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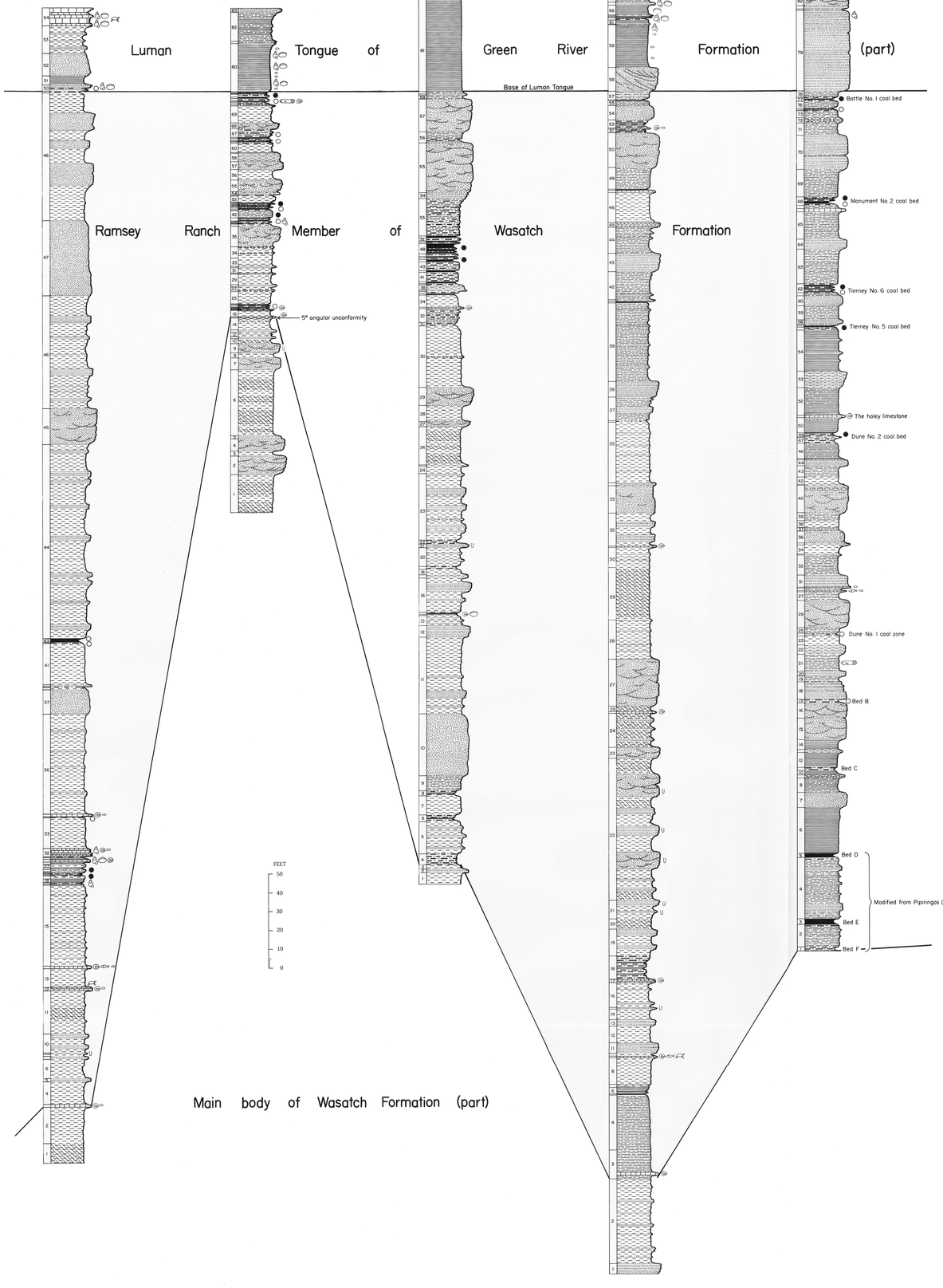
MAP MF-2185



MEASURED SECTIONS OF RAMSEY RANCH MEMBER OF WASATCH FORMATION, GREATER GREEN RIVER BASIN, SOUTHWEST WYOMING

By
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EXPLANATION

Lithology

- Variously bedded sandstone
- Siltstone
- Shale
- Sandy shale
- Slightly carbonaceous shale
- Carbonaceous shale
- Tar sand
- Oil shale
- Slightly kerogeneaceous shale
- Carbonaceous oil shale
- Gray or green mudstone
- Red or variegated mudstone
- Coal
- Limestone
- Algal limestone
- Concretions—Sandstone, limestone, or dolomite

