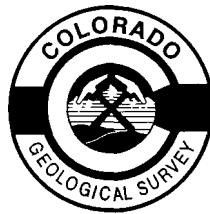


Resource Series 34

PENETRATION CHARTS OF SELECTED COLORADO OIL AND GAS FIELDS

By Carol Morgans Tremain Ambrose

DOI: <https://doi.org/10.58783/cgs.rs34.nnty3340>



Colorado Geological Survey
Department of Natural Resources
Denver, Colorado
1998

DISCLAIMER

This work was prepared by the Colorado Geological Survey (CGS) with funding from the CGS Petroleum Consortium and State of Colorado Mineral Severance taxes. Neither CGS nor Petroleum Consortium members make any warranty or representation, expressed or implied, with respect to the accuracy, completeness, or usefulness of the information contained in this report nor assume any liability with respect to the use of, or damages resulting from the use of, any information contained in this report.

ACKNOWLEDGMENTS

The author wishes to particularly thank Colorado Geological Survey Petroleum Consortium members Amoco, Chevron, Union Pacific, and Texaco for their financial support and advice. Special thanks are due to CGS staff Tom Hemborg, James Cappa, and Cheryl Brchan for their recommendations and editorial reviews. Charts were drafted by Gina Bobbitt, Cheryl Brchan, and Larry Scott.

METHODOLOGY

To graphically present production and show information the Colorado Geological Survey (CGS) constructed penetration charts of significant oil and gas fields in the state. To do this, the state was subdivided into quadrants, and 20-35 fields were selected in each quadrant based on significant producing intervals. Quadrants were further subdivided by tectonic area such as basin or arch. Fields were organized alphabetically by tectonic area. Occasionally contiguous fields were combined where production records did not permit easy separation.

Some field information for the charts was obtained from the Colorado Oil and Gas Conservation Commission (COGCC) COGIMS database, the Atlas of Major Rocky Mountain Gas Reservoirs' database, and the Department of Energy's TORIS database. This information

included county, township and range, field name and discovery date, API oil gravity, gas BTU, trap type, and drive mechanism where available. Additional gas analyses were obtained from Dwight's database and oil analyses from the Department of Energy's Crude Oil Analysis Data Bank. Gas, water, and oil production were input manually from Petroleum Information (PI) production books. Well counts, penetration depths, and producing zones were obtained from PI's petroROM well database.

The USGS geonames database, Atlas of Major Rocky Mountain Gas Reservoirs' stratigraphic chart, American Association of Petroleum Geologist's COSUNA charts, and CGS stratigraphic charts were used to construct stratigraphic columns for each basin or uplift area. Stratigraphic columns were supplemented by frequently mentioned 'formations' or zones from PI's database, American Stratigraphic Logs, and the geologic map of Colorado, in order to facilitate comparisons between USGS and oil field terminology. In contrast to standard stratigraphic columns, group names were listed above rather than beside included formation names and formation names above rather than beside included member names. This was done in order to include show and production data by group or formation where the specific formation or member (respectively) was unknown. If specific formations or members were known, then show and production data appears in that row rather than the more encompassing group or formation category. All database information was combined in Lotus 1-2-3 spreadsheets and these spreadsheets formed the initial charts.

Next, data from Rocky Mountain Association of Geologists and Four Corners Geological Society field books was added to supplement the charts. Production, salt water disposal and enhanced oil recovery information came from the COGCC 1993 statistics book and individual well records in Petroleum Information's 1994 petroROM well database. Show information was derived from the field books, guidebooks and individual well records in PI's petroROM. Finally, COGCC well and hearing files were inspected for any additional information.

ALPHABETICAL LIST OF FIELDS

Field	Quadrant	Area
Adena	NE	West Denver Basin
Alkali Gulch	SW	San Juan Basin
Andy's Mesa	SW	Paradox Basin
Apache Canyon	SE	Raton Basin
Arapahoe	SE	Las Animas Arch
Aristocrat	NE	West Denver Basin
Aztec Wash	SW	San Juan Basin
Badger Creek	NE	West Denver Basin
Barker Dome	SW	San Juan Basin
Battleship	NW	North Park Basin
Beecher Island	NE	East Denver Basin
Big Beaver	NE	East Denver Basin
Big Hole	NW	Sand Wash Basin
Bison	NE	East Denver Basin
Black Hollow	NE	West Denver Basin
Bledsoe Ranch	SE	Las Animas Arch
Blue Gravel	NW	Sand Wash Basin
Bobcat	NE	East Denver Basin
Brandon	SE	Las Animas Arch
Bridle	NW	Douglas Creek Arch
Buck Peak	NW	Axial Basin Uplift
Cache	SW	Paradox Basin
Campo	SE	Hugoton Embayment
Canadian River	NW	North Park Basin
Cavalry	SE	Las Animas Arch
Cheyenne Wells	SE	Las Animas Arch
Chromo	SW	San Juan Basin
Cinder Buttes	SW	San Juan Basin
Cliff	NE	East Denver Basin
Clifford	SE	Las Animas Arch
Craig North	NW	Sand Wash Basin
Danforth Hills	NW	Axial Basin Uplift
Divide	NE	East Denver Basin
Divide Creek	NW	Piceance Basin
Dove Creek	SW	Paradox Basin
Eckley	NE	East Denver Basin
Flank	SE	Hugoton Embayment
Flodine Park	SW	Paradox Basin
Florence-Canon City	SE	Canon City Embayment
Fort Collins	NE	West Denver Basin
Frontera	SE	Las Animas Arch

