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WESTERN GAS SANDS PROJECT

Production Histories of the Piceance and Uinta Basins of Colorado and Utah

November 20, 1980

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CONTENTS

	Page
1. INTRODUCTION	1
2. LOCATION	2
3. OBJECTIVE	4
4. EXPLANATION OF TABLES AND FIGURES	5
5. CONCLUSION	31
6. REFERENCES	32

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FIGURES

	Page
Figure 1 Index Map	3
Figure 2 Uinta Production	16
Figure 3 Green River Production	17
Figure 4 Wasatch Production	18
Figure 5 Mesaverde Production (Continental)	19
Figure 6 Rollins, Cozette, Corcoran Production (Marine Mesaverde)	20
Figure 7 Castlegate Production (Marine Mesaverde)	21
Figure 8 Mancos Production	22
Figure 9 Dakota Production	23
Figure 10 Cedar Mountain Production	24
Figure 11 Morrison Production	25
Figure 12 Entrada Production	26
Figure 13 Navajo Production	27
Figure 14 Shinarump Production	28
Figure 15 Moenkopi Production	29
Figure 16 Weber Production	30

TABLES

	Page
Table 1 Principal Oil and Gas Fields in the Piceance Basin, Colorado	6
Table 2 Principal Oil and Gas Fields in the Uinta Basin, Utah	9
Table 3 Piceance Basin Production Histories	11
Table 4 Uinta Basin Production Histories	14

1. INTRODUCTION

The Western Gas Sands Project was initiated by the United States Department of Energy in 1977 to investigate the resource of natural gas existing in low permeability reservoirs. The Greater Green River, Piceance and Uinta Basins, and Northern Great Plains Province, containing low permeability, gas bearing formations, were designated as target areas.

A geological data base is being generated for the low permeability formations in these target areas from subsurface geological data and from data on producing wells that penetrate these formations. This report summarizes the production histories of the Piceance and Uinta Basins and is intended to accompany the *Western Gas Sands Project: Stratigraphy of the Piceance Basin*, by Anderson (1980).

2. LOCATION

The Piceance Basin is located in northwestern Colorado (Figure 1). The basin is bound by an almost continuous outcrop of the Tertiary-Cretaceous contact and strong structural boundaries. The Uinta Mountains and Axial Basin Uplift form the northern border. The White River Uplift, which is represented by the spectacular Grand Hogback, forms the eastern boundary. The Uncompahgre Uplift and Douglas Creek Arch form the southwestern and western boundaries, respectively.

The Uinta Basin, located in northeastern Utah (Figure 1), is bound on the west and northwest, respectively, by the High Plateaus Province and the eastern slopes of the Wasatch Mountains. Northward, the south flank of the Uinta Mountains defines the basin. The southern margin of the basin extends to the rim of the Tavaputs Plateau. The eastern boundary is not clearly defined by topography, but here is considered to be the Douglas Creek Arch in northwestern Colorado.

The Douglas Creek Arch provides a north-south structural high that forms a natural boundary between the Uinta Basin to the west and the Piceance Basin to the east. In this report, Douglas Creek Arch production is included in that of the Piceance Basin.

Some fields listed in this report are located south and north of the defined basins. They have been included to enhance the production trends and statistics.

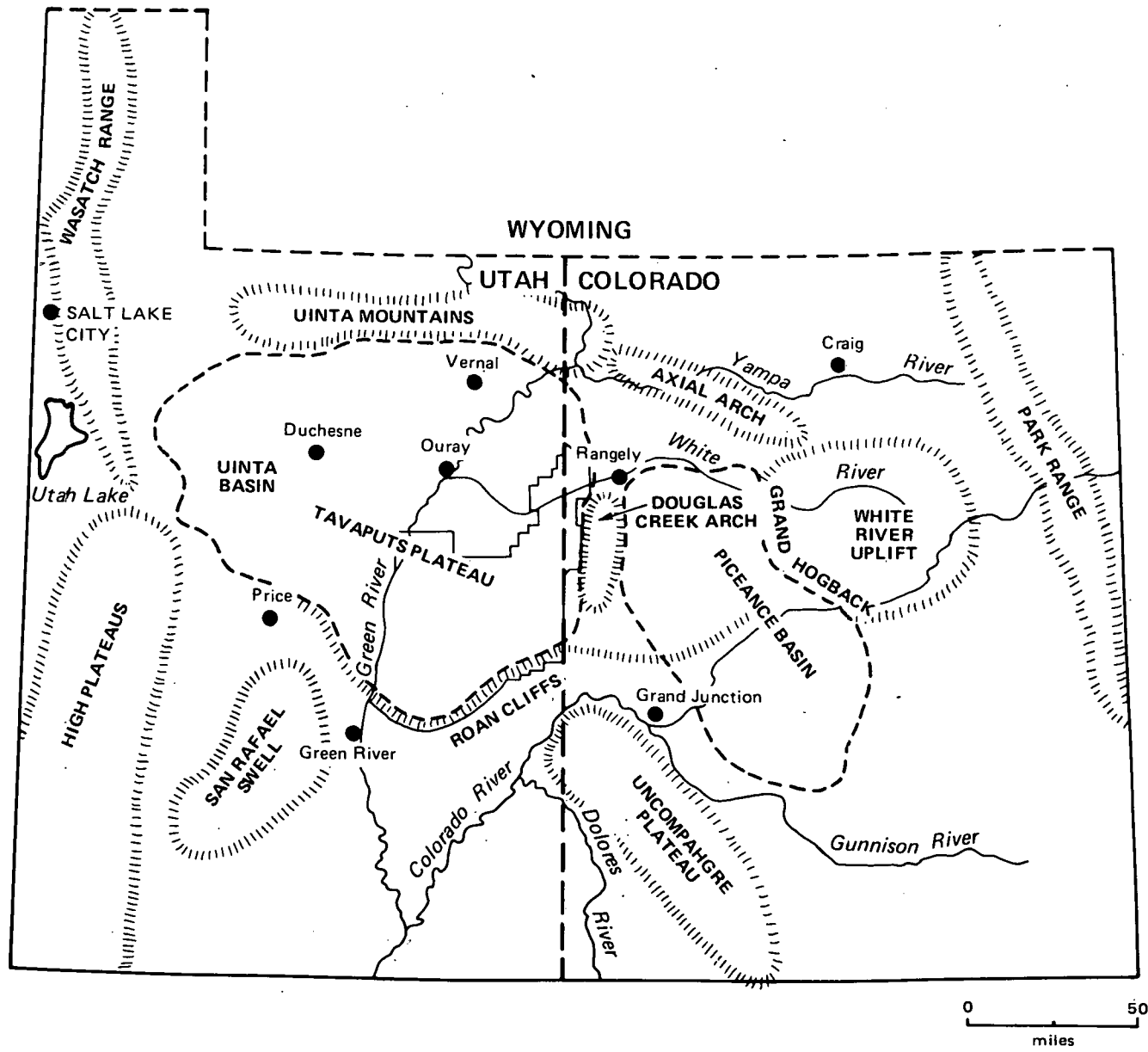


Figure 1 Area of Report and Adjacent Structural and Physiographic Features
(Modified from Cashion, 1967)

3. OBJECTIVE

The objective of this report is to provide a general overview of oil and gas production in the Piceance and Uinta Basins through December, 1979. The overview will aid in: identifying potentially commercial tight gas sand areas by defining production trends; determining the relative amount tight formations have contributed through 1979 to total Piceance and Uinta Basin Production; and substantiating the natural gas potential of tight formations based on potential gas in place estimates.

4. EXPLANATION OF TABLES AND FIGURES

Tables 1 through 4 were compiled from reports by Petroleum Information Corporation, (1979) and Stowe (1979). Tables 1 and 2 give production histories for individual fields. Columns 1 and 2 define the general location of fields with township, range and county. Columns 3 through 8 give the field name, discovery year, producing formations, cumulative production in barrels of oil and thousands of cubic feet of gas and current number of producing wells, respectively.

Tables 3 and 4 show the history of individual or combined formation production. Column 1 gives the formation name or commingled formation names when a single formation could not be determined. Column 2 lists the formation production in barrels of oil and thousands of cubic feet of gas. Column 3 is the percent of oil and gas each formation or combined formations has contributed to total production.

Production distribution is shown in red on Figures 2 through 16. These are arranged in order of decreasing age from the Pennsylvanian-Permian Weber Sandstone to the Tertiary Uinta Formation. No attempt was made to visually represent formation production percentages in a field with more than one producing formation.

Mancos production includes the Emery, Mancos A and B, Morapos, Niobrara and Mowry (Figure 8). The Mesaverde Group is separated into continental (Figure 5) and marine (Rollins, Cozzette, Corcoran and Castlegate) production. (Figures 6 and 7).