Fossils

- Prosobranch gastropods—Mostly *Goniobasis* sp. and *Viviparus* sp.
- Pulmonate gastropods—Mostly *Physa* sp.
- Unionid pelecypods—Mostly *Lampsilis* sp. and *Plesiellipsis* sp.
- Fish
- Turtles
- Ostracodes
- Wood
- U — Trace fossils—Mostly crustacean burrows and worm borings

Radioactivity—Circles indicate beds checked for radioactivity with hand-held scintillometer

- Slightly to moderately radioactive
- No radioactivity

DEFINITION AND LOCATION OF RAMSEY RANCH MEMBER

The Ramsey Ranch Member forms a distinct lithofacies in the upper part of the main body of the Wasatch Formation. The member is composed of drab-weathered, gray or green and sparse red mudstone and sandstone of fluvial (flood-plain) origin that are interbedded with brown or black carbonaceous shale and coal of paludal origin and gray or brown oil shale, sandstone, and limestone of freshwater lacustrine origin. The Ramsey Ranch Member was deposited in the Uinta Mountain trough, which extended from north of the Uinta Mountains eastward across the southern tip of the Rock Springs uplift and northeastward across the Washakie Basin into the Great Divide Basin. The member is more than 800 ft thick near depositional centers of the Uinta Mountain trough that were located north of the Uinta Mountains and in the Washakie Basin. The member thins laterally away from the trough by intertonguing and changing facies to red, variegated, or gray and green mudstone and sandstone of flood-plain origin that constitute the Wasatch Formation to the remaining parts of the greater Green River Basin. The upper contact of the Ramsey Ranch Member is placed at the base of overlying oil shale and sandstone beds of lacustrine origin that form the Luman Tongue of the Green River Formation. The lower contact of the member is arbitrary, but is generally placed where the drab-colored fluvial, paludal, and lacustrine rocks that characterize the Ramsey Ranch change downward in section into lighter colored, often red or variegated, fluvial rocks that characterize the main body of the Wasatch Formation.

The Wasatch Formation was named by Hayden (1869, p. 191) for a group of rocks exposed "immediately west of Fort Bridger" in southwest Wyoming. Hayden (1869, p. 191) stated that these rocks are "wonderfully variegated with some shade of red predominating" and are composed of sands and clays with very little calcareous matter. My field investigations in Hayden's type area of the Wasatch Formation in T. 14 N., Rs. 117-118 W. (Roehler, 1989) indicate that the rocks are indeed mostly red mudstone and sandstone that weather bright red and are of fluvial (flood-plain) origin. They bear little resemblance to the Ramsey Ranch lithofacies in either color or composition.

The Ramsey Ranch Member was named a member of the Green River Formation by me (Roehler, 1965, p. 145), when I recognized that this lithofacies contained "recurrent lacustrine" rocks deposited during embryonic stages of development of Eocene Lake Gosiute in the greater Green River Basin area. Although the member is of mixed lacustrine, paludal, and fluvial origins, measured sections A to E clearly indicate that it is predominantly fluvial in origin and probably more characteristic of the Wasatch Formation than it is of the Green River Formation. The member has historically been mapped as part of the Wasatch Formation. The member, nevertheless, requires special stratigraphic recognition because it is lithologically distinct and contains important deposits of oil shale, coal, and uranium. For these reasons, the name Ramsey Ranch Member has been retained, but, hereby redesignated a member of the Wasatch Formation (Roehler, in press).

The Uinta Mountain trough was present in the greater Green River Basin during most of the Eocene Epoch. Along the bottom of the trough, which was a structural and topographic depression, were alternately located large freshwater lakes, small vegetated ponds, swamps, and flood plains. These depositional environments frequently shifted laterally along the length of the trough in response to varying rates of sedimentation and subsidence. As a result of this lateral shifting of environments and because measured sections A to E are widely spaced, lithologic units in the measured sections do not correlate well.

Beds 3 to 43 in measured section A consist of mostly gray and green and some red fluvial (flood-plain) deposits and interbedded fossiliferous lacustrine oil shale and limestone and paludal carbonaceous shale and coal deposits that are typical of the Ramsey Ranch Member. Beds 44 to 48 in measured section A are mostly gray and green fluvial (flood-plain) deposits consisting of stream channel and splay sandstone and interdistributary mudstone that are more typical of the Wasatch Formation. The main body of the Wasatch Formation in measured section B consists entirely of red or variegated fluvial (flood-plain) deposits (bed 1 to 14). Above these is a mixed fluvial, paludal, and lacustrine sequence (beds 15 to 79) that composes the Ramsey Ranch Member. The main body of the Wasatch Formation and the Ramsey Ranch Member are separated by a 5° angular unconformity that apparently resulted from a local uplift of the northern flank of the Uinta Mountains. The Ramsey Ranch Member in measured section C is a mixture of fluvial, paludal, and lacustrine rocks characterized by concentrations of paludal rocks in beds 31 to 53 and by the presence of a few red beds in beds 26 to 29. The Ramsey Ranch Member in section D is mostly fluvial (flood-plain) in origin in the middle (beds 19 to 35), but becomes mostly paludal and lacustrine at the bottom (beds 3 to 18) and top (beds 36 to 57). Measured section E is an interbedded mixture of fluvial (flood-plain), paludal, and lacustrine rocks, but contains thick sequences of oil shale (beds 6 to 14 and 46 to 54). The oil shale beds in this section will undoubtedly in the future be designated tongues of the Green River Formation. The coal beds in measured section E were named by Pipiringos (1961).

