UNITED STATES DEPARTMENT OF THE INTERIOR

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DESCRIPTIONS OF FOUR STRATIGRAPHIC SECTIONS OF PARTS OF THE GREEN RIVER AND UINTA FORMATIONS IN THE EASTERN UINTA BASIN, UINTAH COUNTY, UTAH, AND RIO BLANCO COUNTY, COLORADO

By

W. B. Cashion

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DESCRIPTIONS OF FOUR STRATIGRAPHIC SECTIONS OF PARTS OF THE GREEN RIVER AND UINTA FORMATIONS IN THE EASTERN UINTA BASIN, UINTAH COUNTY, UTAH, AND RIO BLANCO COUNTY, COLORADO

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INTRODUCTION

The four stratigraphic sections described in this report were measured during and investigation of the composition and geometry of lithofacies of the Green River Formation and associated formations in the eastern Uinta Basin (fig. 1). The principal purpose of the study was to determine the thickness and extent of oil-shale zones and their relationship to associated sedimentary facies.

Lithologic descriptions in the South Raven Ridge, Powder Springs Wash, and Hill Creek sections are of rocks principally within the Green River Formation and the Bonanza section describes rocks entirely within the Uinta Formation. The South Raven Ridge section includes strata from the "wavy bed," an airfall ash bed in the Parachute Creek Member of the Green River Formation, downward to a limestone unit in the Douglas Creek Member about 200 feet above the base of the Green River Formation. Essentially all of the Green River Formation is included in the Powder Springs Wash section and, at Hill Creek, that part of the Green River Formation above the Horse Bench Sandstone Bed and the lowermost 250 feet of the Uinta Formation were measured. Uinta A and Uinta B of Osborn (1929) are described in the Bonanza section.

Jacob staff and steel tape were used to measure the thicknesses of lithologic units. Inclinations of the strata at all localities other than Powder Springs Wash are low-angle: only a few degrees. Beds at the Powder Springs Wash section dip southwest and are inclined as much as 30^{o}. Locations of the measured sections are shown on figures 2 through 5.

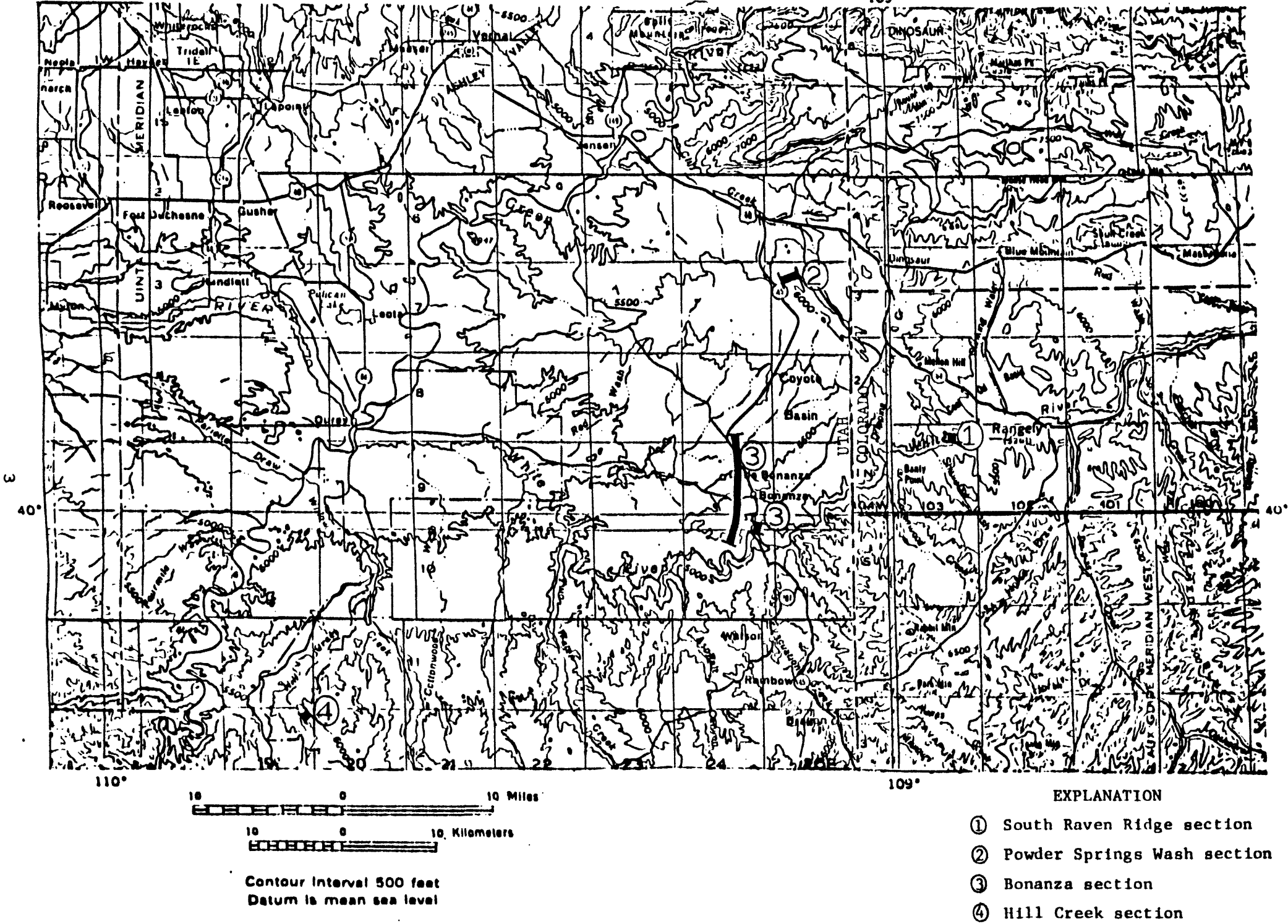

Figure 1.--Map showing locations of measured sections in the eastern Uinta Basin.