Table 1 Principal Oil and Gas Fields in the Piceance Basin, Colorado

Location	County	Field Name	Discovery Year	Producing Formation(s)	Cumulative Production Through Dec. 1979		Current Producing Wells
					Oil (BBLs)	Gas (MCF)	
9S, 100W	Mesa	Asbury Creek	1949	Dakota	0	2,406,841	0
7S, 90W	Garfield	Baldy Creek	1959	Cozzette, Corcoran	0	5,922	0
8-9S, 103W	Mesa	Bar X	1953	Dakota, Morrison, Saltwash	21,289	4,199,504	2
4-5S, 103W	Rio Blanco	Baxter Pass	1977	Dakota, Morrison	794	576,730	1
5S, 102W	Garfield	Baxter Pass So.	1978	Morrison, Entrada	0	96,151	2
4S, 102W	Rio Blanco	Blue Cloud	1978	Mancos A and B	0	263,703	3
4S, 102W	Rio Blanco	Boondocks	1970	Dakota	0	3,116	0
8S, 104W	Garfield	Bridal	1979?	Dakota, Morrison	0	2,001,292	7
9S, 94-95W	Mesa	Buzzard	1958	Mesaverde, Cozzette	0	1,452,343	3
9S, 93W	Mesa	Buzzard Creek	1955	Cozzette	0	4,417,778	1
9S, 99W	Mesa	Cameo	1961	Dakota	0	29,238	0
7S, 103W	Garfield	Carbonera	1957	Buckhorn	121	945,539	2
3S, 100W	Rio Blanco	Cathedral	1975	Mancos A and B, Emery, Dakota	1,386	4,237,340	63
8S, 101W	Mesa	Coal Gulch	1966	Mesaverde	0	110,524	1
2N, 97W	Rio Blanco	Colorow	1979	Mesaverde	12,400	160,740	1
1S, 99W	Rio Blanco	Corral Creek	1979	Mancos B	0	33,102	0
5-6N, 95-96W	Moffat	Danforth Hills	1954	Dakota, Morrison, Entrada, Shinarump, Weber	3,320,912	302,654	4
5N, 96N	Moffat	Danforth Hills North	1958	Morrison	361,289	113,849	3
3N, 104W	Rio Blanco	Dinosaur	1970	Mancos B	107	0	0
7-9S, 91W	Garfield Mesa	Divide Creek	1956	Cozzette, Corcoran	0	44,066,622	6
2-3S, 100-102W	Rio Blanco	Douglas Creek	1943	Mancos B, Dakota	0	21,837,400	17
1S, 101-102W	Rio Blanco	Douglas Creek North	1956	Mancos A and B	16,187	16,571,685	19
2-3S, 101-103W	Rio Blanco	Douglas Creek South	1963	Mancos B, Niobrara, Dakota, Morrison, Buckhorn	216	1,587,035	17
2S, 102W	Rio Blanco	Douglas Creek West	1953	Mancos	337	18,509,428	10
5S, 102W	Garfield	Douglas Pass	1978	Dakota, Morrison	123	580,171	3
2-3S, 102-103W	Rio Blanco	Dragon Trail	1959	Mancos B	6,661	88,243,364	90

Continued

Table 1 Continued

Location	County	Field Name	Discovery Year	Producing Formation(s)	Cumulative Production Through Dec. 1979		Current Producing Wells
					Oil (BBLs)	Gas (MCF)	
1-2S, 101-102W	Rio Blanco	Dragon Trail North	1961	Mancos B	17,179	253,136	2
5N, 98-99W	Moffat	Elk Springs	1926	Weber	528,723	13,030	0
4S, 102W	Rio Blanco	Evacuation Creek	1977	Mancos B	0	135,814	2
4-5S, 102W	Rio Blanco-Garfield	Foundation Creek	1973	Mancos B, Dakota, Morrison, Cedar Mountain, Buckhorn	6,818	1,222,515	16
7-8S, 101-102W	Garfield	Garmosa	1925	Dakota	2	7,135,214	0
1N, 101-102W	Rio Blanco	Gillam Draw	1956	Dakota	0	84,718	0
11S, 94-95W	Mesa	Grand Mesa	1958	Mesaverde	0	741	0
8S, 92W	Mesa	Hells Gulch	1964	Mesaverde	0	150,297	0
2S, 103-104W	Rio Blanco	Hells Hole	1951	Castlegate	0	368,055	0
8-9S, 101-102W	Mesa	Highline Canal	1951	Morrison	0	273,417	0
8S, 96-100W	Mesa	Horsethief Creek	1964	Wasatch	0	141,282	0
8S, 100W	Mesa	Hunters Canyon	1955	Mesaverde	0	2,069,987	3
3-4N, 91-93W	Moffat	Iles	1924	Morrison, Entrada	18,309,202	2,022,991	7
2S, 103W	Rio Blanco	Lower Horse Draw	1960	Mancos B, Emery, Dakota, Morrison	10,056	38,167,668	38
2N, 2-3W	Mesa	Mack Creek	1957	Morrison	0	251,178	0
6-7S, 93W	Garfield	Mam Creek	1959	Mesaverde	443	726,655	2
4N, 95W	Moffat	Maudlin Gulch	1947	Dakota, Morrison, Entrada, Weber	7,027,806	1,364,487	9
4-5N, 91W	Moffat	Moffat	1924	Dakota, Mancos, Niobrara, Entrada, Shinarump	9,386,385	298,354	5
2N, 92-93W	Rio Blanco	Nine Mile	1966	Dakota	952,071	0	3
2S, 101W	Rio Blanco	Philadelphia Creek	1977	Mancos B	62	596,359	16
1-2S, 95-97W	Rio Blanco	Piceance Creek	1930	Wasatch, Mesaverde	109,146	167,946,649	50
3S, 95-96W	Rio Blanco	Piceance Creek South	1954	Green River, Douglas Creek	2,292	2,179,591	1
3N, 86-87W	Rio Blanco	Pinnacle	1956	Shinarump, Dakota	114,416	71,629	1
10S, 95-97W	Mesa	Plateau	1958	Cozzette, Corcoran	0	7,892,423	28
1N, 94-95W	Rio Blanco	Powell Park	1957	Wasatch, Mesaverde	3,794	259,522	0

Continued

Table 1 Continued

Location	County	Field Name	Discovery Year	Producing Formation(s)	Cumulative Production Through Dec. 1979		Current Producing Wells
					Oil (BBLs)	Gas (MCF)	
7-8S, 103W	Garfield	Prairie Canyon	1958	Dakota, Buckhorn, Morrison	0	2,180,327	2
1-3N, 101-104W	Rio Blanco	Rangely	1902	Mancos, Morrison, Weber	616,161,587	685,797,485	427
9-10S, 98-99W	Mesa	Roberts Canyon	1960	Dakota	0	375,773	0
8S, 103W	Mesa	Rock	1977	Dakota	628	0	0
5S, 102W	Garfield	Rock Canyon	1957	Saltwash, Dakota	0	325,130	2
2S, 100W	Rio Blanco	Rocky Point	1976	Mancos	4,425	576	0
6-7S, 93-95W	Garfield	Rulison	1956	Wasatch, Cozzette, Corcoran	0	4,292,344	12
1-2S, 98-100W	Rio Blanco	Sage Brush Hills	1979	Wasatch, Mancos, Dakota, Mesaverde	0	21,858	0
9S, 92W	Mesa	Sheep Creek	1958	Morapos	0	67,010	0
9-10S, 96-97W	Mesa	Shire Gulch	1960	Cozzette, Corcoran	2,776	170,317	3
4-5S, 100-101W	Rio Blanco Garfield	Soldier Canyon	1977	Dakota	200	82,959	3
6-7S, 101-103W	Garfield	South Canyon	1957	Dakota	75	18,084,835	47
2-3S, 97-99W	Rio Blanco	Sulphur Creek	1955	Mesaverde, Fort Union, Mancos B, Wasatch, Green River	1,832	1,651,554	4
3S, 98-99W	Rio Blanco	Sulphur Creek South	1957	Green River	0	398,847	0
4N, 95W	Moffat	Temple Canyon	1953	Shinarump, Dakota	174,667	17,659	1
3S, 102W	Rio Blanco	Texas Mountain	1964	Dakota, Castlegate, Mancos, Morapos	54,487	7,645,613	10
3N, 91-92W	Moffat- Rio Blanco	Thornburg	1925	Dakota, Weber, Entrada	753,686	19,180,918	1
4S, 101-102W	Rio Blanco	Thunder	1976	Mancos B, Dakota	139	958,762	18
4-5S, 101W	Rio Blanco Garfield	Trail Canyon	1975	Mancos B, Dakota	1,775	3,092,074	26
5S, 101-102W	Garfield	Twin Buttes	1951	Dakota, Morrison, Entrada, Niobrara	3,713	3,658,532	3
9-10S, 93W	Mesa	Vega	1977	Cozzette	217	66,257	0
1-2N, 96-97W	Rio Blanco	White River	1890	Mesaverde, Wasatch	8,328	5,785,951	12
2-3N,	Rio Blanco	Wilson Creek	1938	Morrison, Entrada	80,169,354	58,679,179	18
4N, 98-99W	Moffat	Winter Valley	1958	Dakota	286,688	12,775,675	0
8-9S, 89-90W	Pitkin	Wolf Creek	1960	Cozzette	0	12,675,758	0

Table 2 Principal Oil and Gas Fields in the Uinta Basin, Utah

Location	County	Field Name	Discovery Year	Producing Formation(s)	Cumulative Production Through Dec. 1979		Current Producing Wells
					Oil (BBLs)	Gas (MCF)	
13S, 21E	Uintah	Agency Draw	1962	Wasatch	913	740	0
1N-3S, 3-5W	Duchesne	Altamont	1970	Green River - Wasatch	53,645,408	76,770,194	150
5S, 22E	Uintah	Ashley Valley	1948	Morrison, Phosphoria, Weber, Entrada	18,523,426	0	20
17S, 25-26E	Grand	Bar X	1948	Buckhorn, Dakota, Salt Wash, Entrada, Morrison	856	18,224,265	10
3S, 6-7W	Duchesne	Blacktail Ridge	1966	Green River	4,810	11,602	0
1N-2S, 2E-3W, 5S, 19E	Duchesne	Bluebell	1954	Green River	64,234,331	66,452,365	145
3S, 4W	Duchesne	Blue Bench	1972	Green River	191,068	526,373	1
9S, 24E	Uintah	Bonanza	1966	Wasatch	0	266,583	0
18-22E	Grand	Book Cliffs	1961	Dakota	0	377,528	1
7S, 20E	Uintah	Brennan Bottom	1954	Green River	811,921	800,501	3
17S, 24E	Grand	Bryson Canyon	1963	Castlegate, Dakota, Cedar Mountain	0	8,907,937	4
9S, 16E	Duchesne	Castle Peak	1963	Green River	129,496	135,658	2
3S, 6-7W	Duchesne	Cedar Rim	1969	Wasatch, Green River	8,130,070	13,989,812	37
7S, 4W	Duchesne	Chokecherry Canyon	1959	Green River	7,340	6,224	0
19-21S, 21-24E	Grand	Cisco Area	1925	Dakota-Cedar Mountain, Morrison	97,789	5,322,566	14
21S, 23-24E	Grand	Cisco Townsite	1925	Morrison	436	0	0
8S, 25E	Uintah	Coyote Basin	1964	Green River, Wasatch, Mesaverde	822,934	293,519	8
17S, 22E	Grand	Diamond Ridge	1960	Dakota-Cedar Mountain, Morrison	0	261,455	0
4S, 4W	Duchesne	Duchesne	1951	Wasatch, Green River, Uinta	614,109	209,010	1
16S, 24-25E	Grand	East Canyon	1962	Dakota-Cedar Mountain, Morrison	3,022	5,833,366	4
15S, 12E	Carbon	Farnham Dome	1924	Navajo	0	2,547,418	0
15S, 22-23E	Grand-Uintah	Ferice Canyon	1960	Dakota-Cedar Mountain, Morrison	1,180	4,550,535	4
3S, 5W	Duchesne	Flat Mesa	1952	Green River	54,500	0	0
14S, 20E	Uintah	Flat Rock	1963	Wasatch	38,010	159	0
16S, 12E	Carbon-Emery	Grassy Trail	1961	Moenkopi	161,469	5	1
20S, 24E	Grand	Gravel Pile	1964	Dakota-Cedar Mountain, Morrison	2,587	35,814	1