MINERAL RESOURCES

The oil shales in the Ramsey Ranch Member in measured sections A to E were not sampled and assayed for oil yield, but my visual estimates indicate that they are all low grade. Few, if any, of the oil shale beds examined are expected to yield more than 15 gallons of oil per ton of rock and most will probably yield only 2-5 gallons of oil per ton of rock by Fischer assay.

The coal beds and their associated uranium were analyzed in the central part of the Great Divide Basin by Pipiringos (1961) and in the eastern part of the Great Divide Basin by Masursky (1962). Pipiringos (1961, p. A41 and A46) determined that the coal beds were subbituminous and ranged in thickness from a few inches to as much as 21 ft. The uranium content was generally between 0.001 and 0.003 percent, but was 0.0026 percent in one coal bed (Pipiringos, 1961, p. A59). Masursky (1962, p. B42) found that the subbituminous coal beds in his study area were as much as 42 ft thick. The maximum uranium content there was 0.051 percent, but it averaged 0.003 percent (Masursky, 1962, p. B62). The kind of uranium minerals and their source rocks were not accurately determined.

The Ramsey Ranch Member was probably the source beds for much of the natural gas produced from the main body of the Wasatch Formation at Powder Wash field (T. 12 N., R. 97 W.).

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DESCRIPTION OF MEASURED SECTIONS