Field	Quadrant	Area
Garcia	SE	Raton Basin
Golden Spike	SE	Las Animas Arch
Grand Valley	NW	Piceance Basin
Graylin NW	NE	East Denver Basin
Greater Douglas Creek	NW	Douglas Creek Arch
Greenwood	SE	Hugoton Embayment
Hambert	NE	West Denver Basin
Hamilton Creek	SW	Paradox Basin
Hiawatha	NW	Sand Wash Basin
Ignacio Blanco	SW	San Juan Basin
Iles	NW	Axial Basin Uplift
Island Butte	SW	Paradox Basin
Ladder Creek	SE	Las Animas Arch
Lanyard	NE	West Denver Basin
Lewis Creek	NE	East Denver Basin
Lilli	NE	West Denver Basin
Lisbon Southeast	SW	Paradox Basin
Little Beaver	NE	East Denver Basin
Little Beaver East	NE	East Denver Basin
Lone Pine	NW	North Park Basin
Longbranch	NE	West Denver Basin
Loveland	NE	West Denver Basin
Marble Wash	SW	Paradox Basin
Maudlin Gulch	NW	Axial Basin Uplift
McCallum North	NW	North Park Basin
McCallum South	NW	North Park Basin
McClave	SE	Las Animas Arch
McClean	SW	Paradox Basin
Mcelmo	SW	Paradox Basin
Menefee Mountain	SW	San Juan Basin
Merino	NE	East Denver Basin
Midway	SE	Hugoton Embayment
Model	SE	Raton Basin
Moffat	NW	Axial Basin Uplift
Mount Hope	NE	East Denver Basin
Mount Pearl	SE	Las Animas Arch
Papoose Canyon	SW	Paradox Basin
Parachute	NW	Piceance Basin
Peoria	NE	West Denver Basin
Piceance Creek	NW	Piceance Basin
Pierce	NE	West Denver Basin
Plateau	NW	Piceance Basin

Field	Quadrant	Area
Playa	SE	Hugoton Embayment
Plum Bush Creek	NE	East Denver Basin
Powder Wash	NW	Sand Wash Basin
Price Gramps	SW	San Juan Basin
Rangely	NW	Douglas Creek Arch
Red Mesa	SW	San Juan Basin
Roadrunner	SW	Paradox Basin
Roggen	NE	West Denver Basin
Rulison	NW	Piceance Basin
Rush Willadel	NE	East Denver Basin
Saber	NE	East Denver Basin
Sand River	NE	East Denver Basin
Second Wind	SE	Las Animas Arch
Sheep Mountain	SE	Raton Basin
Shire Gulch	NW	Piceance Basin
Smoky Creek	SE	Las Animas Arch
Sorrento	SE	Las Animas Arch

Field	Quadrant	Area
South Canyon	NW	Douglas Creek Arch
Speaker	SE	Las Animas Arch
Spindle	NE	West Denver Basin
Sugar Loaf	NW	Sand Wash Basin
Third Creek	NE	West Denver Basin
Thornburg	NW	Axial Basin Uplift
Tow Creek	NW	Axial Basin Uplift
Vilas	SE	Hugoton Embayment
Wagon Trail	SE	Las Animas Arch
Walsh	SE	Hugoton Embayment
Wattenberg	NE	West Denver Basin
Wellington	NE	West Denver Basin
West Side Canal	NW	Sand Wash Basin
White River	NW	Piceance Basin
Wilson Creek	NW	Axial Basin Uplift
Winter Valley	NW	Piceance Basin
Yenter	NE	East Denver Basin