Continued

Table 2 Continued

Location	County	Field Name	Discovery Year	Producing Formation(s)	Cumulative Production Through Dec. 1979		Current Producing Wells
					Oil (BBLs)	Gas (MCF)	
5S, 19E	Uintah	Gusher	1950	Green River	68,669	29,245	0
16S 23E	Grand	Horse Point	1961	Dakota-Cedar Mountain	0	1,601,898	1
6-7S, 21-22E	Uintah	Horsehoe Bend	1964	Uinta, Green River	161,031	13,200,322	8
10S, 19-20E	Uintah	Island	1961	Wasatch	8,617	5,149,624	14
19S, 21E	Grand	Left Hand Canyon	1972	Entrada	20,003	59	0
16S, 21E	Grand	Moon Ridge	1962	Dakota-Cedar Mountain	0	1,357,136	0
9-11S, 20-23E	Uintah	Natural Buttes	1956	Wasatch, Mesaverde	145,380	61,040,043	114
12S, 24E	Uintah	Oil Springs	1964	Wasatch	19,219	1,978,783	1
9S, 19E	Uintah	Pariette Bench	1962	Green River	480,117	341,808	6
18S, 23E	Grand	Pear Park	1976	Dakota-Cedar Mountain	0	112,397	1
12-13S, 16-17E	Carbon	Peters Point	1963	Green River, Wasatch, Mesaverde	109,782	1,725,854	10
7S, 24E	Uintah	Powder Springs	1965	Green River	0	7,346,110	2
3S, 2E	Uintah	Randlett	1970	Green River	5,578	0	0
7-8S, 20-24E 17S, 24E	Uintah	Red Wash	1951	Green River, Mesaverde, Wasatch	107,621,940	291,681,224	228
8S, 20E	Uintah	Refuge	1967	Green River	14,318	9,931	0
11S, 23-24E	Uintah	Rockhouse	1960	Wasatch, Mesaverde	8,570	7,167,793	5
1S, 1W-1E	Uintah	Roosevelt	1949	Green River	3,220,682	334,719	2
16-17S, 24-26E	Grand	San Arroyo	1955	Mancos, Dakota-Cedar Mountain, Morrison, Entrada	129,502	72,050,038	31
13S, 21-22E	Uintah	Seep Ridge	1972	Dakota, Morrison	2,648	2,617,091	4
16-17S, 21E	Grand	Segundo Canyon	1963	Dakota-Cedar Mountain	704	1,092,840	0
20S, 24E	Grand	Seiber Nose	1955	Morrison	15,584	0	1
10S, 23E	Uintah	Southman Canyon	1962	Wasatch, Mesaverde	1,868	679,403	0
4S, 5W	Duchesne	Starvation	1971	Green River	266,044	848,405	3
17S, 25-26E	Grand	Stateline	1963	Morrison, Entrada, Dakota-Cedar Mountain	2,739	1,564,759	3
10S, 18E	San Juan	Uteland Butte	1961	Wasatch	408	366,447	0
7S, 22-24E	Uintah	Walker Hollow	1952	Green River	1,749,285	8,058,350	10
10S, 17E	Duchesne	Wells Draw	1963	Green River	16,467	0	0
17S, 24E	Grand	Westwater	1952	Morrison, Entrada, Castlegate, Dakota	12,256	31,187,375	0
8S, 22E	Uintah	White River	1951	Green River, Wasatch	2,272,663	1,619,547	8
7-8S, 21-22E	Uintah	Wonsits Valley	1959	Green River	0	80,377	0

Table 3 Piceance Basin Production Histories

Producing Formation(s)	Cumulative Production (through 1979)	Percent of Total Production
Green River (undifferentiated)	398,847 MCF 583 BBL	.04 .00
Douglas Creek	52,676,591 MCF 2,180 BBL	4.91 .00
Wasatch	17,973,061 MCF 106,767 BBL	1.68 .02
Fort Union	2,534 MCF (Test) 122 BBL	.00 .00
Lance	741 MCF (Test)	.00
Mesaverde (undifferentiated)	4,979,328 MCF 19,686 BBL	.46 .00
Mesaverde (continental)	641,075 MCF 3,150 BBL	.06 .00
Cozzette	17,071,129 MCF	1.59
Castlegate	2,298,932 MCF	.21
Emery	577,438 MCF	.05
Mancos (undifferentiated)	2,673,532 MCF 10,282,721 BBL	.25 1.42
Mancos A	888,186 MCF	.08
Mancos B	41,469,677 MCF 33,805 BBL	3.87 .00
Morapos	17,328,960 MCF	1.62
Niobrara	88,487 MCF 61,458 BBL	.00 .01
Mowry	56,872 BBL	.01

Continued

Table 3 Continued

Producing Formation(s)	Cumulative Production (through 1979)	Percent of Total Production
Dakota	54,859,400 MCF 5,684,964 BBL	5.12 .79
Cedar Mountain	387,328 MCF 6,787 BBL	.04 .00
Buckhorn (Cedar Mountain)	1,032,697 MCF 121 BBL	.10 .00
Morrison	57,101,276 MCF 57,371,677 BBL	5.33 7.98
Saltwash (Morrison)	234,488 MCF	.02
Entrada	14,461,260 MCF 26,018,430 BBL	1.34 3.62
Shinarump	1,323 MCF 154,769 BBL	.00 .02
Weber	689,887,666 MCF 607,218,440 BBL	64.34 84.43
Commingled:		
Mesaverde, Corcoran	1,256,756 MCF	.12
Rollins, Cozzette, Corcoran	1,478,057 MCF	.14
Cozzette, Corcoran	53,062,584 MCF	4.94
Mancos, Emery	30,835,303 MCF 72 BBL	2.88 .00
Mancos, Dakota	1,166 MCF	.00
Mancos B, Dakota	178,361 MCF	.02

Continued

Table 3 Continued

Producing Formation(s)	Cumulative Production (through 1979)	Percent of Total Production
Mancos, Dakota, Morrison, Entrada, Shinarump	84,155 MCF 8,335,896 BBL	.01 1.16
Dakota, Buckhorn	518,678 MCF	.05
Dakota, Buckhorn, Morrison	2,180,327 MCF	.02
Dakota, Morrison	3,740,633 MCF 796 BBL	.35 .00
Dakota, Saltwash	198,148 MCF 19,631 BBL	.02 .00
Dakota, Weber	556,511 MCF	.05
Morrison, Saltwash	238,000 MCF	.02
Morrison, Entrada	764,077 MCF 3,779,511 BBL	.07 .53
Totals	1,072,126,712 MCF 719,158,368 BBL	99.80 99.90

Table 4 Uinta Basin Production Histories

Producing Formation(s)	Cumulative Production (through 1979)	Percent of Total Production
Uinta	58,374 MCF 560,950 BBL	.01 .21
Green River (undifferentiated)	307,399,155 MCF 121,338,198 BBL	43.03 46.15
Wasatch	219,863,585 MCF 111,789,139 BBL	30.78 43.00
Mesaverde (undifferentiated)	4,580,474 MCF 22,945 BBL	.64 .01
Mancos (undifferentiated)	2,848,783 MCF 5,567 BBL	.40 .00
Dakota	18,381,975 MCF 112,571 BBL	2.57 .04
Cedar Mountain	8,919,753 MCF 3,104 BBL	1.25 .00
Morrison	12,631,918 MCF 243,429 BBL	1.77 .09
Entrada	3,289,734 MCF 27,794 BBL	.46 .01
Weber	18,523,426 BBL	7.05
Commingled:		
Uinta, Green River	13,200,322 MCF 161,031 BBL	1.85 .61
Green River, Wasatch	10,145,540 MCF 9,990,184 BBL	1.42 4.00
Wasatch, Mesaverde	765,492 MCF 3,728 BBL	.11 .00

Continued

Table 4 Continued

Producing Formation(s)	Cumulative Production (through 1979)	Percent of Total Production
Dakota, Cedar Mountain	297,569 MCF	.04
Dakota, Cedar Mountain, Morrison	41,493,504 MCF 12,262 BBL	5.80 .00
Dakota, Morrison	1,794,580 MCF 2,284 BBL	.25 .00
Dakota, Cedar Mountain, Morrison, Entrada	68,558,148 MCF 122,180 BBL	9.59 .00
Totals	714,228,906 MCF 262,918,792 BBL	99.97 101.17