SECTION A—SAGE CREEK

		Thickness (ft)
	Luman Tongue of Green River Formation (part):	
54.	Coquinal limestone, gray, silty, hard; abundant *Goniobasis* sp., *Lampsilis* sp., and *Viviparus* sp.; some turtle scutes; grades westward into unfossiliferous sandstone, freshwater lacustrine	9.5
53.	Mudstone, medium-gray, and thin interbedded sandstone, gray, very fine grained, micaceous, soft; flood plain and flood-plain splay	14.9
52.	Sandstone, gray, very fine grained to medium-grained, poorly sorted, subangular, micaceous, soft; fluvial channel	11.9
51.	Oil shale, brown, flaky; freshwater lacustrine	4.8
50.	Coquinal sandstone, gray, crumbly, abundant *Goniobasis* sp., *Lampsilis* sp., and *Viviparus* sp.; 0.1 ft-thick carbonaceous laminae 1.0 ft above base; freshwater lacustrine	3.2
	Total measured thickness of Luman Tongue	44.3
	Wasatch Formation (part):	
	Ramsey Ranch Member:	
49.	Shale, dark-gray, carbonaceous; sandy at base; paludal	0.7
48.	Mudstone, gray, and interbedded sandstone, gray, very fine grained to medium-grained, poorly sorted, subangular, micaceous, soft; flood plain and fluvial channel	68.7
47.	Sandstone, gray, very fine grained to medium-grained, poorly sorted, subangular, micaceous, soft; fluvial channel	40.0
46.	Mudstone, medium-gray, and several 1.5- to 3.0-ft-thick interbedded sandstone beds, gray, very fine grained, micaceous, soft; flood plain and flood-plain splay	60.0
45.	Sandstone, gray, very fine grained to medium-grained, poorly sorted, subangular, micaceous; trough crossbedded; fluvial channel	19.3
44.	Mudstone, medium-gray, silty, and several 2.0- to 5.0-ft-thick interbedded sandstone beds, gray, very fine grained to fine-grained, micaceous, soft; flood plain and flood-plain splay	103.5
43.	Coal; paludal	2.0
42.	Shale, dark-brown, carbonaceous; paludal	0.3
41.	Mudstone, medium-gray, silty; flood plain	22.5
40.	Sandstone, gray, very fine grained, micaceous, soft; flood-plain splay	1.1
39.	Shale, dark-brown, carbonaceous; paludal	0.1
38.	Mudstone, gray, sandy; flood plain	1.3
37.	Sandstone, gray, very fine grained to fine-grained, micaceous, soft; fluvial channel	13.0
36.	Mudstone, gray, silty to sandy, and sparse very thin interbedded sandstone, gray, very fine grained, soft; flood plain and flood-plain splay	53.0
35.	Limestone, dark-gray (lower 0.5 ft) and tan-brown (above), silty; abundant *Valvata* sp., *Physa* sp., and ostracodes; pond	1.6
34.	Shale, dark-brown, carbonaceous; paludal	0.2
33.	Mudstone, gray, silty to sandy; flood plain	16.7
32.	Limestone, gray, silty, platy, abundant *Goniobasis* sp., *Valvata* sp., *Viviparus* sp., *Plesiellipsis* sp., and ostracodes; pond	4.4
31.	Shale, dark-brown, carbonaceous; paludal	0.3
30.	Oil shale, medium-brown; shell fragments; some ostracodes; freshwater lacustrine	1.0
29.	Limestone, gray, silty, hard; abundant ostracodes; some *Physa pleromatis*, *Valvata* sp., and *Goniobasis* sp.; a few crocodile teeth; one hackberry seed; pond	1.4
28.	Oil shale, brown, silty; abundant ostracodes; freshwater lacustrine	1.4
27.	Mudstone, gray, silty; mudflat	2.1
26.	Oil shale, brown, flaky, soft; freshwater lacustrine	0.9
25.	Shale, medium-gray, fissile, soft; mudflat	1.2
24.	Shale, black, fissile; mudflat	0.4
23.	Shale, gray, fissile, soft; mudflat	0.6
22.	Shale, dark-brown, carbonaceous; paludal	0.2
21.	Shale, gray-brown, fissile, soft; freshwater lacustrine	0.3
20.	Shale, dark-brown, carbonaceous; paludal	0.3
19.	Mudstone, gray, silty, blocky; mudflat	1.8
18.	Oil shale, brown, fissile, soft; abundant shell fragments; freshwater lacustrine	2.1
17.	Shale, brown, carbonaceous; paludal	0.4
16.	Oil shale, brown, fissile, soft; abundant white shell fragments; freshwater lacustrine	0.8
15.	Mudstone, gray-green, silty, and a few 0.5- to 1.0-ft-thick interbedded sandstone beds, gray, very fine grained, argillaceous, soft; current rippled; flood plain and flood-plain splay	43.2
14.	Limestone, medium-brown, silty, hard; abundant *Physa pleromatis*, unidentified small gastropods, and ostracodes; some fish bones and teeth; pond	1.3
13.	Mudstone, gray-green, silty; abundant turtle and crocodile bones and scutes in lower 1.2 ft; flood plain	10.1
12.	Limestone, medium-brown, hard; abundant *Physa pleromatis*, *Physa bridgerensis*, unidentified small gastropods, *Helix*? sp., and ostracodes; pond	1.9
11.	Mudstone, gray, silty, and a few 0.3- and 0.5-ft-thick interbedded sandstone beds, gray, very fine grained, argillaceous near middle; becomes dark-reddish gray in top 2.0 ft; flood plain and flood-plain splay	23.0
10.	Mudstone, gray, silty, and interbedded sandstone, gray, very fine grained, current rippled; flood plain and flood-plain splay	10.0
9.	Siltstone, gray, limy, hard; extensively burrowed; flood-plain splay	0.6
8.	Mudstone, gray, sandy, soft; flood plain	1.1
7.	Sandstone, gray, very fine grained; current rippled; flood-plain splay	1.6
6.	Mudstone, gray-green, silty; flood plain	10.5
5.	Sandstone, gray, very fine grained, argillaceous, micaceous, soft; flood-plain splay	1.6
4.	Mudstone, gray-green, silty, blocky; flood plain	12.0
3.	Limestone, medium-brown, silty, hard; abundant ostracodes; some *Physa pleromatis* and other very small unidentified gastropods; pond	1.7
	Total measured thickness of Ramsey Ranch Member	542.2
	Wasatch Formation (part):	
	Main body (part):	
2.	Mudstone, gray-green, silty, blocky; flood plain	19.3
1.	Mudstone, dark-reddish-gray, silty; flood plain	10.5
	Total thickness of main body of Wasatch Formation	29.8

