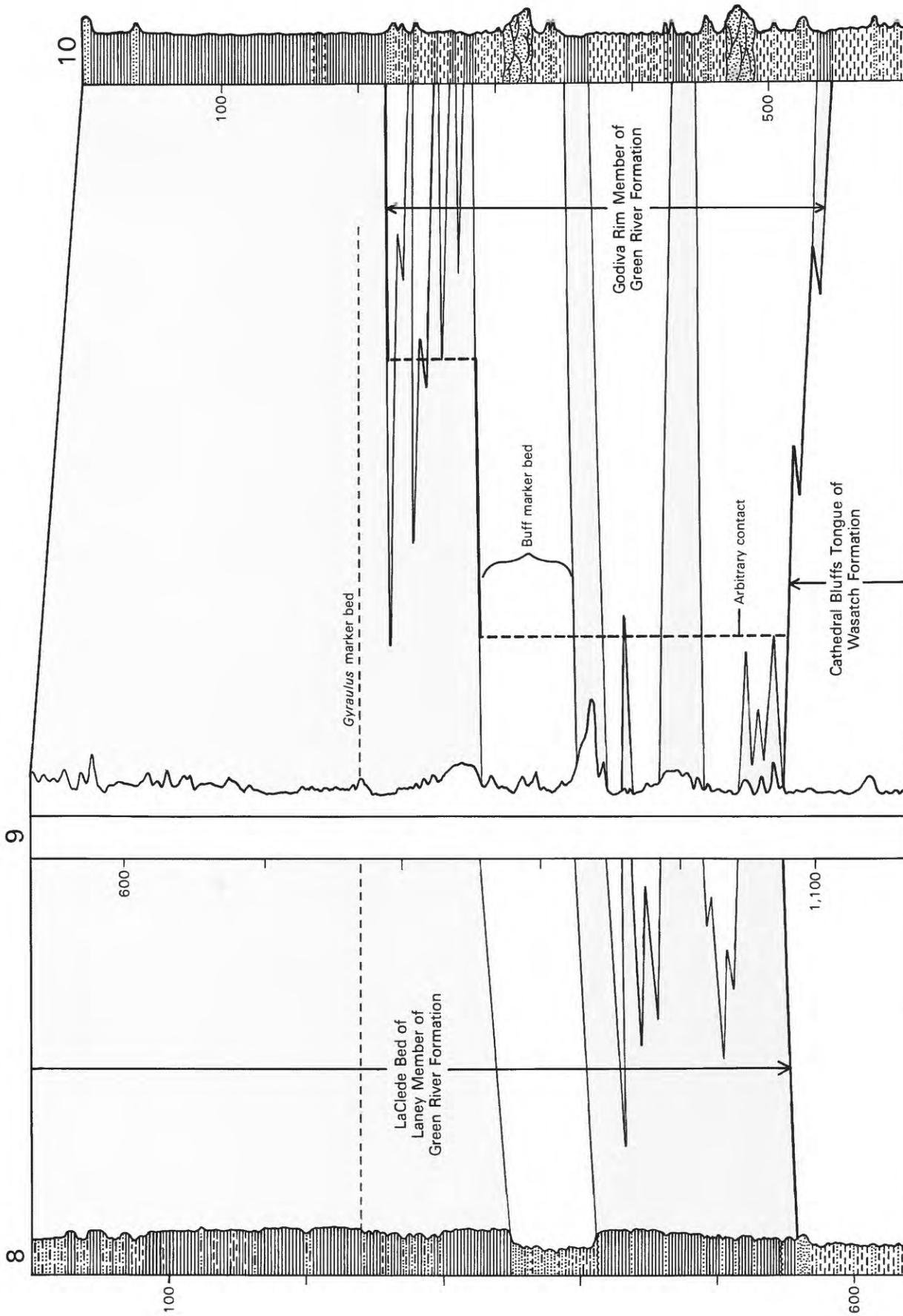


FIGURE 7.—Cross sections showing stratigraphic relationships of the Godiva Rim Member.—Continued