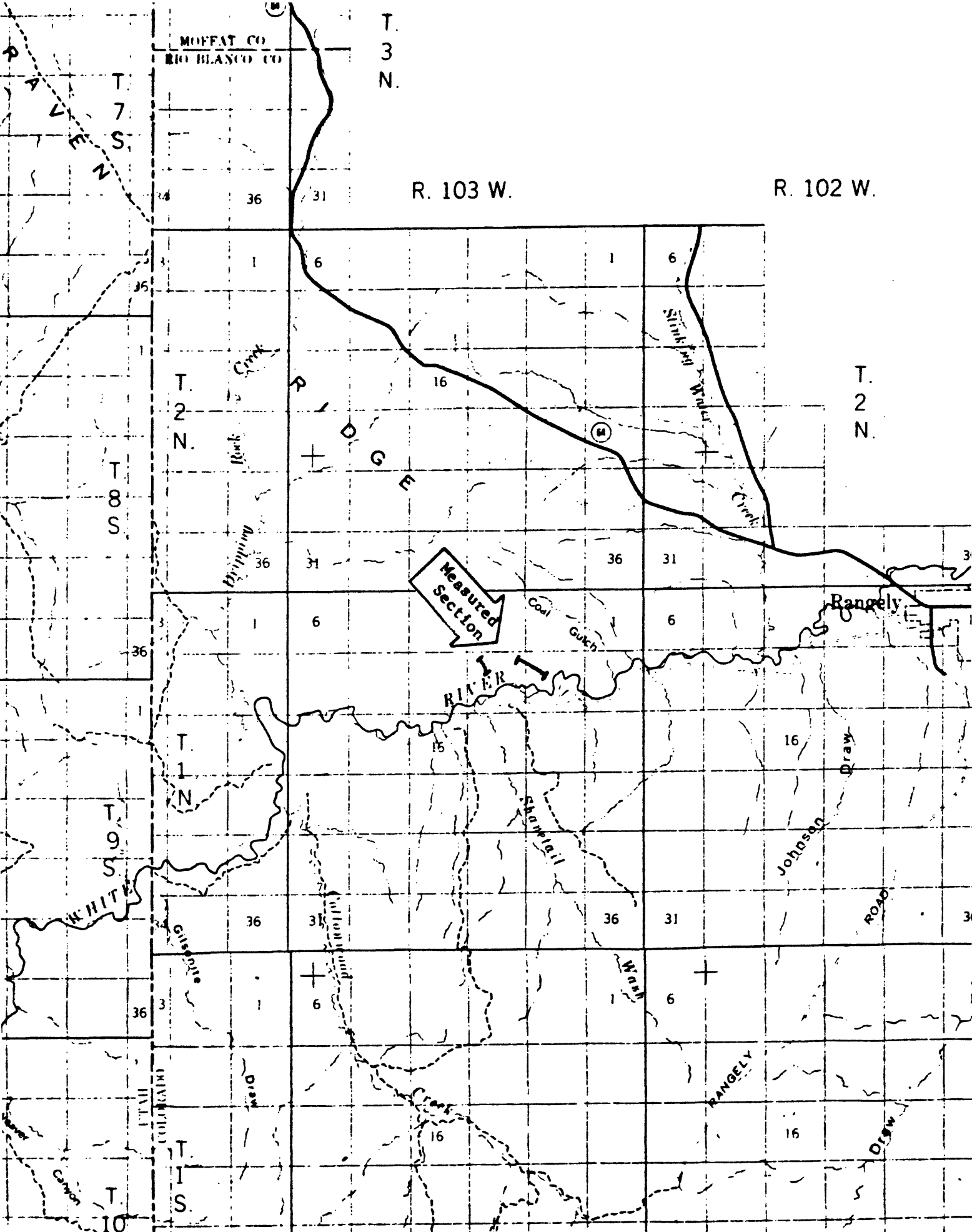

Figure 2.--Map showing location of South Raven Ridge section.

SOUTH RAVEN RIDGE SECTION, MEASURED ON NORTH SIDE

OF WHITE RIVER, IN secs. 10 and 11, T. 1 N.,

R. 103 W., Rio Blanco County, Colorado

[Measured by W. B. Cashion and A. P. Smith, Aug. 1974]

Unit	Description	Thickness (in feet)
	GREEN RIVER FORMATION (part): Parachute Creek Member (part):	
73	Tuff, yellowish-orange; irregular upper surface; slightly irregular lower surface; few biotite flakes in lower part; "wavy-bed"	1.0
72	Marlstone and oil shale	78.0
71	Marlstone, tan; forms slope; "A" groove	14.7
70	Marlstone and oil shale, brown and gray; forms gray slope	21.3
69	Tuff, yellowish-brown; slightly irregular upper and lower surfaces; false Mahogany marker	0.3
68	Oil shale and marlstone, gray and brown	13.1
67	Tuff, oil stained; some stringers of marlstone in upper part; Mahogany marker	0.3
66	Marlstone and oil shale, gray and brown; forms slopes and ledges	14.4
65	Oil shale; high kerogen content, bedding is papery to platy; bedding in uppermost 1.0 foot is papery and very contorted; Mahogany oil-shale bed	3.3
64	Oil shale and marlstone; bedding is thin to papery	6.5
63	Oil shale; high kerogen content; bedding is papery to medium; brick-like jointing; contains dark-brown, irregular, oil stained tuff 0.5 feet thick 0.5 feet above base; tuff is broken by closely spaced joints	3.3

SOUTH RAVEN RIDGE SECTION--Continued

Unit	Description	Thickness (in feet)
62	Marlstone and oil shale; platy bedding; punky bed 0.5 feet thick containing fossil plant remains occurs at top; contains dark-brown irregular tuff 0.5 feet thick 1.3 feet below top; forms slope	10.5
61	Oil shale; high kerogen content; bedding in lower part is platy; bedding in upper part is papery to massive; contains oil-shale clasts and mud cracks; joints occur about 6 to 8 inches apart	3.8
60	Marlstone and oil shale, gray and brown; weathers gray; forms slope with a few small ledges	14.4
59	Tuff, oil stained; even upper and lower surfaces; "Fred bed"	1.0
58	Oil shale and marlstone; forms slopes and ledges	17.1
57	Tuff, yellowish-brown; contains macroscopic analcime crystals; irregular in thickness; "Curly bed"	1.6
56	Oil shale; high kerogen content; forms ledge	3.9
55	Marlstone; contains some thin beds of oil shale; forms slope	19.7
54	Sandstone, brown, fine-grained, crossbedded, ripple bedded; weathers orange-brown; units 20 and 21 form prominent ledge and evidently form all or part of the "m" bed of Cullins (1968); they also make up "B" groove	6.6
53	Sandstone and silty marlstone	28.0

SOUTH RAVEN RIDGE SECTION--Continued

Unit	Description	Thickness (in feet)
52	Oil shale and marlstone; oil shale has medium kerogen content; unit weathers to very steep gray slope with numerous ledges; contains yellowish-brown, very friable sandstone or analcimized tuff 0.6 feet thick and 6.6 feet above base; contains two dark-gray tuffs each about 1 inch thick and 1 foot apart with the lowermost about 20 feet above the base contains several yellowish-orange tuffs one of which is about 0.3 feet thick and about 30 feet above base of unit. Upper part of the R-6 oil-shale zone	44.6
51	Oil shale; high kerogen content; forms ledge	1.3
50	Tuff, yellowish-orange	0.3
49	Oil shale and minor beds of marlstone; forms prominent ledge	33.0
48	Marlstone and oil shale; upper 1/3 of unit is an oil-shale bed with a moderate kerogen content	3.3
47	Oil shale, dark-gray; medium to papery bedding; high kerogen content; weathers dark gray; forms ledge	1.6
46	Marlstone and siltstone interbedded; contains some thin oil-shale beds; mostly gray slope	13.1
45	Oil shale; high kerogen content; weathers bluish gray; forms ledge	0.3
44	Marlstone and siltstone, gray; marlstone is silty and forms slope; siltstone forms ledge	9.8
43	Oil shale; low kerogen content	1.0
42	Marlstone, gray, silty; forms slope	13.1
41	Oil shale, medium kerogen content; forms minor ledge	1.0

SOUTH RAVEN RIDGE SECTION--Continued

Unit	Description	Thickness (in feet)
40	Marlstone, gray, platy; forms slope	1.6
39	Siltstone and marlstone, gray and greenish-gray, limy; forms ledge; siltstones are ripple-bedded in part	11.8
38	Marlstone and siltstone, gray, platy bedding; forms steep gray slope with numerous ledges. Lenticular very fine grained sandstone body about 10 feet thick occurs near base of unit. Some weathered beds have pale-green tint	69.0
37	Sandstone and siltstone interbedded; sandstone is gray, very fine grained, calcareous, and constitutes about 40 percent of unit; siltstones are gray, shaly in part. The sandstones are crossbedded, thin bedded, ripple bedded, and form five prominent ledges with a minor ledge near middle of unit; siltstones weather to steep gray slopes. Unit contains 0.1 foot thick blue-weathering oil-shale bed 82 feet above base	100.0
36	Shale, medium-gray, slightly calcareous, silty, flaky; upper 10 feet is a limy thin-bedded siltstone. Unit contains a few thin-beds of sandstone and siltstone, one or two thin marlstone beds, and a few thin-beds of algal limestone. Weathers to steel-gray slope with minor ledges	82.0
35	Oil shale, dark-gray; bedding is papery to platy; weathers to blue ledge	2.3
34	Marlstone, gray, silty, thin-bedded to fissile; contains several thin-beds of algal limestone	6.9
33	Oil shale, dark-gray; argillaceous in part; bedding is papery to platy	3.3

SOUTH RAVEN RIDGE SECTION--Continued

Unit	Description	Thickness (in feet)
32	Marlstone and oil shale interbedded, gray, fissile; papery in part; upper part is silty. Papery-bedded oil shale contains flattened ostracodes along bedding planes. Sandstone bed 0.3 feet thick occurs at top of unit. Weathers to gray slope	27.9
	Douglas Creek Member (part):	
31	Limestone and siltstone interbedded with thin very fine grained sandstone at top of unit; limestone is oolitic and sandy; siltstone is calcareous and fissile. Sequence weathers to series of gray slopes and orange-brown or gray ledges	14.7
30	Siltstone, medium-gray, calcareous; bedding is fissile to platy; unit weathers to slope. Sandstone with small-scale crossbedding occurs near middle of unit. Sandstone is about 0.6 feet thick and weathers to ledge	14.1
29	Limestone and shale interbedded. Limestones are algal, oolitic and ostracodal. Contains 1.0 foot thick fissile oil-shale bed near base. Unit is approximately 60 percent shale and 40 percent limestone and weathers to series of orange-brown ledges and gray slopes	32.1
28	Shale, dark- to medium-gray, flaky to platy; contains some limy siltstone beds; algal limestone 0.3 feet thick near middle of unit; upper part contains some kerogen	34.4
27	Siltstone, gray, limy. Lower part is thin bedded, soft, and contains thin algal limestones, and upper part is resistant and weathers to overhanging ledge	2.6
26	Shale, dark-gray, flaky to papery-bedded; some kerogen. One thin low-grade oil shale occurs near middle of unit. Contains limestone pebble conglomerate 0.3 feet thick 3 feet below top of unit	14.7