REFERENCES

- Amuedo, C.L., Mott, M.R., eds., 1962, Exploration for Oil and Gas in Northwestern Colorado: Rocky Mountain Association of Geologists Guidebook, 192 p.
- Colorado Oil and Gas Conservation Commission, 1993, Colorado Oil and Gas Statistics, COGIMS database, well files, hearing files, and logs.
- Crouch, M.C.III, 1982, Oil and Gas Fields of Colorado, Nebraska, and Adjacent Areas, vols. 1 and 2, Rocky Mountain Association of Geologists, 791 p.
- Dwight's Energydata "GANL" gas analyses data base.
- Fassett, J.E., ed., 1978, Oil and Gas Fields of the Four Corners Area, Four Corners Geological Society, vol. 1 and 2, 726 p.
- Fassett, J.E., ed., 1983, Oil and Gas Fields of the Four Corners Area, Four Corners Geological Society, v. 3, 729-1143 p.
- Finch, W.C. ed., 1957, Guidebook to the Geology of North and Middle Park Basin, Colorado, Rocky Mountain Association of Geologists, 152 p.
- Goolsby, S.M., and Longman, M.W., eds., 1988, Occurrence and Petrophysical Properties of Carbonate Reservoirs in the Rocky Mountain Region, Rocky Mountain Association of Geologists Guidebook, 474 p.
- Hjelmberg, C.A., 1993, Atlas of Major Rocky Mountain Gas Reservoirs: New Mexico Bureau of Mines and Mineral Resources, 206 p. 10 pls., 3 diskettes.
- Irwin, Dennis, chairman, 1972, Subsurface Cross-sections of Colorado: Rocky Mountain Association of Geologists Special Publications No. 2.
- Jensen, F.S., Sharkey, H.R., and Turner, D.S., eds., 1954, Oil and Gas Fields of Colorado, 1954: Rocky Mountain Association of Geologists Symposium, 302 p.
- Kuhn, P.J., ed., 1958, Oil and Gas in the Four Corners, National Petroleum Bibliography, Amarillo, Texas, 298 p.
- Lindberg, F.A., ed., 1983, Southwest/Southwest mid continent region correlation chart: American Association of Petroleum Geologists, Correlation of Stratigraphic Units in North America (COSUNA) Project, 1 pl.
- Lindberg, F.A., ed., 1988, Central and southern Rockies region correlation chart: American Association of Petroleum Geologists, Correlation of Stratigraphic Units in North America (COSUNA) Project, 1 pl.
- Luttrell, G.W., Hubert, M.L., and Murdock, C.R., 1990, GEONAMES Data Base of Geologic Names of the United States through 1988: U.S. Geological Survey Open File Report 90-0466-K.
- McGinnis, C.J., ed., 1956, Guidebook to the Geology of the Raton Basin, Rocky Mountain Association of Geologists, 148 p.
- Murray, D.K., ed., 1974, Guidebook to the Energy Resources of the Piceance Creek Basin: Rocky Mountain Association of Geologists, 302 p.
- Parker, J.M., ed., 1961, Oil and Gas Field Volume, Colorado - Nebraska, 1961, Rocky Mountain Association of Geologists, 390 p.
- Pearl, R.H., 1978, Colorado Stratigraphic Nomenclature Chart: Colorado Geological Survey Miscellaneous Information Series MI 14, 1 p.
- Petroleum Information, 1994, PetroROM Well Data.
- Pruit, J.D., and Coffin, P.E., eds., 1978, Energy Resources of the Denver Basin: Rocky Mountain Association of Geologists Guidebook, 272 p.
- Ray, R.R., ed., 1995, High-Definition Seismic 2-D, 2-D Swath, and 3-D Case Histories, Rocky Mountain Association of Geologists Guidebook, 214 p.
- Ritzma, H.R., and Oriel, S.S., eds., 1955, Guidebook to the Geology of Northwest Colorado, Rocky Mountain Association of Geologists and Intermountain Association of Petroleum Geologists, 185 p.
- Smith, J.R., Tremain, C.M., and Brchan, C.A., 1991, Oil and Gas Fields Map of Colorado: Colorado Geological Survey Map Series 26, 1:500,000.
- Sonnenberg, S.A., Shannon, L.T., Rader, Kathleen, von Drehle, W.F., and Martin, G.W., eds., 1990, Morrow Sandstones of Southeast Colorado and Adjacent Areas, Rocky Mountain Association of Geologists Guidebook, 236 p.

- Stone, D.S., ed., 1986, New Interpretations of Northwest Colorado Geology: Rocky Mountain Association of Geologists Guidebook, 308 p.
- Tweto, Ogden, compiler, 1979, Geologic Map of Colorado: Colorado Geological Survey, 1:500,000.
- U.S. Dept. of Energy, Bartlesville Project Office, Crude Oil Analysis Data Bank.
- U.S. Dept. of Energy, 1990, TORIS (Tertiary Oil Recovery Information System) Data Base.
- Veal, H.K., ed., 1977, Exploration Frontiers of the Central and Southern Rockies: Rocky Mountain Association of Geologists Guidebook, 496 p.
- Wiegand, D.L., ed., 1981, Geology of the Paradox Basin: Rocky Mountain Association of Geologists Guidebook, 285 p.