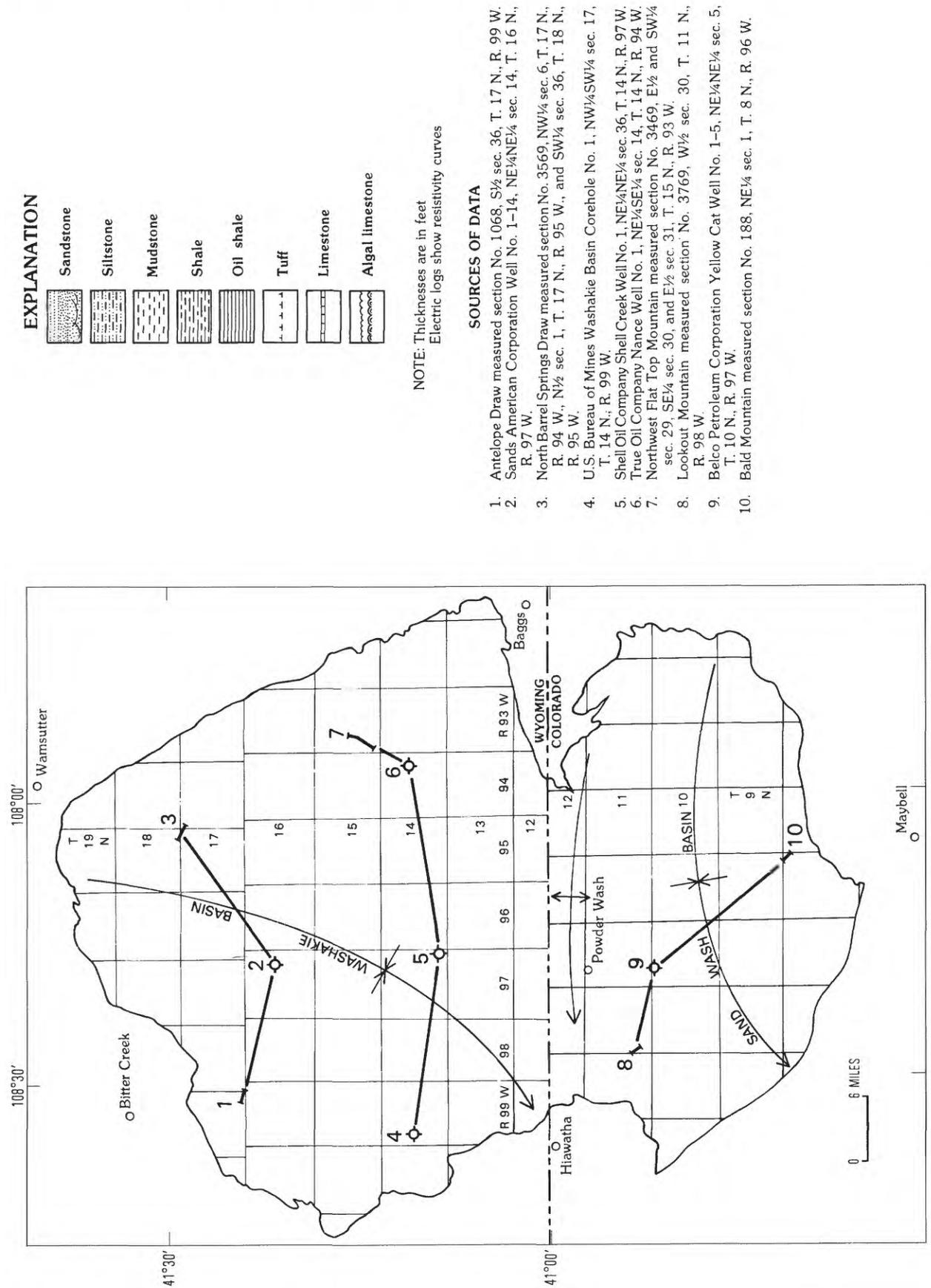


FIGURE 7.— Cross sections showing stratigraphic relationships of the Godiva Rim Member.—Continued