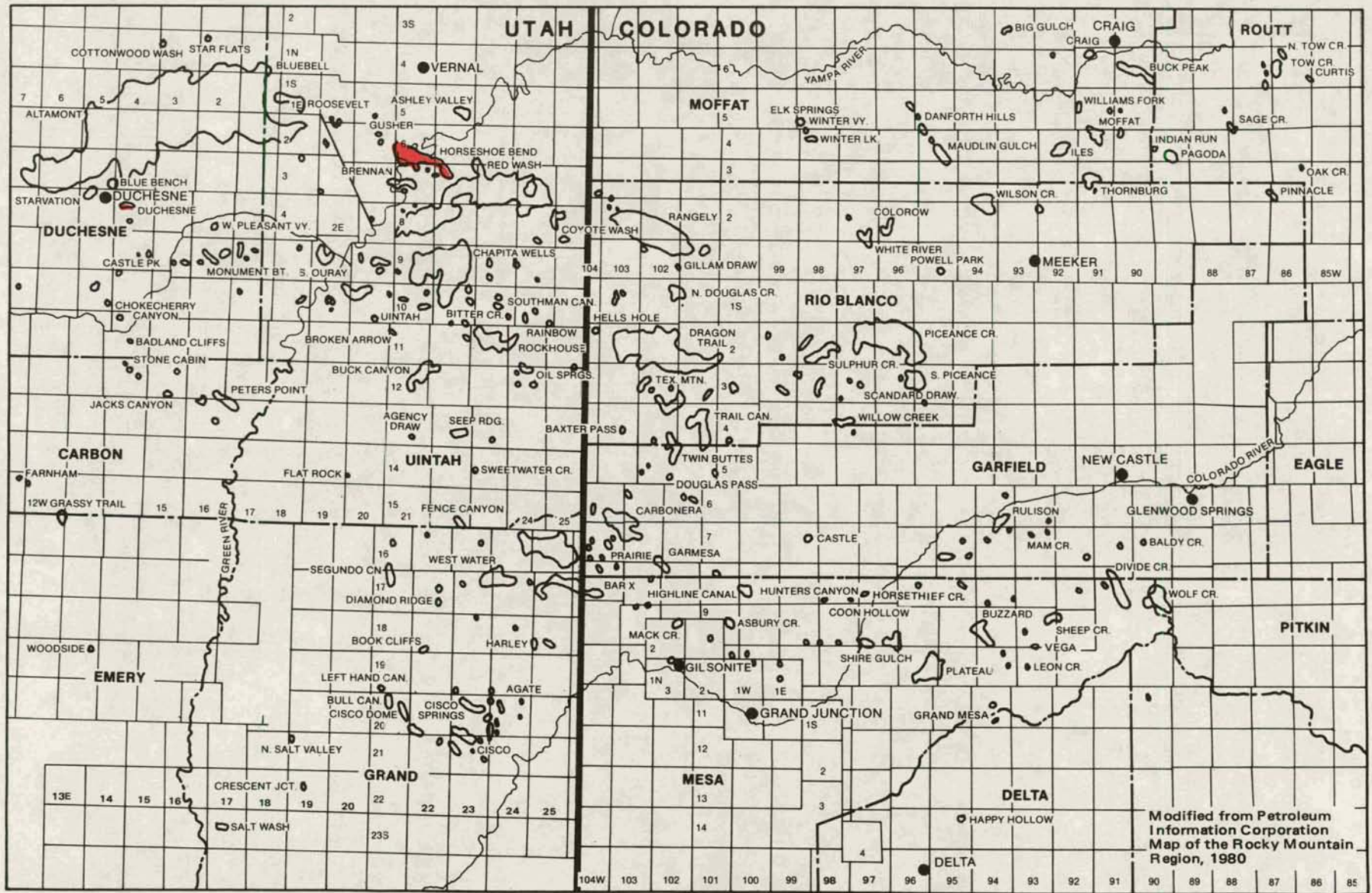


Figure 2 Uinta Production

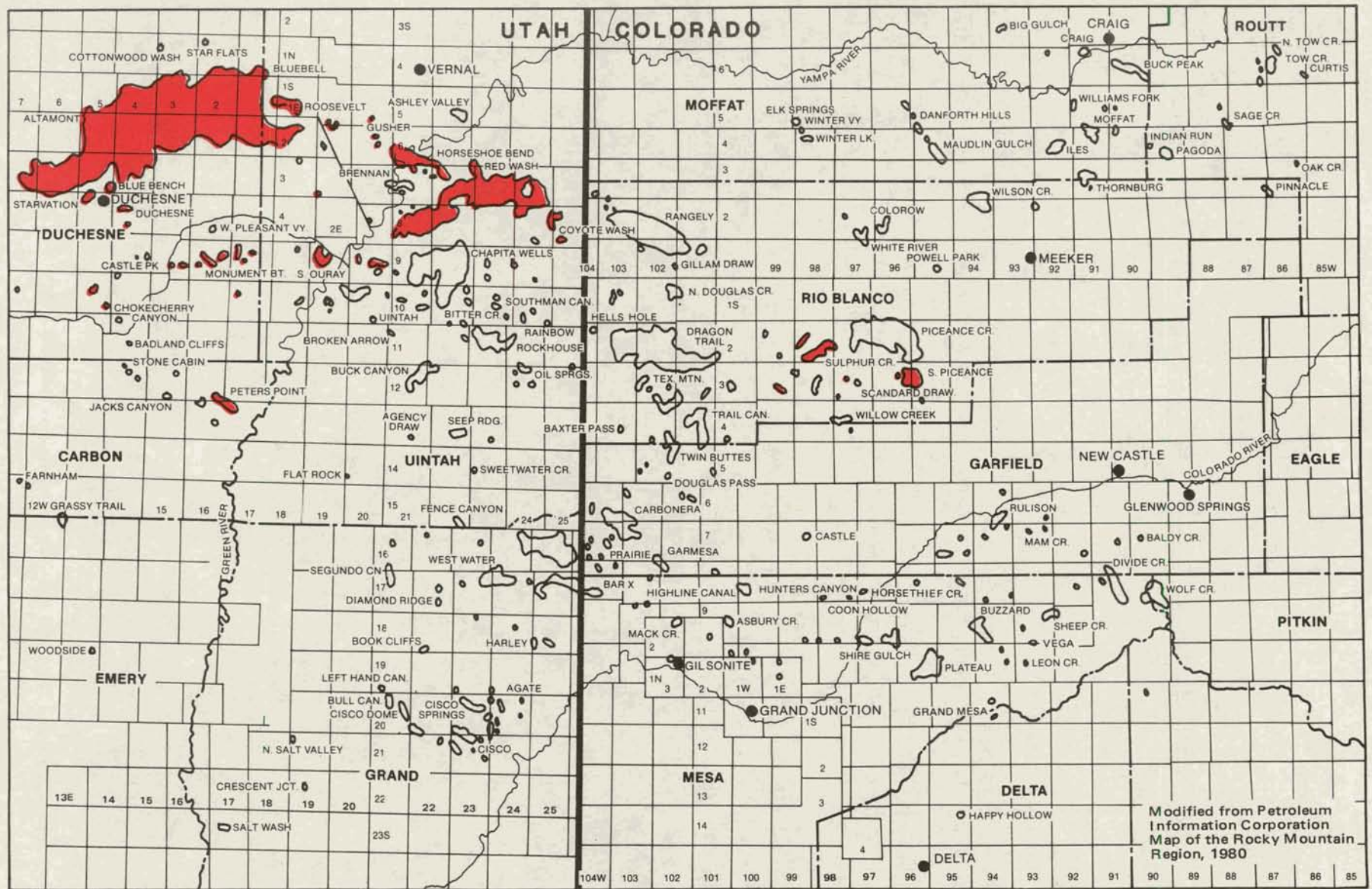


Figure 3 Green River Production

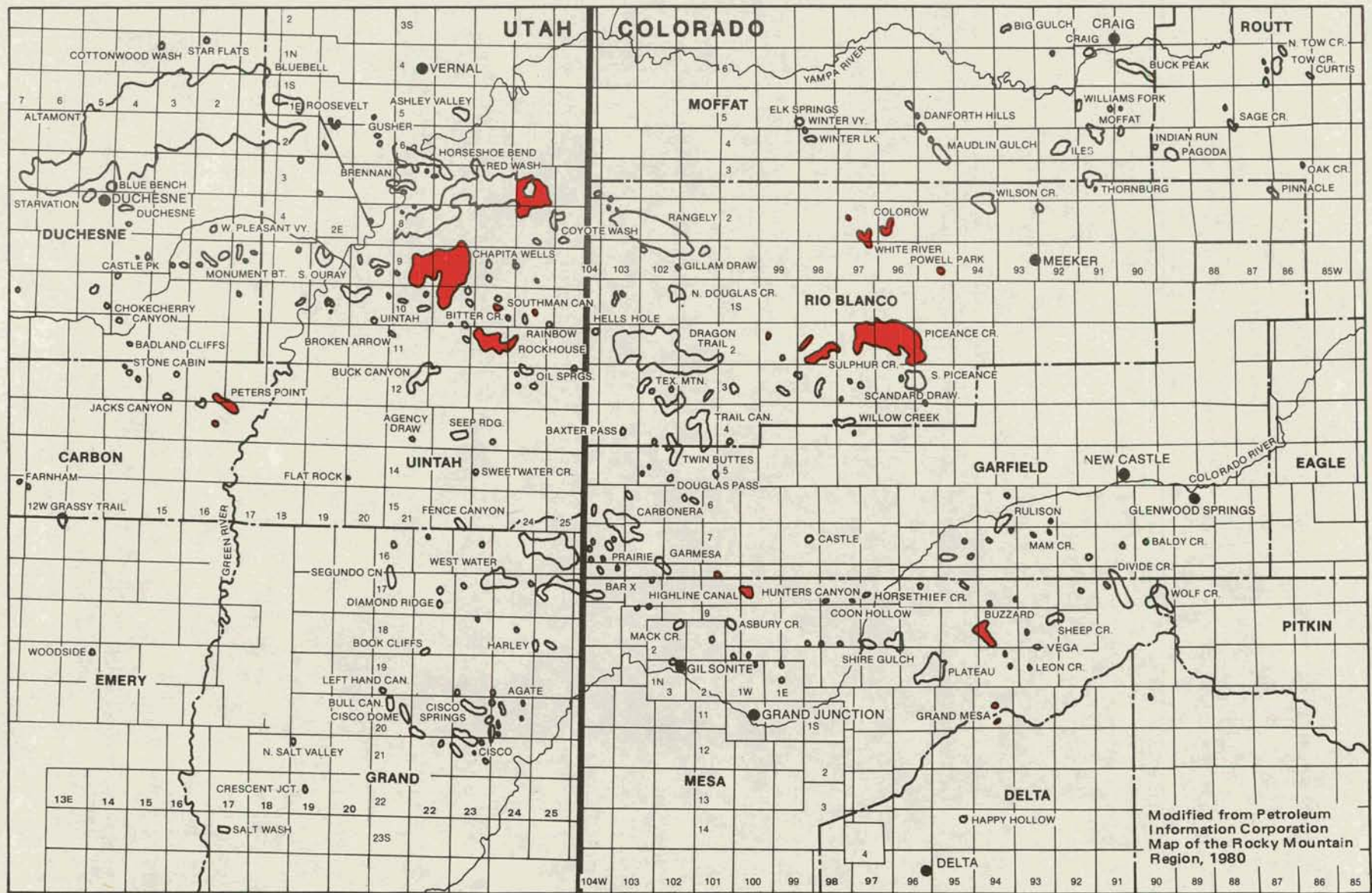
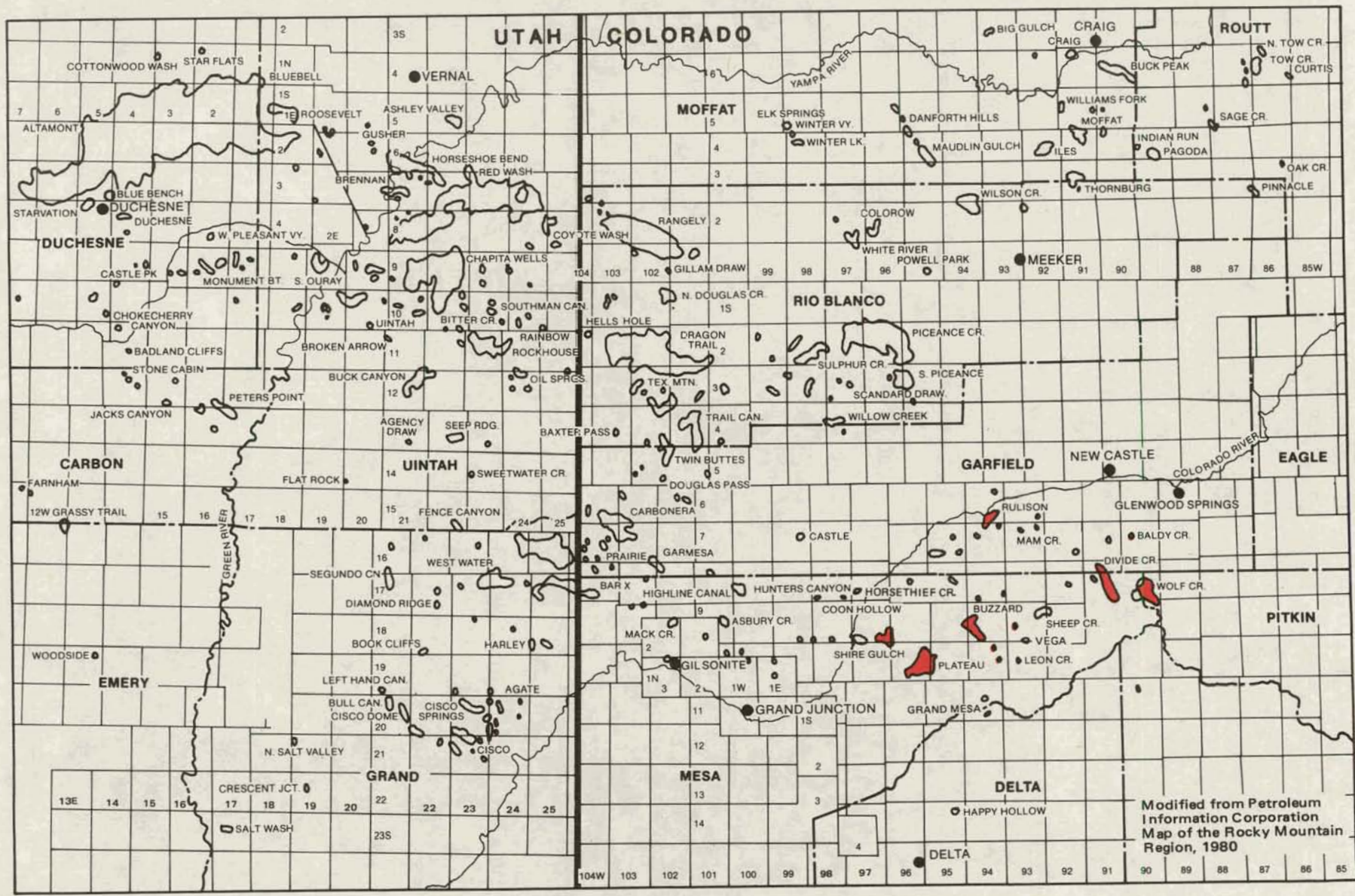


Figure 5 Mesaverde Production (Continental)