PENETRATION CHARTS OF SELECTED COLORADO OIL AND GAS FIELDS

SOUTHWEST QUADRANT

By Carol Morgans Tremain Ambrose

PARADOX BASIN

		ANDY'S MESA FIELD	CACHE FIELD	DOVE CREEK FIELD	FLODINE PARK FIELD	HAMILTON CREEK FIELD	ISLAND BUTTE FIELD	LISBON SOUTHEAST FIELD	MARBLE WASH FIELD	MCCLEAN FIELD	MCELMO FIELD	PAPOOSE CANYON FIELD	ROAD-RUNNER FIELD
		San Miguel County T 44 N R 16 W	Montezuma County T 34-35 N R 20 W	Montezuma County T 38-39 N R 19 W	Montezuma County T 35 N R 20 W	San Miguel County T 44-45 N R 14-15 W	Montezuma County T 38 N R 19 W	San Miguel County T 44 N R 19 W	Montezuma County T 33 N R 20 W	Montezuma County T 37 N R 19 W	Montezuma County T 36-38 N R 17-19 W	Dolores County T 38-39 N R 19-20 W	Montezuma County T 34 N R 20 W
AGE	STRATIGRAPHIC UNIT												
UPPER CRETACEOUS	Mesaverde Gp												
LOWER CRETACEOUS	Mancos Sh												
	Dakota Ss												
	Burro Canyon Fm												
JURASSIC	Morrison Fm												
	San Rafael Gp												
	Summerville (Wanakah) Fm												
	Entrada Ss												
	Carmel Fm												
UPPER TRIASSIC	Glen Canyon Gp												
	Navajo Ss												
	Kayenta Fm												
LOWER PERMIAN	Wingate Ss												
	Chinle Fm												
	Shinarump Cgl Mbr												
PENNSYLVANIAN	Cutler Gp												
	Hermosa Gp												
	Honaker Trail Fm												
	Paradox Fm												
	Ismay Mbr												
MISSISSIPPIAN	Desert Creek Mbr												
	Akahi Mbr												
	Barker Creek Mbr												
DEVONIAN	Pinkerton Trail Fm												
	Molas Fm												
	Leadville Ls												
UPPER CAMBRIAN	Ouray Fm												
	Elbert Fm												
	Upper Elbert Mbr												
PRECAMBRIAN	McCracken Ss Mbr												
	Aneth Fm												
	Ignacio Gp												
	Precambrian rocks												
Discovery Year		1967	1964	1948	1959	1975	1991	1950	1958	1974	1944	1970	1984
Status 12/31/94		Producing	Producing	Producing	Producing	Producing	Producing	Shut-in	Producing	Producing	Producing	Producing	Producing
Oldest Formation Penetrated, Ft		McCracken, 10,857	Akahi, 5,790	Leadville, 8,420	Akahi, 5,861	Paradox*, 9,980	Ouray*, 6,725	Cambrian, 10,820	Akahi, 6,107	Akahi, 6,725	Precambrian, 7,499	Akahi, 6,535	Akahi, 6,110
Deepest Producing Zone, Ft		Honaker Trail, 6,268-7,032	Ismay, 5,428-5,800	Desert Creek, 6,154-6,165	Ismay, 5,508-5,925	Hermosa, 6,612-9,972	Desert Creek, 5,760-6,248	Ouray, 8,821-9,862	Ismay, 5,664-5,920	Desert Creek, 5,910-6,634	Ouray, 8,220-8,250	Desert Creek, 5,701-6,652	Ismay, 5,674-5,872
Lithology		Ss	Ls & dolo	Dolo	Ls & dolo	Dolo	Ls & dolo	Ls & dolo	Ls & dolo	Ls & dolo	Ss, cgl (oil and gas)	Dolomitic ls (CO ₂)	Ls & dolo
Producing or Shut in Wells, End of 1994		7	10	1	6	4	3	4	5	5	2	40	12
1994 Production, BO		0	52,079	118	22,572	0	459,316	0	10,347	293,952	0	4,336	32,682
1994 Production, MCF		623,045	36,503	0	109,686	463,004	1,100,102	0	12,065	752,662	46,613	220,826,281	1,265,857
1994 Production, BW		0	319,945	0	0	404	71	0	43,703	180,231	182	391,959	290,941
Number of Wells That Produced Through 1994		8	23	4	12	4	5	5	16	8	11	44	19
Cumulative Production, BO		11,264	4,311,374	108,631	2,607,547	0	943,773	151,963	983,779	3,306,100	1,097	5,402,301	1,898,967
Cumulative Production, MCF		20,879,555	7,348,419	1,318,402	19,165,173	2,443,011	2,013,222	13,969,288	1,681,937	5,801,149	1,171,203	1,963,920,698	3,536,982
Cumulative Production, BW		851	2,616,076	12	178,169	7,208	12,209	59,515	815,409	9,564	3,071,943	956,484	2,598,414
Cumulative Production, BOE		3,491,190	5,536,110	328,365	5,821,743	407,168	1,279,310	2,480,178	1,260,758	4,272,957	196,297	10,414,514	2,488,064
Oil Gravity, Degrees API		55-60	45	44-69	44-8			57-1-65	41-5	40-46		44-69-1	41-3-42-6
BTU Per Cubic Foot		970	1,436	1,251-1,279	1,297	1,050		994		1,254	781 Shinarump	1,248	
Drive Mechanism		GE	SG & PWD	GE	SG	GE		GE & PWD	SG	WD & SG	WD	PD	
Trap Type		Struc-Strat	Struc-Strat	Struc-Strat	Stratigraphic	Struc-Strat	Stratigraphic	Anticline, faulted	Stratigraphic	Stratigraphic	Anticline, faulted	Strat-algal mound	Stratigraphic
Remarks				*Western National 1-A Driscoll T 38 N, R 19 W, sec. 3	*Includes Floodline Park E & W	*Nearby WC Mobil 1 Norwood Unit, TD in McCracken at 10,220 ft in T 44 N, R 14 W, sec. 13					*98% CO ₂		