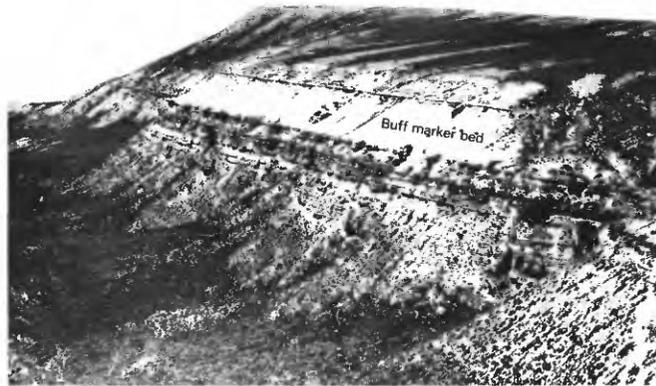
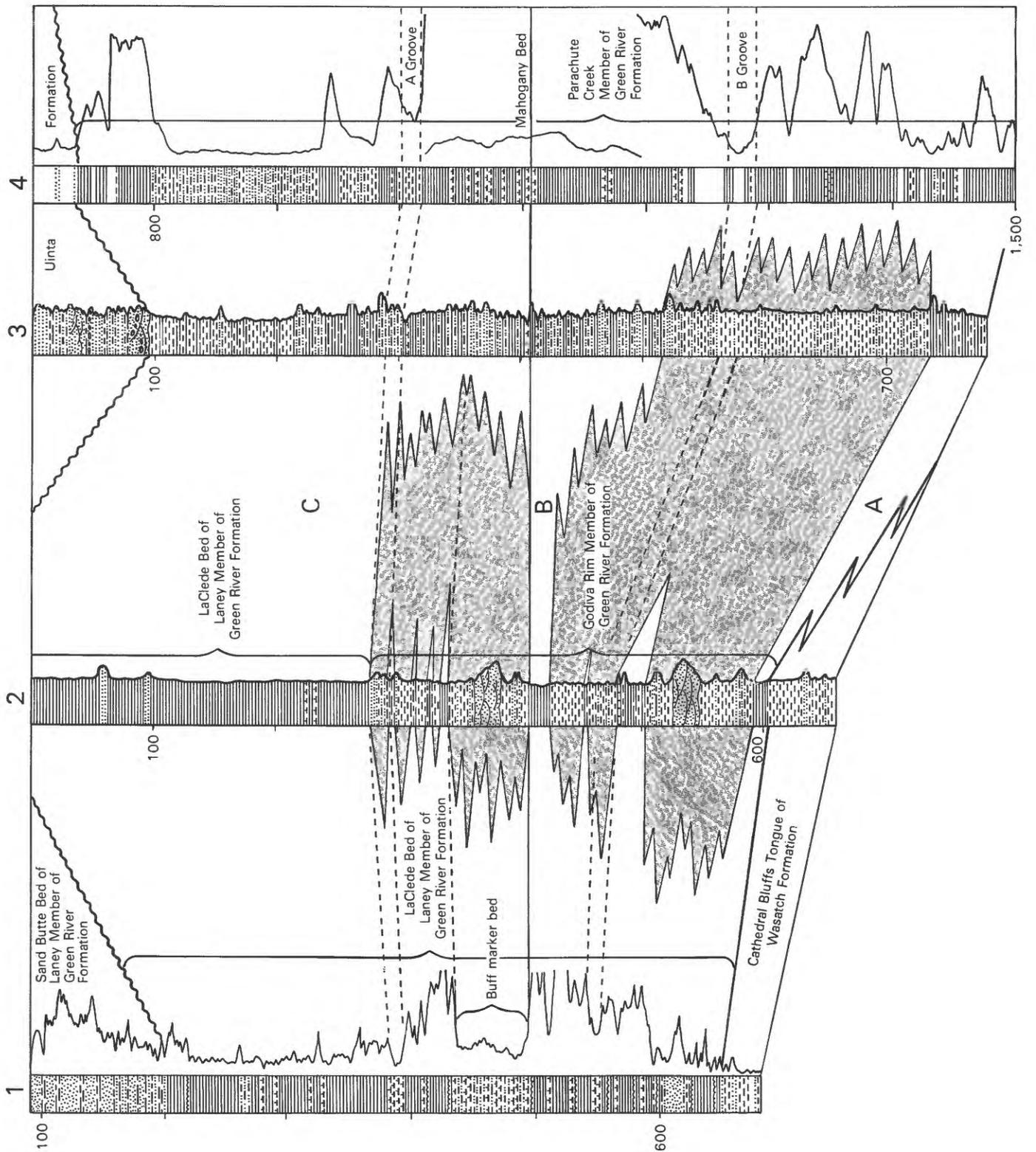
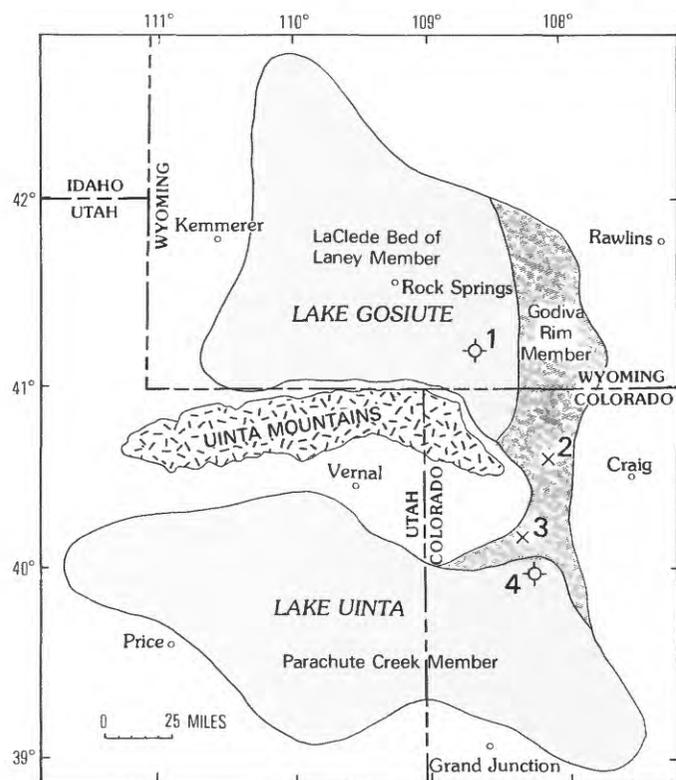