SOUTH RAVEN RIDGE SECTION--Continued

Unit	Description	Thickness (in feet)
25	Shale, gray, flaky. Contains 0.6 foot thick algal limestone near top of unit. Weathers to slope	6.5
24	Siltstone, gray, limy, thin-bedded; weathers to ledge	4.9
23	Marlstone and siltstone interbedded medium-gray, fissile to platy bedding; weathers to gray and very pale greenish-gray slope	34.5
22	Marlstone and siltstone, interbedded, gray and brown. Contains several thin (less than 0.3 feet) algal limestones. Forms gray ledge	9.8
21	Siltstone and marlstone interbedded, olive-gray, platy to fissile; forms very pale greenish-gray slope	33.4
20	Oil shale, dark-gray, fissile; moderate kerogen content; weathers dark blue gray	1.0
19	Marlstone and siltstone interbedded, olive-gray, platy bedding; weathers to slope with minor ledges	31.1
18	Siltstone, light-gray, calcareous. Contains three algal limestones, each about 0.6 ft thick. Weathers to ledge	9.8
17	Shale, gray-brown, fissile. Unit includes two low-grade oil-shale beds, each about 3 ft thick. One occurs about 25 ft above base of unit and the other about 13 ft above base. Contains a few ostracodes. Upper part weathers to blue-gray and greenish-brown slope. Several small landslides just below top of unit	113.2
16	Limestone, yellow-brown, brecciated; weathers to orange-brown, knobby, discontinuous ledge	1.6

SOUTH RAVEN RIDGE SECTION--Continued

Unit	Description	Thickness (in feet)
15	Shale, gray, fissile. Contains two or three low-grade flaky oil shales	32.8
14	Oil shale, dark-brown to dark-gray, flaky to papery. Upper and lower parts have high kerogen contents. Middle part has moderate kerogen content	5.6
13	Sandstone, gray, very fine grained, very thin bedded; weathers to minor ledge	0.6
12	Shale, dark-gray, flaky; forms gray slope	40.0
11	Oil shale, papery, moderate kerogen content	10.0
10	Marlstone, light-gray, thin-bedded	3.2
9	Limestone, brownish-gray, microcrystalline to oolitic; upper part contains some pisolites; weathers to yellowish-orange ledge	1.0
8	Shale and siltstone with a few thin very fine grained sandstones. Shales and siltstones are flaky to blocky. Also contains a few thin oolitic limestones. Flaky shale near middle of unit contains blue-gray kerogen(?) concretions with small desiccation cracks on surfaces. Concretions are ovate and about 2 inches long. Some siltstone ledges are thin bedded and ripple bedded	210.0
7	Tuff, yellow to yellowish-orange, analcimized, oil(?) stained; deeply weathered	0.3
6	Shale, gray and siltstone, gray, platy; weathers to light-gray slope; mostly covered	13.1
5	Limestone, yellow-gray, oolitic, sandy; forms dip slope	1.0
4	Shale, dark-gray-brown; weathers to dark-gray slope	29.5

SOUTH RAVEN RIDGE SECTION--Continued

Unit	Description	Thickness (in feet)
3	Sandstone, yellow-gray, limy; forms ledge	0.3
2	Shale, dark-gray, very fissile. Contains some thin-beds of papery oil shale in lower half of unit. Weathers to slope. Mostly covered	54.1
1	Limestone, yellow-brown, silty, medium-bedded, oolitic; forms dip slope	3.3
	Lowermost unit in section is approximately 200 ft above base of Green River Formation	

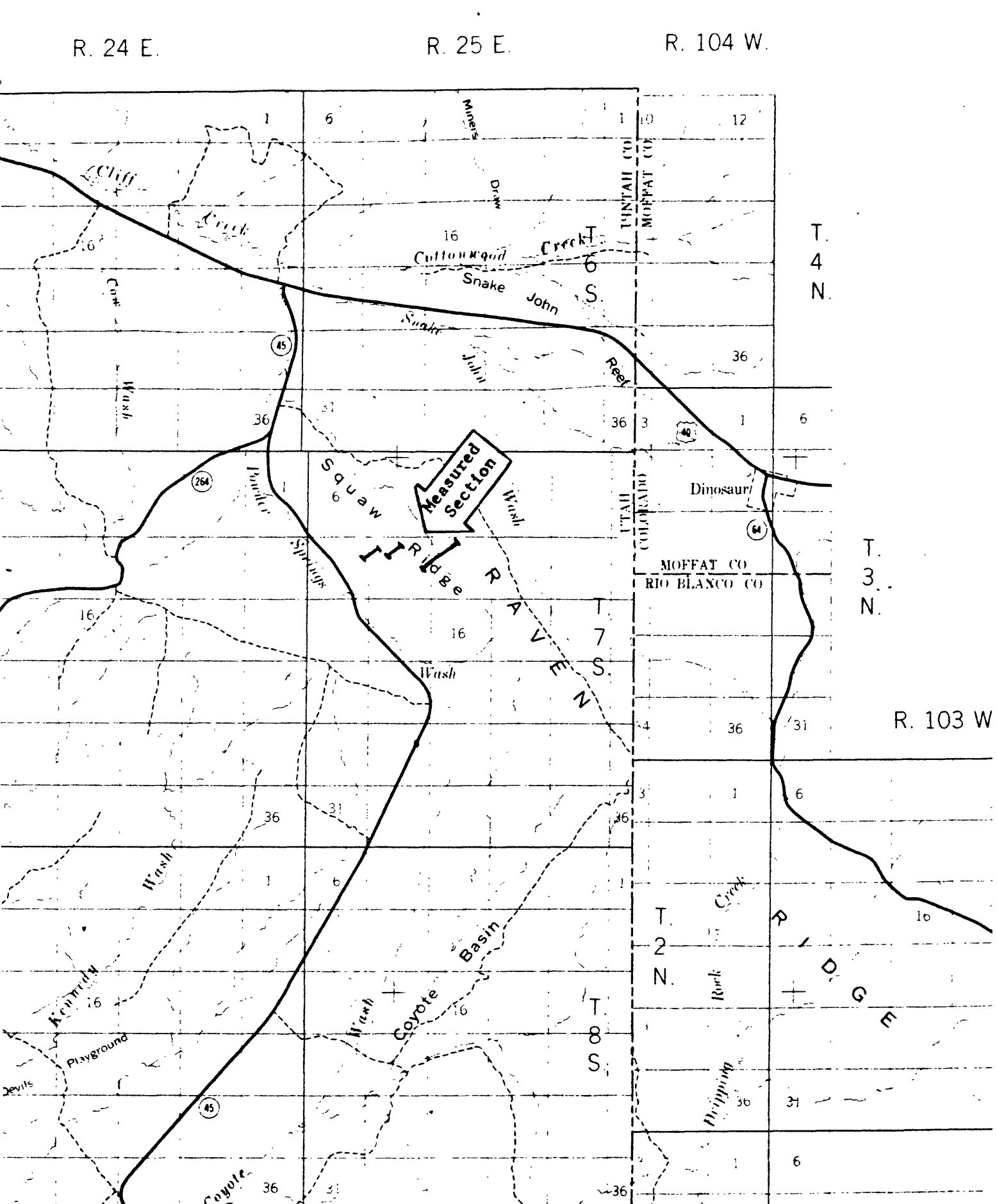

Figure 3.-- Map showing location of Powder Springs Wash section

POWDER SPRINGS WASH SECTION, MEASURED

ACROSS RAVEN AND SQUAW RIDGES, secs. 7, 8, and 9,

T. 7 S., R. 25 E., Uintah County, Utah

[Measured by W. B. Cashion, Oct. 1967]