Modified from Petroleum Information Corporation Map of the Rocky Mountain Region, 1980

Figure 6 Rollins, Cozzette, Corcoran Production (Marine Mesaverde)

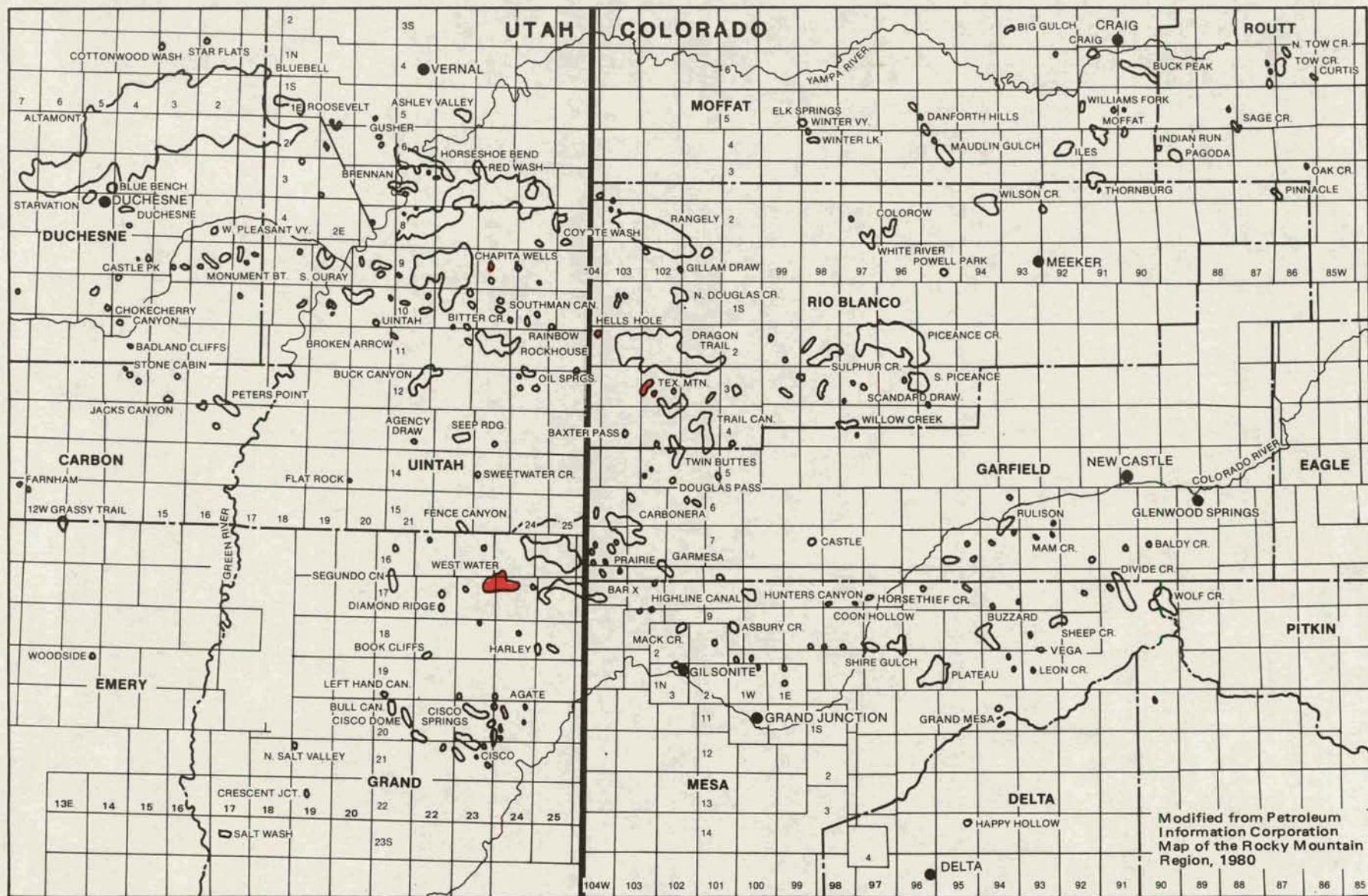


Figure 7 Castlegate Production (Marine Mesaverde)