FIGURE 8.—Outcrops of the buff marker bed and adjacent oil shale beds in the lower part of the LaClede Bed of the Laney Member of the Green River Formation on Kinney Rim in the western Washakie basin in sec. 22, T. 15 N., R. 100 W. The buff marker bed is 59 ft thick here. Contact of the LaClede Bed with the underlying Cathedral Bluffs tongue of the Wasatch Formation is covered in lower left part of photograph.



FIGURE 9.—Outcrops of the LaClede Bed of the Laney Member (Tgla) and Godiva Rim Member (Tgg) of the Green River Formation and the Cathedral Bluffs Tongue (Twc) of the Wasatch Formation, west side of Little Snake River, Sand Wash basin. View is to the west toward The Nipple in T. 10 N., R. 96 W. The Godiva Rim Member is 185 ft thick here.





NOTE: Thicknesses are in feet
 Electric logs show resistivity curves
 Lithologies are described in figure 7

SOURCES OF DATA

1. U.S. Bureau of Mines Washakie Basin Corehole No. 1, sec. 17, T. 14 N., R. 99 W.
2. Bald Mountain measured section No. X88, sec. 1, T. 8 N., R. 96 W.
3. Yellow Creek measured section No. 967, secs. 9, 10 and 15, T. 2 N., R. 98 W.
4. U.S. Bureau of Mines Yellow Creek Corehole No. 1, sec. 13, T. 1 N., R. 98 W.

FIGURE 10 (above and facing page).—Cross section showing the probable connections of the Eocene Lake Gosiute and Lake Uinta east of the Uinta Mountains. A, B, C, the intervals of the merging open water; intervals of the intervening mudflats are patterned. Generalized paleogeography shown on index map. Datum is the top of the Mahogany Bed. Thicknesses shown are drill-hole depths or measured section intervals.

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