Unit	Description	Thickness (in feet)
	GREEN RIVER FORMATION (undifferentiated):	
125	Siltstone, sandy; contains lenses that are slightly impregnated with bitumen; upper part is limy and more evenly bedded; forms prominent cuesta and in this area is commonly the uppermost exposed bed in the Green River Formation	74.5
124	Sandstone, very fine grained, thin-bedded, friable; impregnated with bitumen	4.0
123	Siltstone, gray; forms slope	50.0
122	Sandstone, very fine grained, thin-bedded, friable; impregnated with bitumen	4.5
121	Siltstone, gray; forms slope	5.0
120	Siltstone, medium-bedded to platy; upper and lower parts impregnated with bitumen	3.0
119	Siltstone, shaly	2.5
118	Oil shale, papery, moderately kerogenous	1.5
117	Sandstone, very fine grained; moderately impregnated with bitumen	1.0
116	Siltstone; forms gray slope	20.0
115	Tuff, gray; weathers orange brown	0.1
114	Siltstone, gray; forms slope	6.9
113	Tuff, gray; weathers to orange-brown fragments	0.05

POWDER SPRINGS WASH SECTION --Continued

Unit	Description	Thickness (in feet)
112	Siltstone, gray; forms slope	20.0
111	Sandstone, medium-gray, medium-grained to conglomeratic; contains dark-gray silicified limestone pebbles up to 3/4 inch in diameter; moderately impregnated with bitumen	3.0
110	Siltstone, limy; forms slope	6.7
109	Tuff, dark-gray with streaks of orange-brown; impregnated with bitumen; weathers blue gray and orange brown	0.5
108	Siltstone, gray; forms slope	9.5
107	Tuff, same as unit 109	0.3
106	Siltstone, gray; forms slope	16.0
105	Tuff, gray; weathers blue gray and orange brown	0.1
104	Siltstone, gray; forms slope	6.9
103	Tuff, same as unit 105	0.05
102	Siltstone, gray, limy. A bitumen-impregnated sandstone 1 foot thick occurs 25 feet above base. Lowermost 20 feet contains 2 thin marlstone beds (each less than 1 foot thick) that contain small amounts of kerogen. Unit forms slope with a few thin ledges.	40.0
101	Sandstone, light- to dark-gray, very fine grained; slightly impregnated with bitumen; weathers to light-gray ledge and forms small cuesta	5.0

POWDER SPRINGS WASH SECTION --Continued

Unit	Description	Thickness (in feet)
100	Siltstone, gray- to grayish-brown; contains 2 sandstones that are moderately impregnated with bitumen. Each sandstone is about 2 feet thick. One is 17 feet above base and the other is 32 feet above base	54.5
99	Sandstone, very fine grained, medium-bedded; ripple bedded in part	3.5
98	Siltstone, gray, limy, thin-bedded to platy	2.5
97	Sandstone, very fine grained, light- to dark-gray, ripple-bedded, irregularly impregnated with bitumen. Contains lenses of siltstone and also lenses of sandstone that contain coarse material up to 1/4 inch in diameter	4.5
96	Siltstone, light-gray, limy; forms slope	7.0
95	Sandstone, light- to dark-gray; some ripple-bedding; irregularly impregnated with bitumen	8.0
94	Siltstone, gray, platy; contains two slightly kerogenous marlstone beds, each about 1 foot thick	40.0
93	Sandstone, very fine grained; impregnated with bitumen	5.0
92	Siltstone, gray, platy; forms slope	10.0
91	Siltstone, light-gray, limy; forms ledge	3.0
90	Marlstone, tan; slightly kerogenous	2.0
89	Oil shale, dark-gray, papery, some marlstone. Unit has an average shale-oil yield of about 15-20 gallons per ton. Mahogany oil-shale bed(?)	2.5

POWDER SPRINGS WASH SECTION --Continued

Unit	Description	Thickness (in feet)
88	Marlstone, silty; slightly kerogenous	2.0
87	Marlstone, silty	10.0
86	Sandstone, light-gray, very fine grained	1.0
85	Siltstone, very light-gray, platy to thin-bedded, very limy. Contains tuff 20 feet above base. Tuff is 0.1 foot thick and weathers dark-gray with abundant specks of red hematite(?). Unit forms slope with minor ledges	39.0
84	Marlstone, gray- to medium-gray. Upper 1 foot is slightly kerogenous	2.0
83	Sandstone, very fine grained, light-gray, limy; forms minor ledge	2.0
82	Siltstone, marly, fissile to platy	6.0
81	Sandstone, gray, very fine grained; forms minor ledge	3.0
80	Siltstone, gray, with few thin sandstone beds; forms slope with minor ledges	43.0
79	Marlstone, gray; contains 2 foot thick low-grade oil shale 1 foot above base	5.0
78	Sandstone, light-gray, very fine grained, limy; forms minor ledge	5.0
77	Siltstone, fissile; forms gray slope	7.5
76	Sandstone, very fine grained, contains some silty zones; middle 10 feet is slightly impregnated with bitumen	15.0

POWDER SPRINGS WASH SECTION --Continued

Unit	Description	Thickness (in feet)
75	Sandstone and siltstone interbedded. Sandstones are very fine grained. Unit forms series of ledges and slopes	40.0
74	Siltstone, shaly; forms prominent yellow-brown slope	11.5
73	Sandstone and siltstone interbedded; forms ledges and grooves	10.0
72	Sandstone, yellow-brown, very fine grained; forms tan ledge	3.5
71	Shale, gray, marly; forms slope	17.0
70	Sandstone, yellow-brown, very fine grained, thin-bedded; forms yellow-brown or tan ledge	7.5
69	Siltstone, shaly; forms yellow-brown slope	2.5
68	Sandstone and siltstone interbedded. Weathered to three 0.1 foot thick ledges separated by fissile beds. Unit forms prominent tan ledge	6.0
67	Shale, silty; upper 2 or 3 feet contain numerous fossil fish	10.0
66	Sandstone, very fine grained, medium-bedded; impregnated with bitumen; forms ledge	5.0
65	Sandstone, yellow-brown, silty, thin-bedded, friable; forms tan slope	12.0
64	Sandstone, yellow-brown, very fine grained, thin- to medium-bedded, mostly even-bedding with some cross bedding. Contains mammal teeth about 3 feet below top (see Dawson, 1968)	32.0

POWDER SPRINGS WASH SECTION --Continued

Unit	Description	Thickness (in feet)
63	Shale, light-gray, silty; forms slope	15.0
62	Sandstone, tan, very fine to fine-grained, even-bedded; thin-bedded at base and massive at top; forms prominent ledge	25.0
61	Sandstone and silty claystone interbedded; weathers to banded gray and tan slope	50.0
60	Sandstone, very fine grained, even-bedded, limy; slightly impregnated with bitumen	2.0
59	Sandstone, dark-gray, fine- to medium-grained, evenly bedded; contains some coarse granules and flat pebbles; impregnated with bitumen	15.0
58	Shale, greenish-gray, silty; contains thin-beds of sandstone	85.0
57	Sandstone, gray- to yellow-brown, very fine to medium-grained; several lenses containing abundant granules; some vuggy zones	40.0
56	Covered slope, probably underlain by silty shale	25.0
55	Sandstone, gray, very fine to fine-grained. One thin bed contains coarse granules	8.0
54	Shale, gray-green, rubbly	30.0
53	Sandstone, very fine to fine-grained; upper part contains granules	48.0
52	Shale, gray-green, silty; contains some thin oolitic beds	13.0