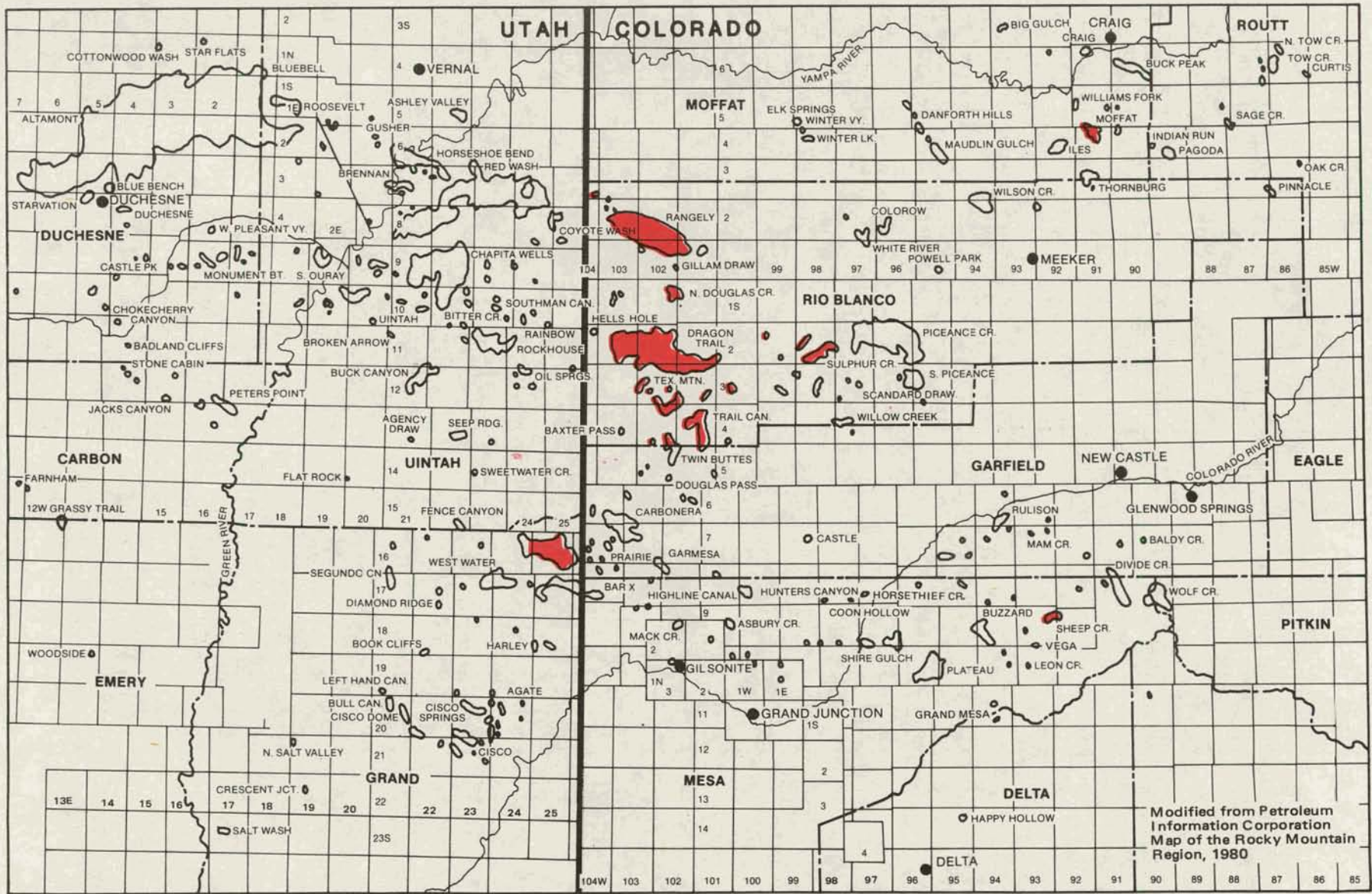


Figure 8 Mancos Production

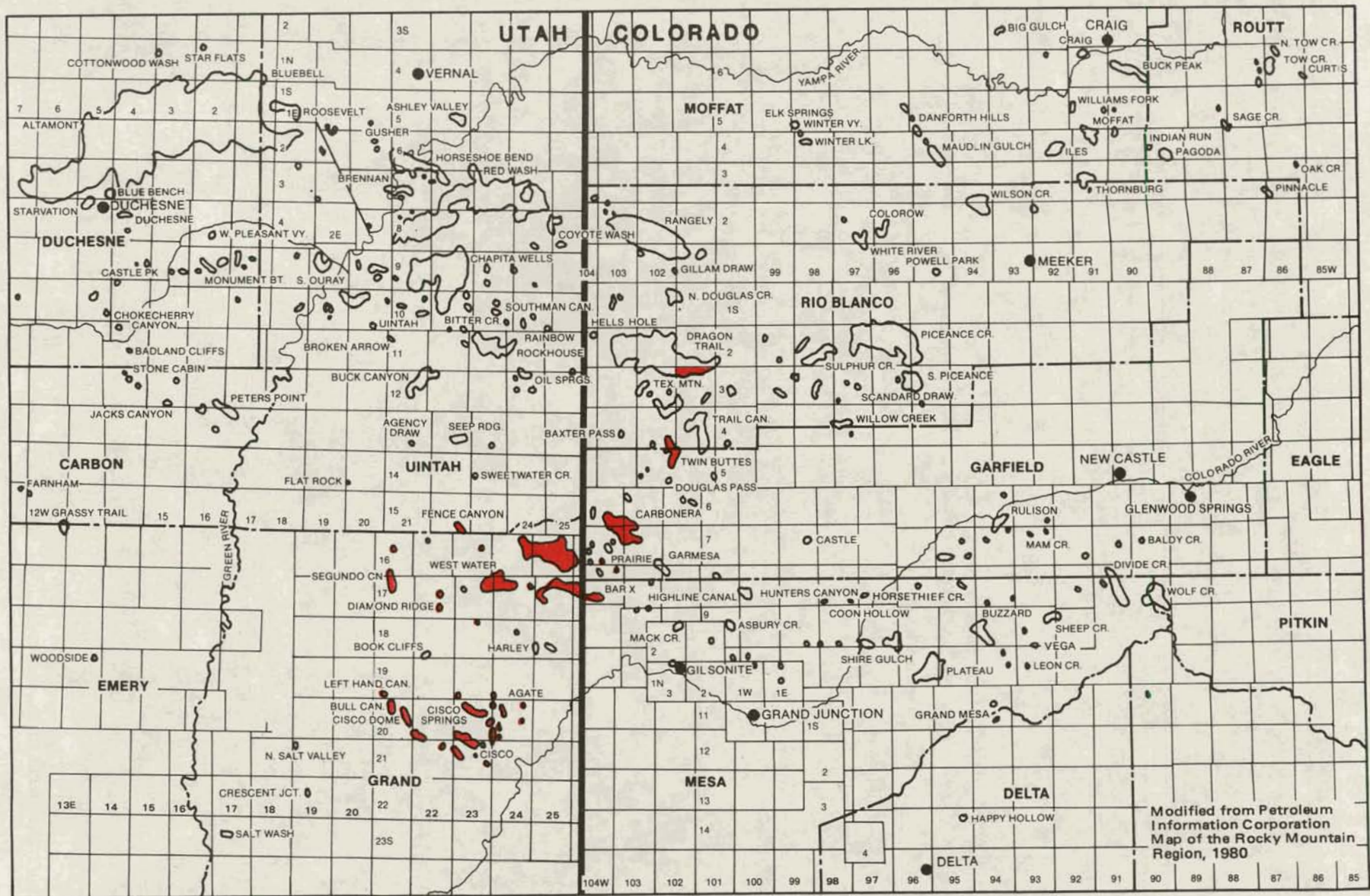


Figure 10 Cedar Mountain Production

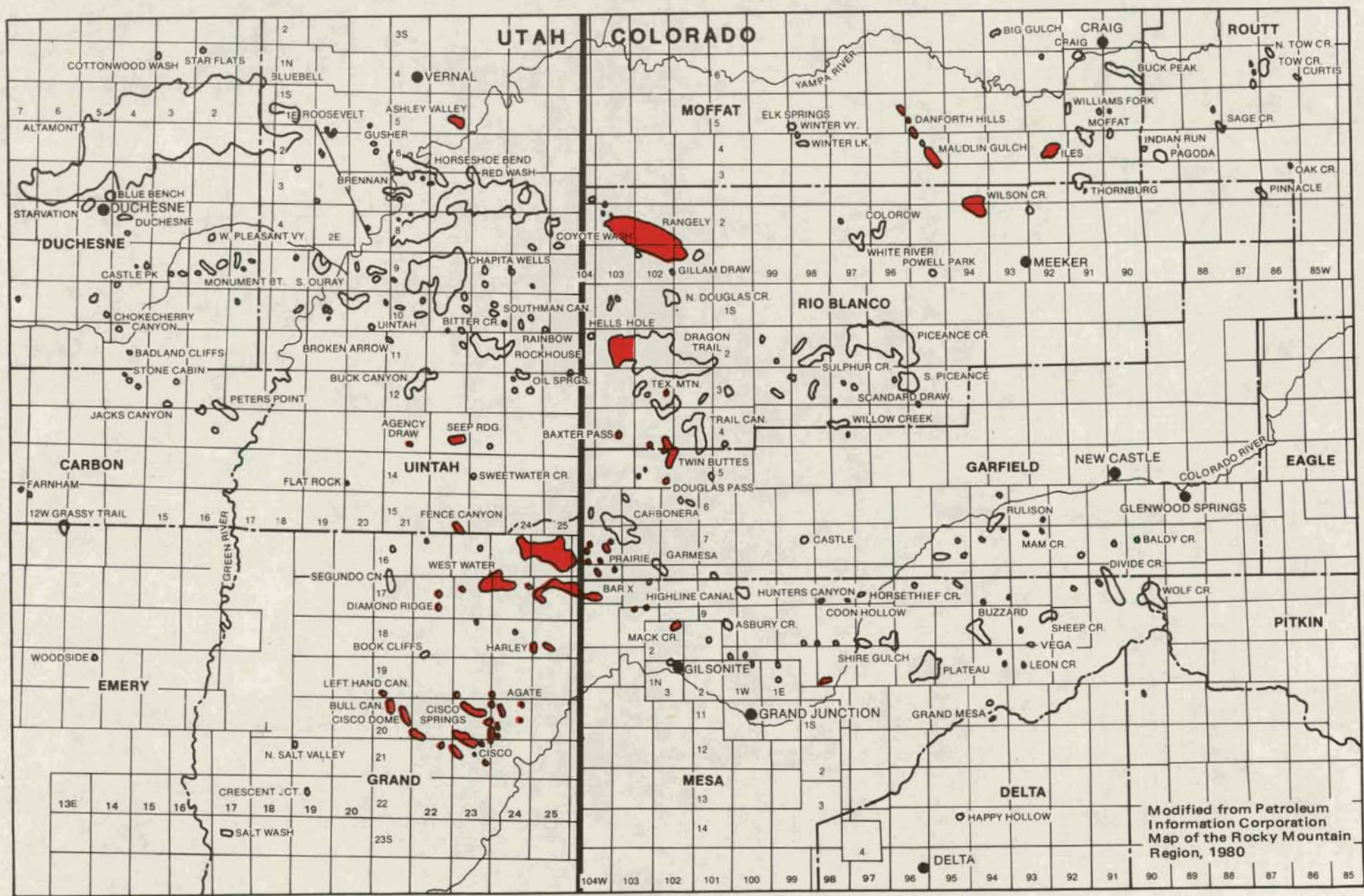


Figure 11 Morrison Production

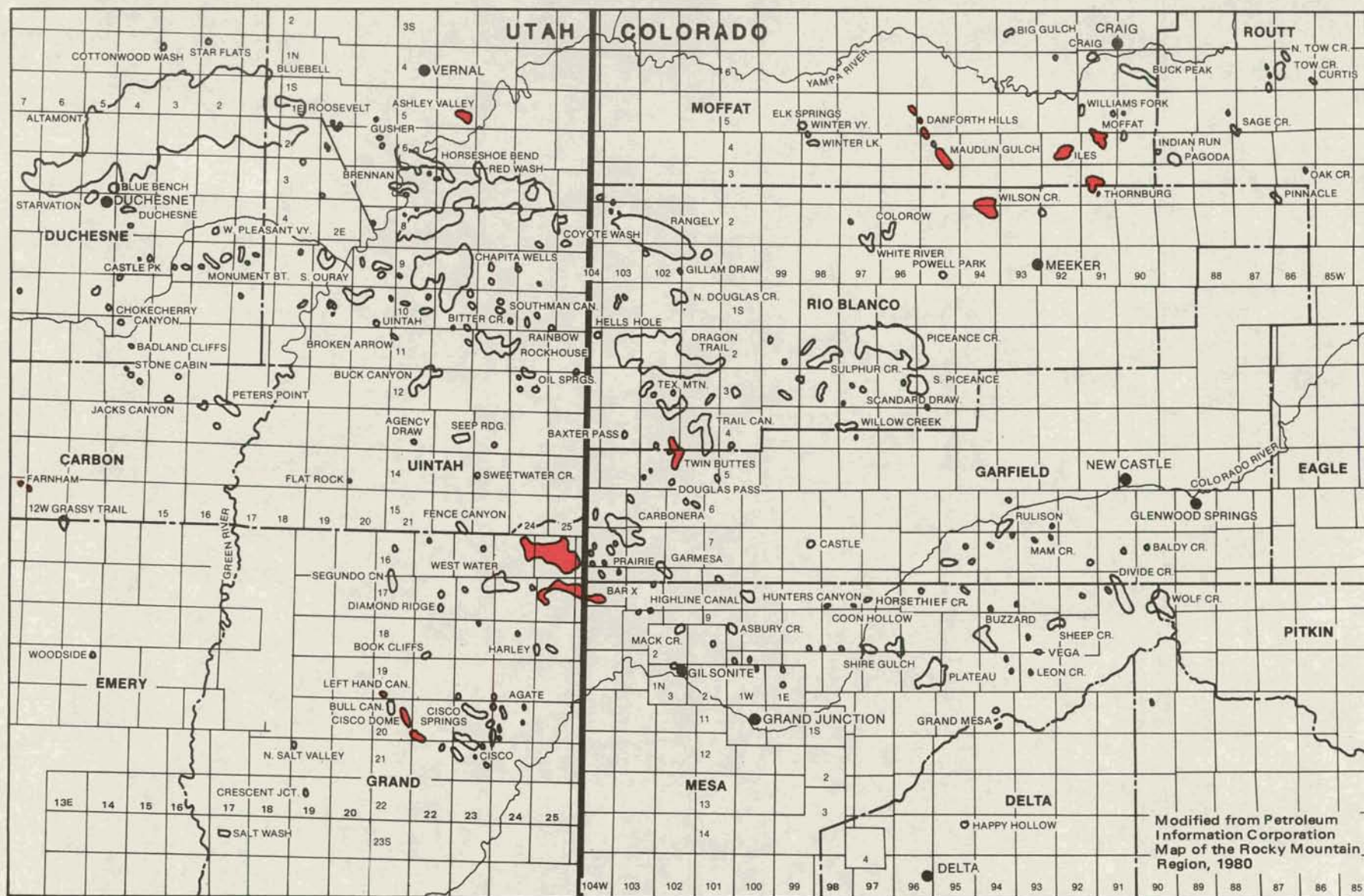


Figure 12 Entrada Production

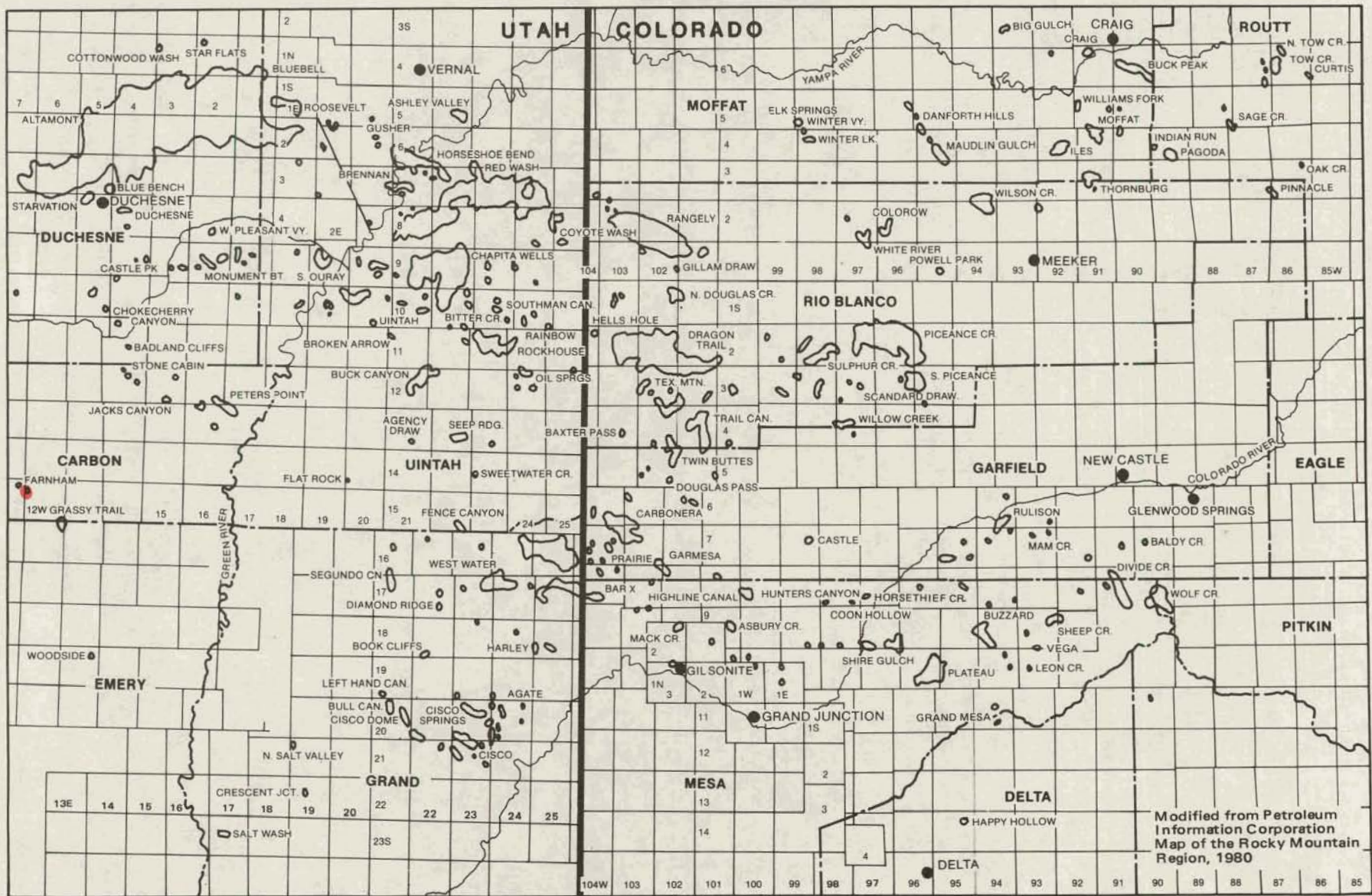


Figure 13 Navajo Production

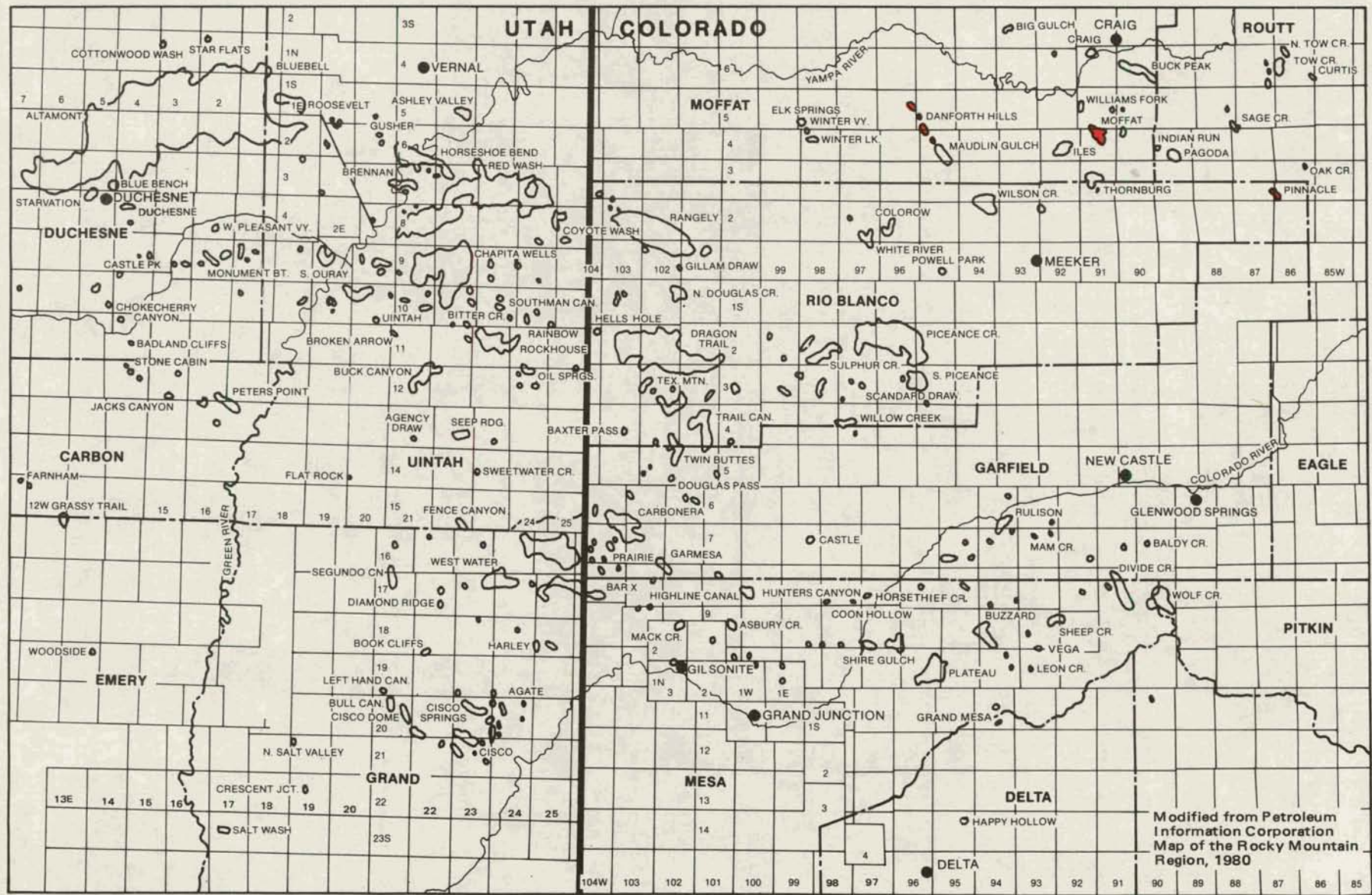


Figure 14 Shinarump Production

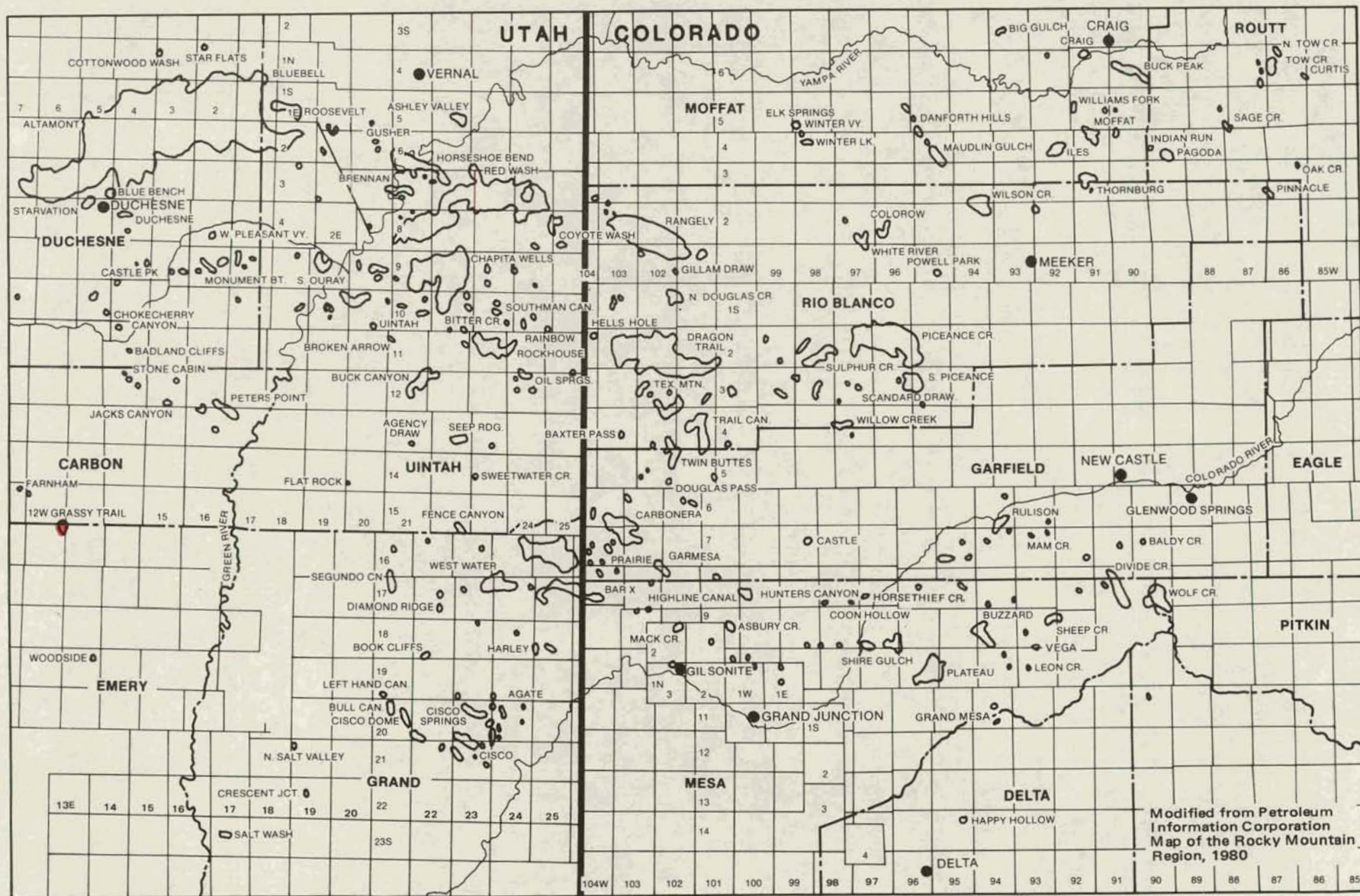
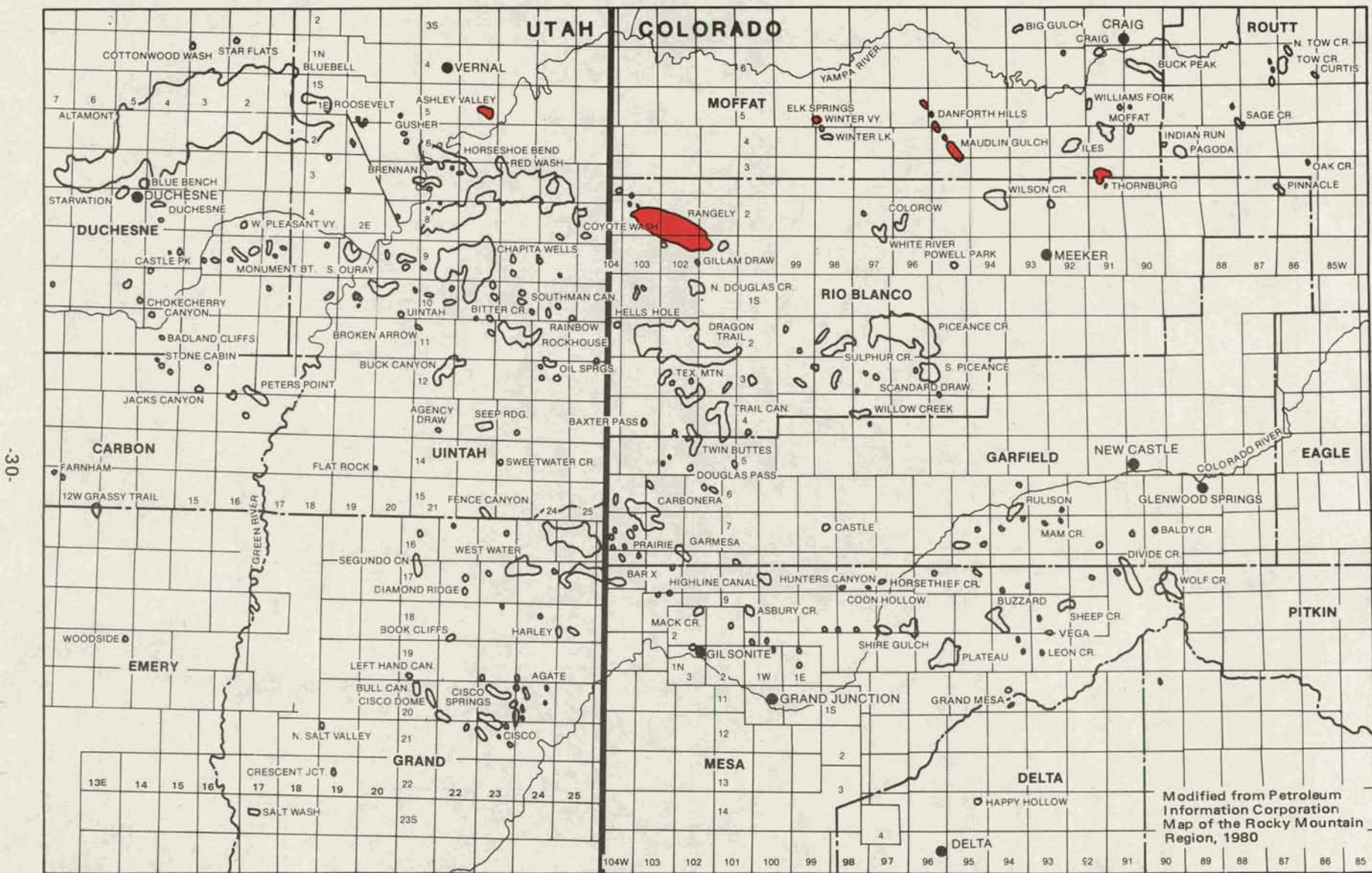


Figure 15 Moenkopi Production



-30-

Figure 16 Weber Production

5. CONCLUSION

Current United States geological tight sand designations in the Piceance and Uinta Basins' Western Gas Sands Project include the Mesaverde Group, Fort Union and Wasatch Formations. Others, such as the Dakota, Cedar Mountain, Morrison and Mancos may eventually be included. Future production from these formations will probably be closely associated with existing trends (Figures 2 through 16).

Research should begin with existing fields (Figures 2 through 16) to define the geologic parameters critical for production and establish pertinent relationships. Specifically, structure and isopach maps of each tight formation should be completed over areas from producing into non-producing areas. The former could define locations most suitable for commercial development by depth and the latter, areas with sufficient sand development. Economic consideration of these parameters would more clearly define the recoverable resource base.

Cumulative gas production through December, 1979, of the Mesaverde Group, Fort Union and Wasatch Formations in the Piceance and Uinta Basins is less than 275 billion cubic feet. This contrasts dramatically with potential gas in place estimates of 360 trillion cubic feet.* If the geology can be fully understood and engineering problems surmounted, significant potential reserves can be exploited.

* Based on Federal Power Commission and United States Geological Survey estimates.

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