SAN JUAN BASIN AND FOUR CORNERS PLATFORM

		ALKALI GULCH FIELD*	AZTEC WASH FIELD	BARKER DOME FIELD*	CHROMO FIELD*	CINDER BUTTES FIELD	IGNACIO BLANCO FIELD	MENEFFEE MOUNTAIN FIELD	PRICE GRAMPS FIELD	RED MESA FIELD
		La Plata County T 33-34 N R 12-13 W	Montezuma County T 32 N R 17 W	La Plata County T 32-33 N R 13-14 W	Archuleta County T 32-33 N R 1-2 E	La Plata County T 32 N R 12-13 W	La Plata and Archuleta Counties T 32-35 N R 5-11 W	Montezuma County T 35 N R 13 W	Archuleta County T 33 N R 2 E	La Plata County T 32-34 N R 11-12 W
AGE	STRATIGRAPHIC UNIT									
EOCENE	San Jose Fm									
PALEOCENE	Nacimiento Fm									
	Animas Fm									
	Kirtland Sh									
UPPER CRETACEOUS	Farmington Ss Mbr									
	Fruitland Fm									
	Pictured Cliffs Ss									
	Lewis Sh									
	Mesaverde Gp									
LOWER CRETACEOUS	Cliffhouse Fm									
	Manelee Fm									
	Point Lookout Ss									
UPPER JURASSIC	Mancos Sh									
	Niobrara Mbr									
	Tecote Ss									
MIDDLE JURASSIC	Gallup Ss									
	Juana Lopez (Sanastee) Mbr									
	Carlisle Mbr									
UPPER TRIASSIC	Greenhorn Ls Mbr									
	Graneros Sh Mbr									
	Dakota Ss									
UPPER JURASSIC	Burro Canyon Fm									
	Morrison Fm									
	San Rafael Gp									
MIDDLE JURASSIC	Summerville (Wanakah) Fm									
	Entrada Ss									
	Glen Canyon Group									
UPPER TRIASSIC	Chinle Fm									
	Shinarump Cgl Mbr									
LOWER CRETACEOUS	Monticelli Fm									
	Cutler Fm									
	Hermosa Gp									
PENNSYLVANIAN	Honaker Trail Fm									
	Paradox Fm									
	Ismay zone									
UPPER JURASSIC	Desert Creek zone									
	Akahi zone									
	Barker Creek zone									
UPPER TRIASSIC	Pinkerton Trail Fm									
	Molas Fm									
	Leadville Ls									
UPPER DEVONIAN	Ouray Fm									
	Elbert Fm									
	McCracken Ss Mbr									
UPPER CAMBRIAN	Ignacio Gp									
	Precambrian rocks									
Discovery Year		1957	1961	1948	1947	1966	1950	1977	1935	1924
Status 12/31/94		Producing	Producing	Producing	Producing	Producing	Producing	Producing	Producing	Producing
Oldest Formation Penetrated, Ft		Leadville, 10,026	Akahi, 7,135	Molas, 10,073	Early Penn., 4,110	Chinle, 5,890	Precambrian, 14,503	Molas, 8,661	Precambrian, 2,270	Molas, 9,905
Deepest Producing Zone, Ft		Barker Crk., 8,956-9,577	Gallup, 1,219-1,304	Barker Crk., 9,355-9,398	Dakota, 2,326-2,346	Morrison, 7,599-8,014	Dakota, 3,434-4,305	Morrison, 1,165-1,395	Morrison, 1,226-1,509	Barker Crk., 9,152-9,720
Lithology		Ls & dolo	Ss	Ss & dolo	Sh, ls, stst	Ss	Ss & coal	Ss	Ss	Ss, silty sh
Producing or Shut in Wells, End of 1994		6	10	7	13	4	2,000	9	30	123
1994 Production, BO		0	1,482	2,002	633	0	11,019	0	28,783	51,398
1994 Production, MCF		158,132	0	1,001,238	0	0	220,473,237	0	0	109,098
1994 Production, BW		461	0	8,336	0	0	33,167,718	0	0	612,664
Number of Wells That Produced Through 1994		13	13	14	23	5	2,079	19	49	176
Cumulative Production, BO		686	52,257	88,905	166,879	1,235	94,918	48,432	6,774,540	1,852,700
Cumulative Production, MCF		32,043,860	4,139	107,720,892	6,342	272,946	1,548,640,331	1,294	69,209	2,026,998
Cumulative Production, BW		4,348	4,505	126,792	0	10	150,902,143	9,328	15,064,934	98,797
Cumulative Production, BOE		5,341,329	52,947	18,042,387	167,936	46,726	258,201,640	48,648	6,786,075	2,190,533
Oil Gravity, Degrees API		60	60	31.9-32.5				34	31.4-32	33-39.2
BTU Per Cubic Foot		967		913-844	1,200	1,176	789 coal, 1,008 ss			998
Drive Mechanism		PD	WD	WD	PD	PD	PD, GE	WD	PWD	PD, PWD
Trap Type		Struc-Strat	Stratigraphic	Anticline, faulted	Anticline, faulted	Struc-Strat	Basin centered gas	Struc-Strat	Anticline, faulted	Anticline
Remarks		*Includes Alkali Gulch W		*Some H ₂ S & CO ₂ NM not included	Includes E. Chromo		*World's most productive coalbed methane formation. Gas produced by desorption.			*H ₂ S in Barker Creek zone