POWDER SPRINGS WASH SECTION --Continued

Unit	Description	Thickness (in feet)
51	Sandstone, gray, very fine to fine-grained, poorly sorted. Thin sandstone bed at base is reddish-brown. Unit contains very thin conglomeratic beds at top and 11 feet above base. Pebbles in conglomerates are siliceous limestone and quartz. Pebbles are scattered, angular, and some up to 0.05 feet in diameter. Unit is mostly massive rounded ledges, but contains some friable zones	35.0
50	Sandstone, tan, fine-grained, thin-bedded	4.0
49	Sandstone, very fine to fine-grained; contains a few pebbles	15.0
48	Sandstone, tan, very fine to fine-grained, limy; contains a few medium and coarse grains; forms ledge	3.0
47	Sandstone, gray, very fine grained, well-sorted, massive	15.0
46	Sandstone, light-gray, very fine to fine-grained, thin- to medium-bedded, poorly sorted, slightly limy	10.0
45	Sandstone, tan, very fine grained, massive, jointed; forms rounded ledge	16.0
44	Sandstone, light-gray, fine- to medium-grained, very friable, poorly sorted; contains some pink grains	4.0
43	Limestone, oolitic, sandy; may contain some stromatolitic structures; forms ledge	2.0
42	Sandstone, gray, very fine to fine-grained, friable, massive; contains a few thin oolitic beds	32.0

POWDER SPRINGS WASH SECTION --Continued

Unit	Description	Thickness (in feet)
41	Limestone, oolitic, sandy; contains a few quartz pebbles; forms prominent cuesta	7.0
40	Sandstone, gray to tan, very fine grained, thin-bedded	10.0
39	Limestone, ostracodal and oolitic	3.0
38	Sandstone, gray to tan, very fine grained, thin-bedded, evenly bedded; oolitic in part	35.0
37	Sandstone and claystone interbedded	80.0
36	Shale, gray, limy; forms prominent greenish-gray slope	65.0
35	Siltstone, light-gray, fissile; forms slope	15.0
34	Sandstone, light-gray, very fine grained, well-sorted, medium-bedded; contains siltstone partings; forms minor ledge	10.0
33	Mostly covered slope with scattered outcrops of silty claystone. Weathers gray to tan	182.0
32	Limestone, yellow-brown, algal, vuggy, oolitic; varies in thickness	3.0
31	Shale, gray; contains thin ostracodal limestone beds	12.0
30	Limestone, ostracodal, yellow-brown; forms ledge	1.0

POWDER SPRINGS WASH SECTION --Continued

Unit	Description	Thickness (in feet)
29	Shale, gray and brown, flaky to papery; lower 1/3 weathers mostly gray and is flaky; upper 2/3 is alternating bands of gray and brown. Brown shale is papery and has waxy appearance and gray shale is flaky and calcareous. Unit contains thin beds of sandstone and ostracodal limestone. Bands of vegetation grow on this unit	165.0
28	Sandstone, tan, fine-grained; interbedded with thin oolitic and ostracodal limestones	40.0
27	Sandstone, tan, fine-grained; upper part contains oolites	40.0
26	Shale, gray, calcareous	15.0
25	Sandstone, tan to gray, very fine grained, well-sorted, friable. Mostly thin bedded, but has some small-scale cross-bedding	50.0
24	Shale, gray-brown, bentonitic(?)	25.0
23	Sandstone, tan, fine- to medium-grained, mostly thin bedded, friable, well-sorted	52.0
22	Sandstone, gray, very fine grained, slightly limy; contains scattered ostracodes; forms cuesta	4.0
21	Sandstone, very fine grained, thin- to medium-bedded, evenly bedded; forms series of ledges	18.0
20	Shale, gray; interbedded with brown fine-grained sandstone	22.0
19	Sandstone, brown, very fine grained, slightly limy	2.0
18	Shale, greenish-gray, ostracodal, flaky; contains thin ostracodal limestones	34.0

POWDER SPRINGS WASH SECTION --Continued

Unit	Description	Thickness (in feet)
17	Limestone, ostracodal, thin-bedded; forms minor cuesta	1.0
16	Shale, gray	6.0
15	Sandstone, gray, ostracodal; interbedded with thin ostracodal limestones	14.0
14	Limestone, tan, ostracodal	1.0
13	Sandstone, limy; contains scattered ostracodes	2.0
12	Shale, gray, flaky	5.0
11	Limestone, buff, ostracodal	3.0
10	Sandstone, gray to tan, very fine to fine-grained, friable; contains a few thin sandy ostracodal limestone beds. Limestone beds have recemented fractures	15.0
9	Limestone, tan to orange-brown, ostracodal, platy bedded; forms minor cuesta	2.0
8	Sandstone, light-gray, friable; contains thin oolitic limestone; forms tan slope	20.0
7	Sandstone, tan, ostracodal	1.0
6	Limestone, oolitic and ostracodal, sandy; forms tan ledge	2.0
5	Sandstone, gray, very fine grained, friable	15.0
4	Limestone, ostracodal, thin-bedded; forms minor cuesta	3.0
3	Shale, contains thin-beds of ostracodal limestone; forms slope	16.0
2	Limestone, gray to tan, ostracodal, upper part rubbly; forms crest line for part of Raven Ridge	12.0

POWDER SPRINGS WASH SECTION --Continued

Unit	Description	Thickness (in feet)
1	Sandstone, gray, fine-grained, limy, and sandy limestone containing scattered ostracodes and a few gastropods; forms series of minor ledges	60.0
	WASATCH FORMATION (PART)	
	Shale, red and gray; contains some tan sandstone and siltstone	

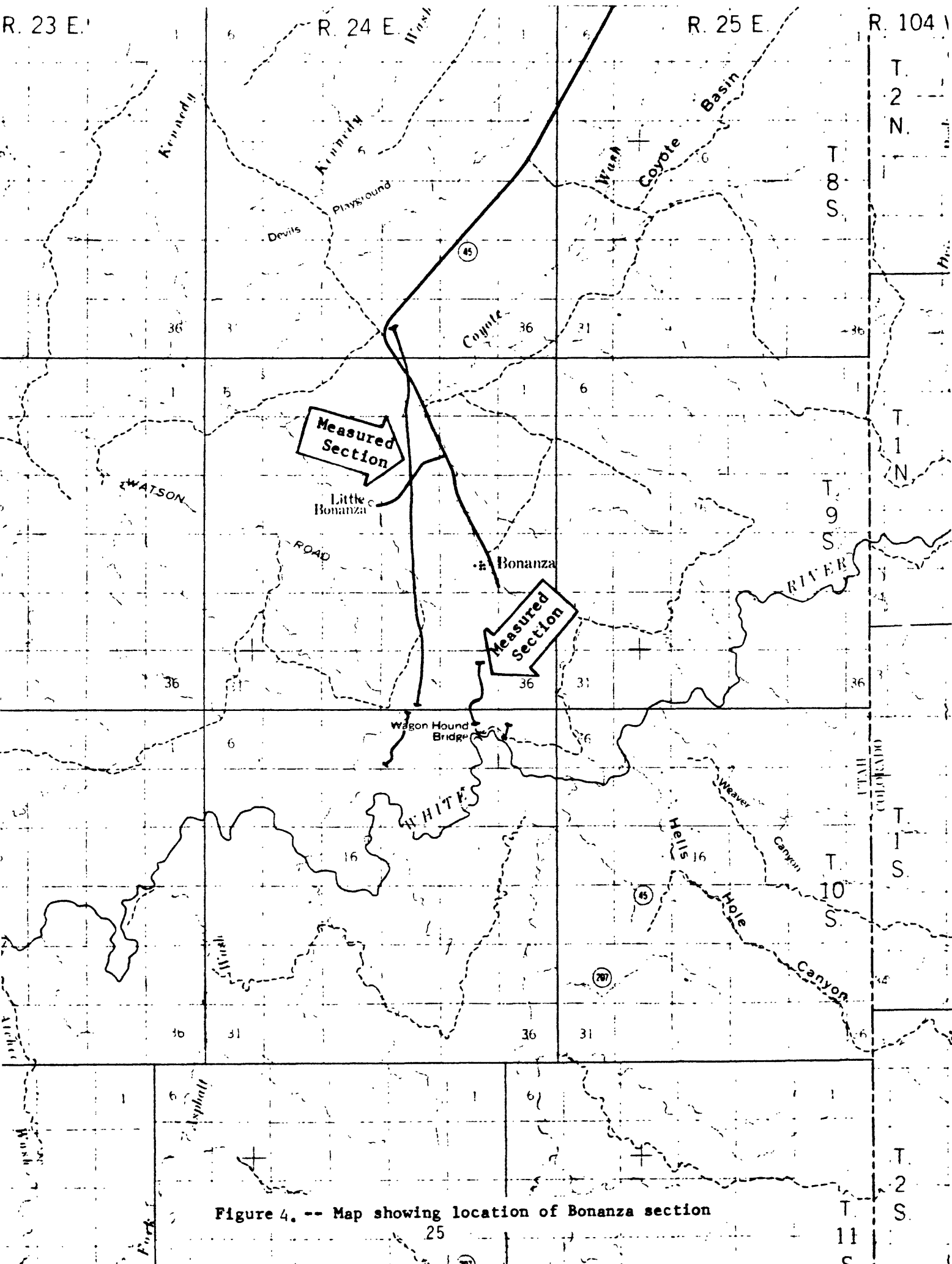

Figure 4. -- Map showing location of Bonanza section

BONANZA SECTION, MEASURED IN AND NEAR WAGONHOUND CANYON AND NORTHWARD TO NORTH SIDE OF COYOTE BASIN, IN sec. 34, T. 8 S., R. 24 E., secs. 3, 10, 15, 22, 27, 34, and 35, T. 9 S., R. 24 E. and secs. 1, 2, and 3, T. 10 S., R. 24 E., Uintah County, Utah