SECTION B—LITTLE MOUNTAIN

		Thickness (ft)
	Luman Tongue of Green River Formation (part):	
83.	Sandstone, gray, very fine grained to medium-grained, poorly sorted, subangular, argillaceous, firm; no distinct bedding; freshwater lacustrine	2.3
82.	Shale, gray to gray-brown, fissile, partly silty, and some interbedded oil shale, brown, flaky; freshwater lacustrine	15.1
81.	Sandstone in very thin parallel beds, gray, very fine grained, calcareous, and interbedded shale, gray-brown, silty; freshwater lacustrine	1.1
80.	Oil shale, brown, flaky, soft; abundant ostracodes; numerous layers containing *Goniobasis* sp., *Viviparus* sp., and *Lampsilis* sp.; freshwater lacustrine	25.8
	Total measured thickness of Luman Tongue	44.3
	Wasatch Formation (part):	
	Ramsey Ranch Member:	
79.	Coal; paludal	0.5
78.	Shale, brown, carbonaceous; paludal	0.2
77.	Coal; paludal	0.2
76.	Shale, gray, carbonaceous; paludal	1.4
75.	Coal; paludal	0.8
74.	Shale, light- to dark-brown, carbonaceous; paludal	1.4
73.	Claystone, medium-gray; paludal	0.2
72.	Coal; paludal	0.5
71.	Shale, gray, soft; poorly preserved fragments of fossil wood; mudflat	1.0
70.	Limestone, gray, hard; black shells of *Physa pleromatis*, *Valvata* sp., *Lymnea* sp., and *Hydrobia* sp.; pond	0.3
69.	Mudstone, gray, clayey, partly silty; flood plain	10.1
68.	Sandstone, gray, very fine grained to fine-grained; trough crossbedded; a small channel; flood plain	3.1
67.	Shale, medium-gray to dark-brown, carbonaceous, and thin interbedded shale, medium-gray	5.1
66.	Coal; paludal	0.3
65.	Shale, gray, clayey, slightly carbonaceous; paludal	1.0
64.	Shale, dark-brown, carbonaceous; paludal	0.2
63.	Shale, medium-gray, clayey, slightly carbonaceous; paludal	0.5
62.	Coal; paludal	0.3
61.	Shale, gray-brown, carbonaceous; paludal	0.5
60.	Mudstone, gray, blocky; flood plain	4.8
59.	Algal limestone, gray, in wavy beds, balls, and nodules as much as a few inches in diameter; freshwater lacustrine	0.7
58.	Siltstone, gray, argillaceous, blocky; freshwater lacustrine	4.3
57.	Sandstone, gray, very fine grained to fine-grained, calcareous; trough crossbedded; fluvial channel	4.4
56.	Mudstone, gray, blocky, soft; flood plain	5.6
55.	Sandstone, gray, very fine grained to fine-grained, argillaceous; low-angle, small-scale trough crossbedding; fluvial channel	6.3
54.	Siltstone, medium-gray, shaly; fluvial channel	1.9
53.	Shale, dark-gray, carbonaceous; paludal	0.3
52.	Mudstone, gray, clayey, blocky, soft; flood plain	3.3
51.	Shale, dark-gray, carbonaceous; paludal	0.2
50.	Mudstone, gray, limy; rooted; mudflat	0.4
49.	Siltstone, brown, carbonaceous; paludal	0.3
48.	Coal; paludal	0.6
47.	Shale, medium-gray, carbonaceous; paludal	0.2
46.	Coal; paludal	0.3
45.	Shale, medium-gray, slightly carbonaceous, clayey; paludal	0.9
44.	Coal; paludal	0.5
43.	Shale, gray, carbonaceous; paludal	0.6
42.	Shale, gray, clayey, soft; root casts; mudflat	4.4
41.	Coal, and very thin interbedded siltstone lenses, gray, calcareous, carbonaceous; paludal	1.4
40.	Shale, brown, carbonaceous; paludal	0.2
39.	Mudstone, gray, some carbonaceous shale partings at top and bottom; paludal	0.5
38.	Oil shale, gray-brown; abundant white shell fragments; freshwater lacustrine	0.4
37.	Shale, gray, carbonaceous; paludal	0.1
36.	Mudstone, gray, clayey, blocky; flood plain	1.1
35.	Sandstone, gray, very fine grained to fine-grained, calcareous, hard; small-scale trough crossbedding; wave and current ripples; lenticular fluvial channel	11.6
34.	Mudstone, gray, sandy, soft, and some nodular limestone, gray, hard, dense; flood plain	6.0
33.	Mudstone, gray, sandy, soft; flood plain	4.5
32.	Sandstone, gray, very fine grained, calcareous; current rippled; weathers brown; flood-plain splay	2.5
31.	Mudstone, gray, sandy, soft; flood plain	2.7
30.	Mudstone, gray, sandy, soft; flood plain	0.5
29.	Mudstone, gray, sandy, soft; flood plain	5.4
28.	Sandstone, gray, very fine grained, soft, rounded, limonitic; weathers rust; flood-plain splay	1.0
27.	Mudstone, gray-green, soft; flood plain	2.0
26.	Siltstone, gray, limy, nodular; flood plain	0.2
25.	Mudstone, gray-green, blocky, firm; flood plain	6.6
24.	Shale, brown, calcareous, carbonaceous; paludal	0.2
23.	Coal; paludal	0.2
22.	Shale, gray-brown, carbonaceous; paludal	1.0
21.	Shale, gray-brown, fissile, soft; freshwater lacustrine	0.3
20.	Shale, dark-brown, carbonaceous; paludal	0.2
19.	Shale, gray, soft; flood plain	0.8
18.	Mudstone, gray, silty, soft; flood plain	0.2
17.	Limestone, medium-gray, hard, dense; some ostracodes; large *Physa pleromatis* and *Valvata* sp.; calcitized wood fragments; pond	0.5
16.	Mudstone, gray to gray-green, silty, blocky; flood plain	4.2
15.	Limestone, tan-gray, very hard; abundant *Valvata* sp. and *Physa pleromatis*; some ostracodes and a few black fish bones; pond	0.6
	Total measured thickness of Ramsey Ranch Member	120.8