EXPLANATION OF FIELD DATA

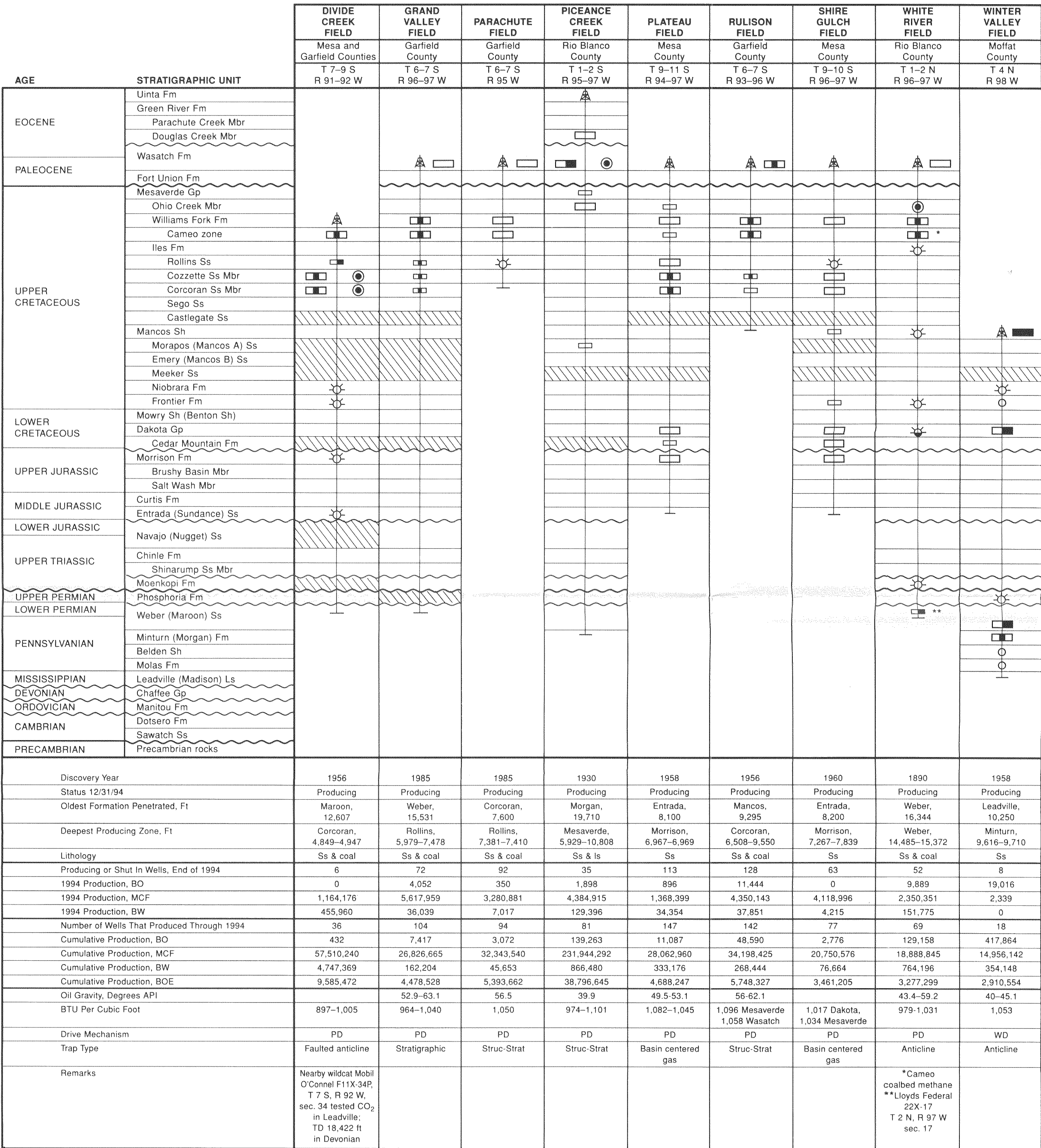
Term	Definition
Discovery Year	Year field was discovered
Status 12/31/94	Field status
Oldest Formation Penetrated, Ft	Oldest formation penetrated and depth
Deepest Producing Zone, Ft	Deepest zone that has produced with shallowest and deepest perforations
Lithology	Lithology of producing zones
Producing or Shut in Wells, End of 1994	Number of producing and shut in wells
1994 Production, BO	1994 annual production, barrels of oil
1994 Production, MCF	1994 annual production, thousand cubic feet of gas
1994 Production, BW	1994 annual production, barrels of water
Number of Wells That Produced Through 1994	Total number