[Measured by W. B. Cashion and R. W. Blair, Aug. 1969]

Unit	Description	Thickness (in feet)
	UINTA FORMATION (part): Uinta B of Osborn (1929, fig. 63):	
28	Sandstone, gray and brown, fine- to coarse-grained; upper part contains lenses of conglomerate with rounded pebbles as much as 0.75 inches in diameter; weathers dark-yellowish-brown and forms ledge. This is the Amynodon Sandstone illustrated by Riggs (1912, pl. 5) at a location in SE1/4NE1/4 sec. 24, T. 8 S., R. 25 E.	15.0
27	Mudstone, gray, sandy, and thin very fine grained sandstone; units form slope with ribs of dark-reddish-brown sandstone	75.0
26	Sandstone, gray and tan, fine- to coarse-grained, lenticular; mostly thin bedded; weathers yellowish-brown; forms bench	20.0
25	Mudstone and sandstone, gray and greenish-gray; forms slope	20.0
24	Sandstone, tan and gray, fine- to medium-grained; grains subangular to round, cross-bedded; contains abundant biotite; weathers to prominent yellowish-brown rubbly ledge	18.0

BONANZA SECTION--Continued

Unit	Description	Thickness (in feet)
23	Mudstone, green and greenish-gray, very sandy; contains several thin, persistent, sandstone ledges. Some sandstone beds grade laterally into massive yellow-brown ledges. Sandstones are limy and contain grains of dark minerals. Unit forms slope with thin ledges. On some outcrops uppermost part of this sequence is bright green	85.0
22	Sandstone, dark-yellowish-brown, medium-grained; forms persistent ledge	2.0
21	Mudstone and some lenticular sandstone; mudstone is gray and green; sandstone is tan; unit forms slope	30.0
20	Sandstone, tan, very fine grained	1.0
19	Mudstone, grayish-green; forms slope	10.0
18	Sandstone, siltstone and tuff; sandstones are yellowish orange, very fine grained and contain lenses of coarse-grained material and lenses of conglomerate with siltstone pebbles as much as 2 inches in diameter; many sandstones are crossbedded. Unit changes abruptly northeastward along strike from sandstone and siltstone to shale and mudstone; units weathers principally to massive rounded yellowish-orange ledges; contains some beds of greenish-gray siltstone. Unit contains a red shale bed about 170 feet below top. Uppermost bed in unit is a persistent tuff or tuffaceous siltstone that caps several mesas west and north of Bonanza	230.0

BONANZA SECTION--Continued

Unit	Description	Thickness (in feet)
17	Siltstone and sandstone interbedded; siltstones are yellowish gray to greenish gray, thin bedded, and make up most of unit; sandstones are yellowish gray, very fine to medium-grained; thin sandstone beds are laterally persistent; most of thick sandstone beds are cross-bedded and lenticular; unit weathers yellowish gray and greenish gray; forms ledges and gentle slopes	145.0
16	Sandstone, pale-orange, very fine to medium-grained; some evenly bedded units and some crossbedded lenticular units; contains iron-cemented concretions as much as 3 inches in diameter; weathers yellowish orange; forms rounded ledges	61.0
15	Similar to unit 17	128.0
14	Tuff(?), yellowish-gray, very fine grained, laterally persistent; weathers yellowish gray; forms minor ledge	1.3
13	Similar to unit 17	42.0
12	Tuff, pale-yellowish-orange, medium-grained; contains minor amount of biotite; weathers pale yellowish orange; forms ledge or rubbly slope. This unit can be mapped westward at least as far as Willow Creek. It occurs at what is interpreted to be the top of the "columnar sandstones" pictured by Osborn (1929, pl. IX A.) and, because it is easily identified, it has been mapped (Cashion, 1974) as the basal bed of the Uinta B of Osborn (1929, fig. 63)	6.0

BONANZA SECTION--Continued

Unit	Description	Thickness (in feet)
	Uinta A of Osborn (1929, fig. 63)	
11	Siltstone and sandstone interbedded. Siltstones are yellowish gray, thin bedded, weather yellowish gray and form slopes; sandstones are pale yellowish orange, very fine grained, weather pale grayish orange and form rounded ledges; lowermost 130 feet is mostly slope forming; uppermost 50 feet is mostly ledges and steep slopes; lowermost 100 feet contains channelform lenses of reddish-brown, medium-grained, crossbedded sandstones; unit contains light-yellowish-gray tuff 1 foot thick about 60 feet above base, and light-yellowish-gray vuggy tuff(?) 1 foot thick about 150 feet above base. Most strata in the unit are relatively even bedded and laterally persistent	183.0
10	Tuff, yellowish-orange; weathers pale yellowish orange; forms prominent rubbly slope or massive ledge. This is the "a" bed of Cashion (1974)	5.2

BONANZA SECTION--Continued

Unit	Description	Thickness (in feet)
9	Sandstone and siltstone interbedded, very pale grayish-orange and greenish-gray; siltstones are mostly thin to medium bedded; sandstones are medium bedded to massive with some small-scale crossbedding and abundant ripple-bedding; most strata are even bedded and laterally persistent, especially in upper part of unit; weathers grayish orange; forms series of slopes and ledges with uppermost part forming cliff in many places. Upper part of sequence appears to be more tuffaceous. In the vicinity of Southam Canyon and Asphalt Wash this interval contains two or three massive sandstones. One crops out prominently. It is about 20 to 30 feet thick and occurs about 30 to 50 feet below unit 10. The sandstone weathers to massive, rounded, pock-marked ledges and at some localities the base appears to be irregular. On some outcrops there is no apparent bedding and on others there are abundant cross-beds	197.0
8	Sandstone, very pale grayish-orange, biotitic, calcitic; abundant small-scale crossbedding; ripple-bedded; uniform upper and lower surfaces; weathers pale grayish orange; forms persistent ledge	2.3
7	Sandstone, grayish-orange, very fine grained; abundant biotite; thin bedded to massive, but predominantly massive; considerable crossbedding although unit is predominantly evenly bedded; minor amount of contorted bedding; contains numerous ovate cavities as much as 4 feet in diameter and "cannonball" concretions; weathers to very pale orange and grayish-orange; forms ledges and steep slopes	52.7

BONANZA SECTION--Continued

Unit	Description	Thickness (in feet)
6	Marlstone, yellowish-gray, silty, thin-bedded; contains fossil leaves; forms very prominent light-gray slope-forming unit along north side of White River. This probably is the leaf-bearing bed mentioned by Douglass (1914, p. 419)	10.0
5	Sandstone, light-gray to yellowish-gray, fine- to medium-grained; medium to massive bedding; upper and lower parts are predominantly medium grained and contain more angular grains than middle part; middle part is predominantly fine grained and even bedded, but contains some crossbedded units. Uppermost 2 feet is laterally persistent, evenly bedded (some minor crossbedding) calcitic ledge-former; unit weathers grayish orange; forms cliff. Cliff face contains cavities of various shapes, mostly elongate, that range from less than 0.1 foot to 10 feet in diameter	95.0
4	Marlstone, yellowish-gray, thin-bedded; upper surface very irregular; weathers to a yellowish-gray chippy slope	20.0
3	Sandstone, pale-yellowish-orange to yellowish-gray, very fine grained, calcitic; mostly medium to massive bedding; contains small flakes of biotite and numerous grains of dark minerals; bedding extremely contorted; weathers to buttes and rounded hills	130.0
2	Marlstone, dark yellowish-brown, thin-bedded; forms light-gray slope	10.0