—Angular unconformity—

		Thickness (ft)
	Wasatch Formation (part):	
	Main body (part):	
14.	Mudstone, gray to gray-green, silty to sandy, blocky; thin band of red 2.0 ft below top; flood plain	6.5
13.	Sandstone, gray, very fine grained to medium-grained, calcareous, hard; flood-plain splay	1.1
12.	Mudstone, gray, sandy, and interbedded sandstone, gray, very fine grained to medium-grained; flood plain and flood-plain splay	2.7
11.	Sandstone, gray, very fine grained to medium-grained, poorly sorted, subangular, slightly calcareous; some small brown pyrite inclusions; flood-plain splay	1.0
10.	Mudstone, gray, maroon, and green, variegated, silty, blocky; flood plain	2.5
9.	Sandstone, gray, very fine grained to medium-grained; calcareous at top; trough crossbedded; abundant worm borings and smooth-walled burrows that are mostly vertical and as much as 0.05 ft thick and 0.8 ft long; fluvial channel	4.9
8.	Mudstone, gray-green, silty, blocky; flood plain	2.8
7.	Sandstone, gray, very fine grained to coarse-grained, lenticular; a small, narrow fluvial channel	6.4
6.	Mudstone, gray, red, gray-green, and brown, variegated, silty to sandy, blocky; flood plain	35.1
5.	Sandstone, gray, very fine grained to coarse-grained, calcareous, hard; scattered small pebbles; flood-plain splay	1.7
4.	Sandstone, gray, very fine grained to coarse-grained; weathers brown; trough crossbedded; a small, narrow fluvial channel	6.7
3.	Mudstone, medium-gray, sandy; flood plain	2.9
2.	Sandstone, gray, very fine grained to very coarse grained; weathers brown; trough crossbedded; fluvial channel	9.8
1.	Mudstone, maroon-red and gray, banded, silty to sandy, blocky; flood plain	20.0
	Total measured thickness of main body of Wasatch Formation	104.1