BONANZA SECTION--Continued

Unit	Description	Thickness (in feet)
1	Sandstone, yellow-gray, very fine to medium-grained; grains angular to subround; medium bedded to massive; contains fossil plant fragments; bedding contorted; some crossbedding; weathers yellowish orange; forms rounded hills. Units 1 through 4 probably compose the sequence that Douglass (1914, p. 419) stated was not clearly Green River or Uinta. Sequence is 200 feet thick according to our measurement; Douglas (1914) measured 170 feet	40.0
	TOP OF GREEN RIVER FORMATION	

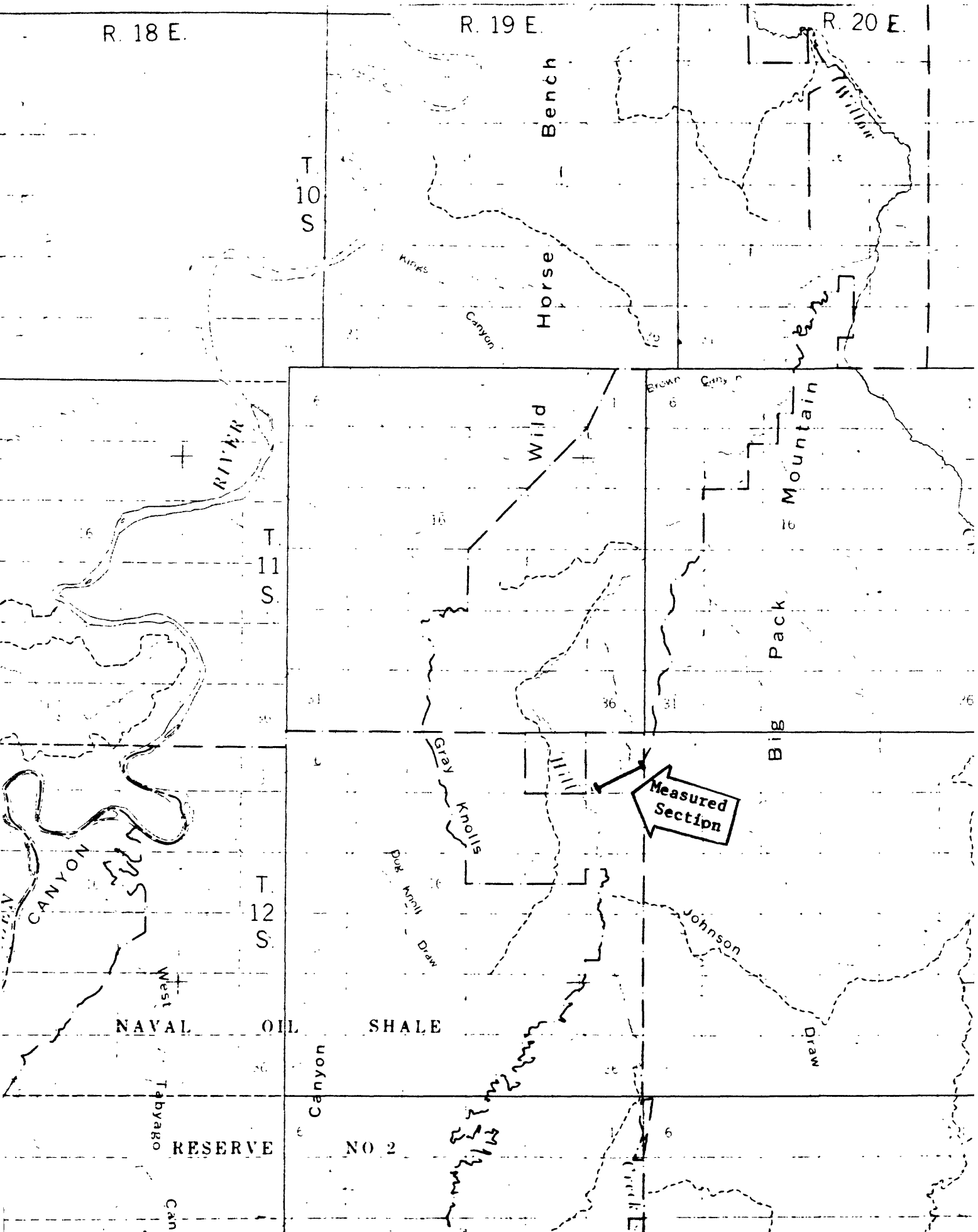

Figure 5.-- Map showing location of Hill Creek section

HILL CREEK SECTION, MEASURED ON EAST SIDE OF HILL CREEK ABOUT 2 MILES NORTH OF JOHNSON DRAW, sec. 1, T. 12 S., R. 19 E., Uintah County, Utah

[Measured by W. B. Cashion and R. W. Blair, Aug. 1969]

Unit	Description	Thickness (in feet)
	UINTA FORMATION (Basal part only):	
64	Mudstone, maroon	----
63	Siltstone and mudstone interbedded; weathers yellowish-gray and greenish-gray; forms ribbed cliff	80.0±
62	Sandstone, siltstone, and marlstone interbedded. The sandstones are fine to coarse grained; grain size and amount of crossbedding increase upward; siltstones are yellowish brown and mostly even bedded; marlstones are greenish gray. Unit includes a few thin lenses containing ripup clasts and upper part has abundant gypsum stringers. Upper part of unit weathers conspicuous yellowish orange, remainder is predominantly yellowish brown; forms steep slopes and minor ledges	174.0
	GREEN RIVER FORMATION: Parachute Creek Member (part):	
61	Marlstone, gray, silty; weathers to light gray slope	20.0
60	Siltstone and silty marlstone interbedded; thin bedded, fissile to platy; contains stringers of an unidentified secondary mineral which may have replaced saline minerals; weathers dusky yellow; forms steep slopes and knobby ledges	35.0
59	Sandstone and siltstone interbedded, grayish-orange. Sandstones are very fine grained, thin bedded; unit weathers grayish orange; forms slope	15.0

HILL CREEK SECTION--Continued

Unit	Description	Thickness (in feet)
58	Marlstone and siltstone interbedded, pale- to dark-yellowish-brown; marlstones are silty with low kerogen content; weathers light gray; forms slope	18.1
57	Sandstone, grayish-orange, very fine grained, thin and evenly bedded; weathers grayish orange; forms series of slopes and ledges	20.0
56	Siltstone and marlstone interbedded, yellowish-gray, thin-bedded; contains 0.1-ft-thick tuff 6.7 ft above base; tuff is pale yellowish brown, slightly biotitic and weathers grayish orange; marlstone and siltstone unit weathers yellowish gray speckled with yellowish-orange. There is a marked color change at base of this unit; rocks below weather mostly yellowish gray and greenish gray and those above are predominantly yellowish brown with some bands of light gray	11.0
55	Claystone, light-olive-gray, silty; weathers light olive; forms slope	10.0
54	Limestone, olive-gray and pale-yellowish-brown, very silty, thin-bedded; weathers yellowish gray; forms minor ledge	1.3
53	Marlstone, pale-yellowish-brown, silty, thin-bedded; low kerogen content	6.7
52	Limestone, pale-yellowish-brown, finely crystalline; contains minute grains of dark mineral; weathers pale orange; forms ledge	0.3
51	Marlstone, pale-yellowish-brown, thin-bedded, silty; very low kerogen content. Upper 2 to 3 feet is very silty; unit weathers greenish-gray	5.5
50	Tuff, medium-dark-gray; slightly biotitic; contains randomly oriented pale-yellowish-brown lenses up to 1/4 inch in length; load casts at base; weathers olive gray to dark orange; forms overhanging ledge	0.2

HILL CREEK SECTION--Continued

Unit	Description	Thickness (in feet)
49	Marlstone, dark-yellowish-brown, silty, thin-bedded; weathers greenish gray; forms slope	14.4
48	Tuff, pale-yellowish-orange; irregular top and bottom; contains weathered biotite; weathers yellowish orange	0.2
47	Marlstone, dark-yellowish-brown, silty; lower part contains a few thin limestone beds; upper 3.0 ft is very silty and contains abundant carbonaceous trash	32.0
46	Tuff, pale-yellowish-orange; contains weathered biotite(?); irregular top and bottom; weathers pale yellowish orange speckled with dark yellowish orange	0.3
45	Marlstone, pale-yellowish-brown, silty; weathers greenish gray; forms slope	7.0
44	Tuff, yellowish-gray, very biotitic; thickness varies from 0.5 to 1.0 ft; weathers yellowish gray; forms ledge	0.8
43	Marlstone, pale-yellowish-brown, silty; weathers greenish gray; forms slope	3.2
42	Tuff, yellowish-gray; biotitic, massive; thickness varies from 0.4 to 1.0 ft; weathers yellowish gray	0.6
41	Marlstone, pale-yellowish-brown, silty; contains 0.1 ft thick dark-gray siliceous tuff 0.8 ft above base; weathers greenish gray; forms slope	13.5
40	Limestone, pale-yellowish-brown, dolomitic, medium-bedded; weathers pale yellowish orange; forms bench	0.6
39	Marlstone, pale-yellowish-brown to dark-yellowish-brown; lower part silty; weathers pale greenish gray; forms slope	38.0

HILL CREEK SECTION--Continued

Unit	Description	Thickness (in feet)
38	Limestone, olive-gray, silty; weathers pale orange; forms minor bench	0.8
37	Marlstone, light-olive-gray to pale-yellowish-brown, thin-bedded; contains a few thin limestone beds; upper part weathers olive gray and forms slope; lower part weathers light gray and forms slope	16.3
36	Tuff, pale-yellowish-orange; weathers yellowish orange	0.1
35	Marlstone, pale-yellowish-brown; weathers light gray; contains 0.1-ft-thick tuff 11.0 ft above base; tuff is dark gray, dense, siliceous, and weathers dark bluish gray	16.5
34	Tuff, dark-yellowish-brown; dense; contains a few flakes of biotite; weathers pale orange	0.4
33	Marlstone, pale-yellowish-brown, thin-bedded; contains 0.1-ft-thick tuff 1.5 ft above base; tuff is medium gray, has irregular upper and lower contacts and contains minute biotite flakes. Marlstone weathers gray; forms slope.	11.0
32	Limestone, pale-yellowish-brown, laminated, dense; weathers grayish orange; forms prominent bench	0.7
31	Marlstone, pale-yellowish-brown, thin-bedded; weathers gray; forms slope	10.0
30	Limestone, pale-yellowish-brown, laminated, dense; weathers grayish orange; forms prominent bench	0.2
29	Tuff, light-gray with medium-brown speckles; irregular upper and lower contacts; weathers pale orange with rusty-brown speckles	0.1
28	Marlstone, pale-yellowish-brown, thin-bedded, argillaceous; weathers gray; forms slope	12.0

HILL CREEK SECTION--Continued

Unit	Description	Thickness (in feet)
27	Siltstone and marlstone interbedded; weathers light gray to yellowish orange; forms bench	3.0
26	Marlstone, light-olive-gray, thin-bedded; weathers light greenish gray; forms slope	8.5
25	Siltstone, olive-gray; limy, weathers grayish orange; forms minor bench	0.5
24	Marlstone, light-olive-gray, thin-bedded; weathers light greenish gray; forms slope; contains 0.7-ft-thick tuff 9.2 ft above base; upper and lower contacts of tuff are slightly irregular and upper surface has mosaic appearance; weathers pale yellowish orange	15.0
23	Tuff, medium-gray; abundant biotite at base, scattered biotite at top; slightly irregular upper contact; load casts at base; weathers grayish orange; breaks along joints to form "fence posts"	0.2
22	Marlstone, light-olive-gray, thin-bedded; weathers greenish gray; forms slope	2.5
21	Tuff, very light gray speckled with grayish-black; contains minute hematite concretions; relatively even upper and lower surfaces; weathers very pale orange to very pale yellowish orange speckled with dark reddish brown	0.2
20	Marlstone, light-olive-gray, thin-bedded; silty; contains thin oil shale 30.0 ft above base; contains tuffs as follows: (1) 0.04 ft thick 6 ft above base of unit, medium-gray, slightly biotitic at base; even upper contact, load structures at base. (2) 0.06 ft thick 10.8 ft above base of unit, pale-yellowish-brown, weathers pale-orange. (3) 0.03 ft thick 16.5 ft above base of unit, banded, yellowish-orange to light-gray; even upper and lower contacts; weathers pale-orange. (4) 0.04 ft thick 17.8 ft above base of unit, medium-light-gray, biotitic; even upper contact, slightly irregular lower contact. (5) 0.02 ft thick 26.5 ft above base	40.0

HILL CREEK SECTION--Continued

Unit	Description	Thickness (in feet)
19	Siltstone, pale-olive-gray, platy; weathers grayish orange	1.0
18	Marlstone, light-olive-gray, silty, thin-bedded; weathers greenish gray	8.0
17	Siltstone, pale-olive-gray, thin-bedded, platy; weathers grayish orange; forms prominent ledge	1.0
16	Marlstone, light-olive-gray, silty, thin-bedded; kerogen content is low; weathers greenish gray; forms slope; contains tuffs as follows: (1) 0.05 thick 15 ft above base of unit, medium-gray; contains minute biotite flakes; even upper surface; weathers pale yellowish orange. (2) 0.05 ft thick 16.5 ft above base of unit, medium-gray	26.5
15	Tuff, medium-light-gray; granular texture; abundant biotite flakes	0.1
14	Marlstone, dark-yellowish-brown, silty, thin-bedded; weathers light gray; forms slope	11.0
13	Marlstone, dark-yellowish-brown, silty, thin-bedded; weathers light gray; forms slope. At top of unit are two yellowish-gray 0.07 ft thick tuffs with abundant minute biotite flakes and even upper and lower surface; weathers very pale orange	2.3
12	Tuff, very pale orange; abundant biotite; biotite is slightly weathered; unit has irregular base and even top; weathers grayish orange; breaks along joints to form "fence posts"	0.3
11	Marlstone, dark-yellowish-brown, silty, thin-bedded; weathers light gray; forms slope	2.5

HILL CREEK SECTION--Continued

Unit	Description	Thickness (in feet)
10	Marlstone, dark-yellowish-brown, silty, thin-bedded; weathers light gray; forms slope. At top of unit there is a 0.05-ft-thick bluish-gray tuff that contains a few tiny biotite flakes and weathers bluish gray	1.5
9	Oil shale, brownish-black, silty; abundant iron stains on bedding planes; low kerogen content; weathers light bluish gray; forms ledge	0.2
8	Marlstone, dark-yellowish-brown, thin-bedded; silty; weathers light gray; forms slope	3.5
7	Tuff, pale-yellowish-gray; contains abundant small flakes of biotite; weathers yellowish orange with brownish-black spots	0.5
6	Marlstone, dark-yellowish-brown, thin-bedded, silty; weathers light gray; forms slope	2.0
5	Marlstone, dark-yellowish-brown, thin-bedded, silty; weathers light gray; forms slope; contains 0.1 ft thick tuff at top. Tuff is light bluish gray, irregularly banded, irregular on upper and lower surfaces; abundant biotite in basal part; weathers light gray; forms ledge	5.1
4	Tuff, very light gray, finely crystalline; abundant small biotite flakes; even upper and lower surface; contains irregular veins of calcareous material; weathers light gray; breaks along joints to form "fence posts"	0.3
3	Marlstone, dark-yellowish-brown, thin-bedded; weathers light greenish gray; contains tuffs as follows: (1) 0.002 ft thick 14.5 ft above base. (2) 0.03 ft thick 17.0 ft above base; weathers dark yellowish orange	31.0

HILL CREEK SECTION--Continued

Unit	Description	Thickness (in feet)
2	Marlstone, dark-yellowish-brown, thin-bedded; low kerogen content; weathers to light greenish gray. At top of unit there is a dark yellowish brown tuff, 0.03-0.07 ft thick; biotitic; irregular upper surface and even lower surface; weathers yellowish brown and yellowish orange; forms ledge	4.3
1	Horse Bench Sandstone Bed	----

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