SECTION C—WEST HIAWATHA

		Thickness (ft)
	Luman Tongue of Green River Formation (part):	
61.	Oil shale, brown, flaky, soft; freshwater lacustrine	55.0
	Wasatch Formation (part):	
	Ramsey Ranch Member:	
60.	Shale, gray, very sandy, soft; flood plain	1.3
59.	Sandstone, gray, very fine grained, calcareous, micaceous, hard; ripple marked; weathers to brown ledge; flood-plain splay	0.6
58.	Shale, gray, sandy, firm; flood plain	2.1
57.	Sandstone, gray, very fine grained, calcareous, firm; trough crossbedded; fluvial channel	17.3
56.	Shale, gray, brown, sandy, firm, partly carbonaceous; flood plain	6.1
55.	Sandstone, gray, very fine grained, calcareous, partly argillaceous; carbonaceous streaks; ripple marked and trough crossbedded; weathers to massive cliff; fluvial channel	26.7
54.	Sandstone, gray, very fine grained, silty, slightly argillaceous; fluvial channel	3.1
53.	Shale, dark-brown, fissile, silty, carbonaceous, firm; paludal	19.9
52.	Coal; paludal	1.0
51.	Shale, black, silty, carbonaceous, firm; paludal	1.7
50.	Coal; paludal	0.7
49.	Shale, dark-gray, carbonaceous, soft; paludal	0.9
48.	Coal, and some dark-brown carbonaceous shale partings; paludal	4.7
47.	Shale, dark-brown, carbonaceous; paludal	1.8
46.	Coal; paludal	0.5
45.	Shale, dark-brown, carbonaceous; paludal	1.1
44.	Coal; paludal	1.2
43.	Shale, dark-brown, very carbonaceous, partly silty, firm; paludal	5.0
42.	Coal; paludal	0.8
41.	Shale, dark-brown, gray, carbonaceous, partly silty; firm; paludal	5.2
40.	Coal; paludal	0.9
39.	Shale, brown, carbonaceous, silty; paludal	0.6
38.	Siltstone, brown, carbonaceous, firm; paludal	2.9
37.	Siltstone, brown, limy, platy; in thin, parallel beds; paludal	0.7
36.	Shale, dark-brown, silty, carbonaceous; paludal	1.0
35.	Coal; paludal	0.9
34.	Mudstone, gray, silty, soft; sandy in top 1.5 ft; flood plain	6.6
33.	Limestone, gray, silty, hard; some shell fragments including *Gyraulus* sp.; pond	0.8
32.	Mudstone, gray, silty, soft, and interbedded shale, brown, carbonaceous; some siltstone concretions; paludal	7.5
31.	Shale, brown, carbonaceous, soft; paludal	2.0
30.	Mudstone, gray, brown, silty, soft, and a zone of gray, dolomitic concretions near center; flood plain	32.5
29.	Sandstone, gray, very fine grained to coarse-grained, poorly sorted, micaceous; abundant colored grains; trough crossbedded; weathers to bench; fluvial channel	9.5
28.	Mudstone, dark-gray, silty, soft; flood plain	8.5
27.	Sandstone, gray, very fine grained, calcareous, firm; lenticular; trough crossbedded; fluvial channel	2.8
26.	Mudstone, red, maroon, gray, and brown, variegated, silty, soft; flood plain	20.8
25.	Siltstone, gray, dolomitic, hard; flood-plain splay	0.6
24.	Mudstone, gray, silty; flood plain	4.0
23.	Mudstone, gray, silty, soft, and some interbedded sandstone, gray, very fine grained, argillaceous, soft; thin concretionary zone in lower part; flood plain and flood-plain splay	35.0
22.	Shale, dark-brown, carbonaceous, soft; flood-plain marsh	2.3
21.	Sandstone, gray, very fine grained, silty, calcareous; ripple marked; some worm borings; flood-plain splay	2.0
20.	Mudstone, gray, silty, soft, and very thin interbedded siltstone, gray, calcareous; flood plain and flood-plain splay	10.0
19.	Shale, dark-brown, carbonaceous, soft; flood-plain marsh	1.4
18.	Mudstone, gray, silty, soft; flood plain	3.0
17.	Siltstone, gray, sandy, dolomitic, very hard; flood-plain splay	1.9
16.	Mudstone, gray, silty, soft, and interbedded sandstone, gray, very fine grained, argillaceous, calcareous; ripple marked; flood plain and flood-plain splay	18.2
15.	Shale, dark-brown to black, fissile, silty, carbonaceous, and very thin interbedded coal; flood-plain marsh	1.1
14.	Siltstone, gray, carbonaceous, firm; some unidentified snails and clams; flood-plain marsh	0.4
13.	Mudstone, gray, soft, and thin interbedded sandstone, gray, very fine grained, argillaceous, soft; flood plain and flood-plain splay	5.2
12.	Sandstone, gray, very fine grained, argillaceous, soft; flood-plain splay	6.1
11.	Mudstone, gray, silty to sandy, soft, and some interbedded sandstone in lower part, gray, very fine grained, argillaceous, soft; flood plain	41.0
10.	Sandstone, gray, very fine grained, argillaceous, soft; fluvial channel	33.5
9.	Shale, gray, silty, soft; flood plain	8.0
8.	Shale, dark-brown, carbonaceous, soft, and a 0.2-ft-thick coal bed; flood plain marsh	2.8
7.	Mudstone, gray, silty, soft; flood plain	9.9
6.	Shale, dark-brown, fissile, carbonaceous, soft, and a 0.3-ft-thick coal bed near base; flood-plain marsh	3.7
5.	Mudstone, gray, silty, soft, and thin interbedded sandstone, gray, very fine grained, argillaceous, soft; flood plain and flood-plain splay	17.5
4.	Shale, dark-brown, carbonaceous, soft; flood-plain marsh	5.8
	Total measured thickness of Ramsey Ranch Member	413.1
	Wasatch Formation (part):	
	Main body (part):	
3.	Mudstone, gray, silty, soft; flood plain	2.3
2.	Sandstone, gray, very fine grained, calcareous, firm; ripple marked; flood-plain splay	1.8
1.	Mudstone, gray, silty, soft; flood plain	6.0
	Total measured thickness of main body of Wasatch Formation	10.1

SECTION D—RIFE RIM

		Thickness (ft)
	Luman Tongue of Green River Formation (part):	
81.	Shale, gray-brown, fissile to flaky, soft; freshwater lacustrine	0.8
80.	Coquinal sandstone, brown, limy, crumbly, firm; abundant *Goniobasis* sp., *Lampsilis* sp., and *Viviparus* sp.; freshwater lacustrine	0.8
79.	Oil shale, brown, fissile, soft; freshwater lacustrine	1.0
78.	Shale, gray, fissile, soft; freshwater lacustrine	0.7
77.	Sandstone, gray, very fine grained, silty, argillaceous, calcareous; carbonaceous in lower 2.0 ft; interbedded with gray shale at top; ripple marked; beach	6.1
76.	Shale, dark-gray, silty, carbonaceous, firm; paludal	0.5
75.	Coal; paludal	0.2
74.	Shale, dark-gray, carbonaceous, silty, firm; paludal	0.3
73.	Coal; possibly canneloid; paludal	0.6
72.	Coquinal sandstone, brown, limy, hard, and interlaminated shale near middle, brown, carbonaceous; abundant *Goniobasis* sp., *Lampsilis* sp., and *Viviparus* sp.; freshwater lacustrine	1.0
71.	Shale, dark-gray, silty, carbonaceous, firm; freshwater lacustrine shoreline	1.0
70.	Oil shale, dark-brown, fissile, flaky, soft; freshwater lacustrine	1.8
69.	Shale, dark-gray-brown, fissile, carbonaceous, silty, firm; freshwater lacustrine	2.8
68.	Oil shale, dark-brown, fissile, flaky, soft; freshwater lacustrine	4.7
67.	Coquinal siltstone, gray, hard; ripple marked; abundant *Goniobasis* sp., *Lampsilis* sp., and *Viviparus* sp.; freshwater lacustrine	1.8
66.	Oil shale, brown, fissile, soft; some silty laminae; abundant shell fragments including *Lampsilis* sp.; freshwater lacustrine	5.1
65.	Siltstone, gray, limy, hard, *Goniobasis* sp., *Lampsilis* sp., and *Viviparus* sp. in upper 0.3 ft; freshwater lacustrine	0.5
64.	Oil shale, brown, fissile, soft; freshwater lacustrine	0.4
63.	Coquinal limestone, brown, sandy, soft; *Goniobasis* sp., *Viviparus* sp., and *Lampsilis* sp.; freshwater lacustrine	0.3
62.	Coal in upper 0.8 ft; underlain by shale, dark-gray, carbonaceous, silty, soft; freshwater lacustrine shoreline	1.3
61.	Oil shale, brown, flaky, soft; becomes silty in upper 1.0 ft; freshwater lacustrine	2.2
60.	Shale, brown, soft; mostly brown shell fragments; freshwater lacustrine	0.1
59.	Oil shale, brown, flaky, soft; abundant ostracodes; freshwater lacustrine	22.9
58.	Sandstone, gray, very fine grained, fairly well sorted, very calcareous, hard; scattered colored grains; large-scale trough crossbedding; pond	12.9
	Total measured thickness of Luman Tongue	69.8
	Wasatch Formation (part):	
	Ramsey Ranch Member:	
57.	Shale, gray, silty to sandy, firm; flood plain	4.3
56.	Coal; paludal	0.4
55.	Shale, gray, silty, fissile, soft; flood plain	2.7
54.	Sandstone, gray, very fine grained, silty, argillaceous, soft; fluvial channel?	7.7
53.	Shale, dark-gray, carbonaceous, silty, soft, and some interlaminated coal; paludal	4.2
52.	Limestone, gray-brown, silty, hard; some ostracodes and *Gyraulus* sp.; pond	0.4
51.	Shale, gray, fissile, slightly carbonaceous, silty, soft, and thin interbedded sandstone; coal; paludal	1.9
50.	Sandstone, gray, very fine grained, fairly well sorted, micaceous, hard; some colored grains; faint trough crossbedding; fluvial channel	18.8
49.	Shale, medium- to dark-gray, fissile, soft; flood plain	11.7
48.	Coal; paludal	0.5
47.	Limestone, gray-brown, silty, hard, dense; pond	1.1
46.	Mudstone, gray-green, silty, soft; thin basal bed of sandstone, gray; flood plain	16.0
45.	Limestone, gray-brown, sandy, hard, dense; pond	2.6
44.	Shale, medium- to dark-gray, fissile, soft, and thin interbedded sandstone in upper part, gray, very fine grained, silty, calcareous; flood plain and flood-plain splay	14.3
43.	Sandstone, gray, very fine grained, argillaceous, soft; becomes very silty and thin to top 2.0 ft;