PENETRATION CHARTS OF SELECTED COLORADO OIL AND GAS FIELDS

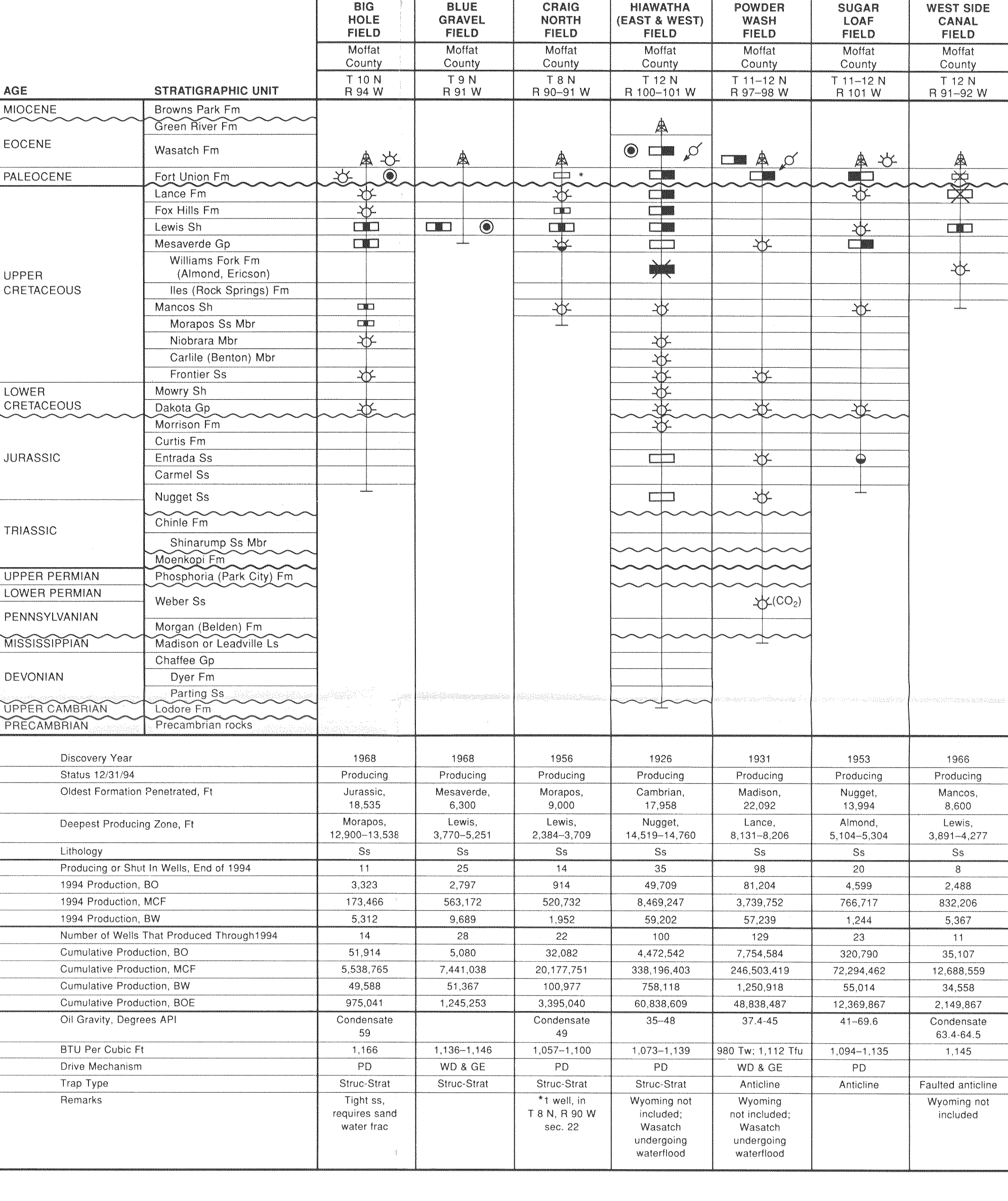
NORTHWEST QUADRANT

By Carol Morgans Tremain Ambrose

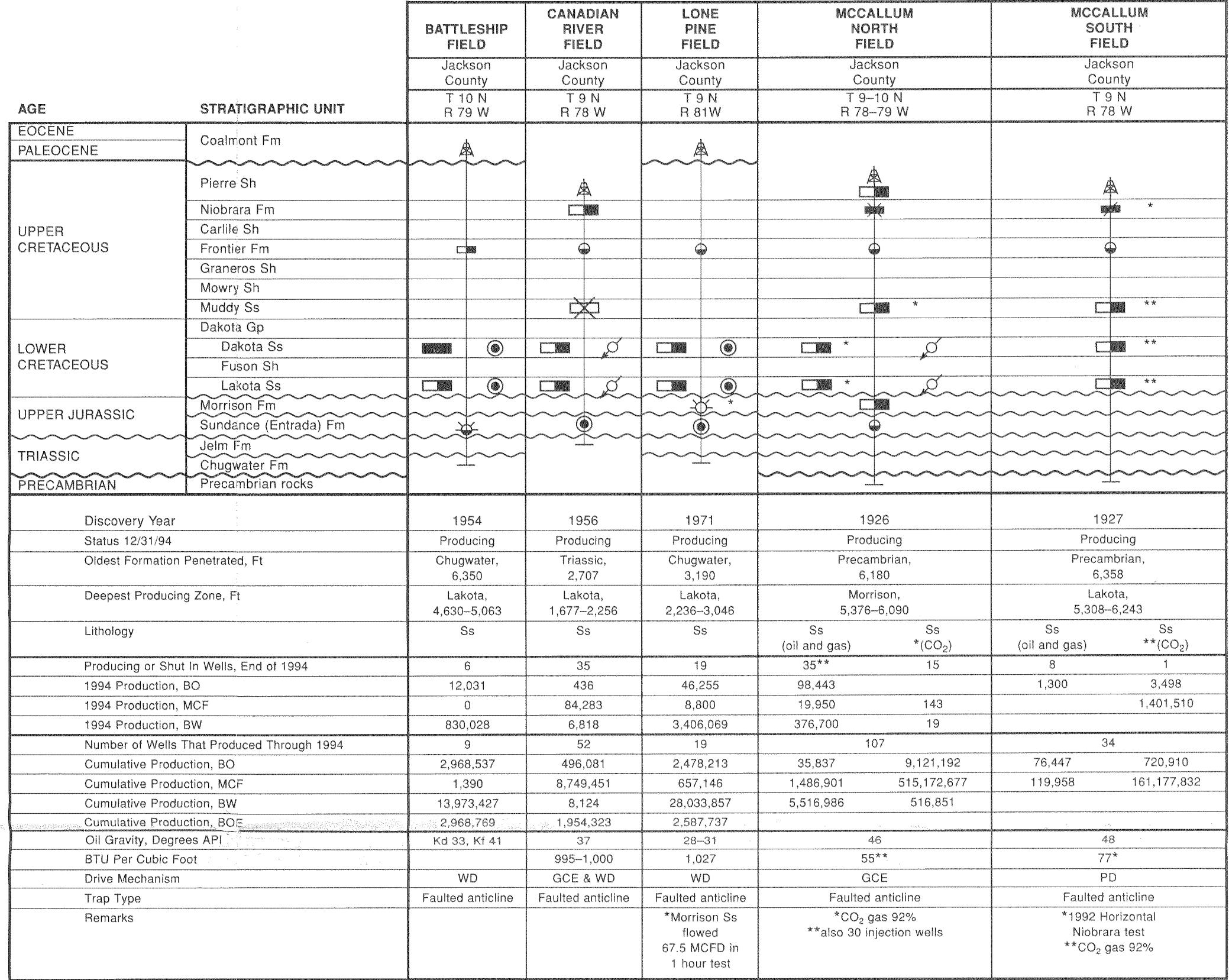
PICEANCE BASIN



SAND WASH BASIN



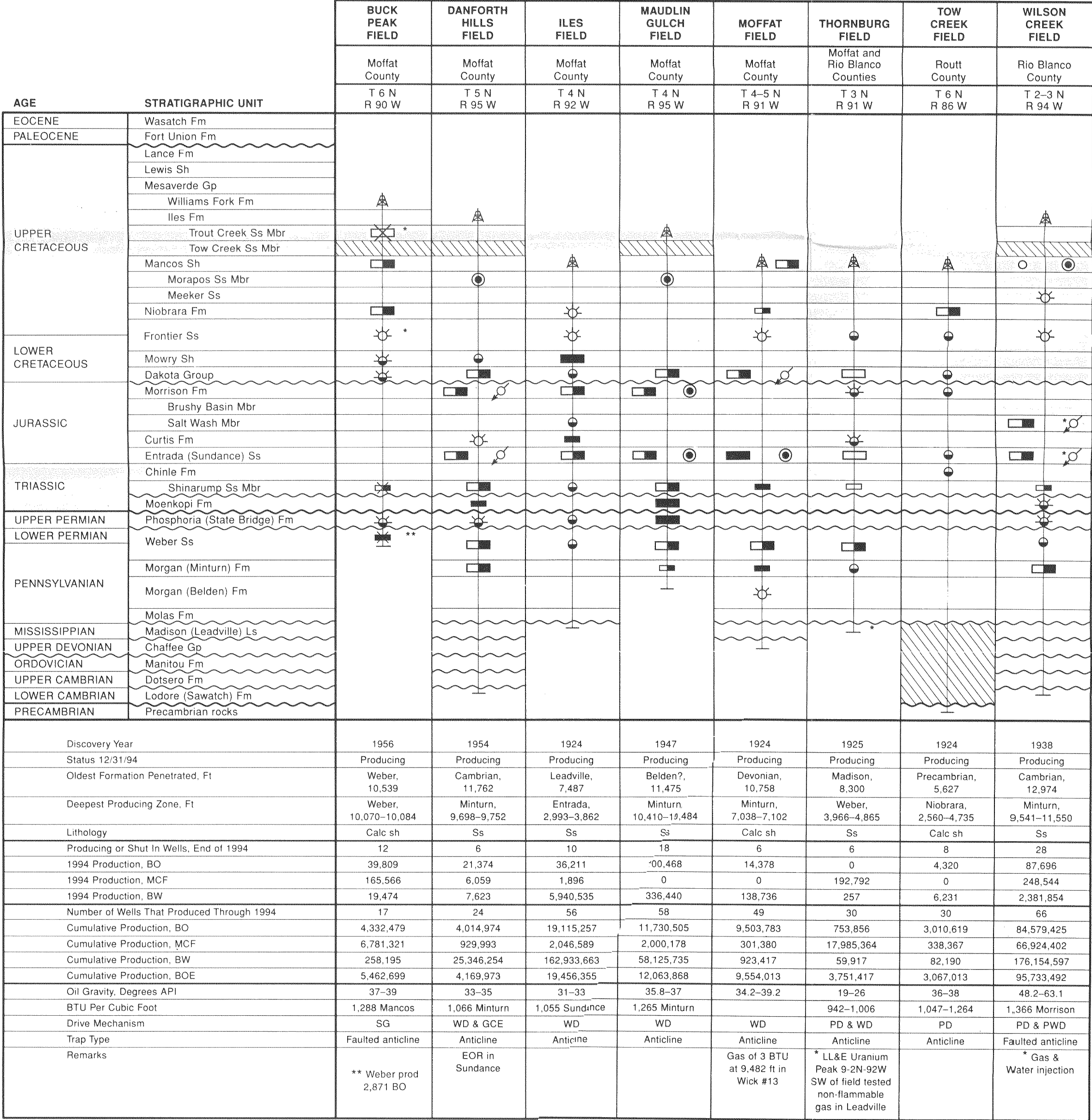
NORTH PARK BASIN



EXPLANATION OF FIELD DATA

Term	Definition
Discovery Year	Year field was discovered
Status 12/31/94	Field status
Oldest Formation Penetrated, Ft	Oldest formation penetrated and depth
Deepest Producing Zone, Ft	Deepest zone that has produced with shallowest and deepest perforations
Lithology	Lithology of producing zones
Producing or Shut In Wells, End of 1994	Number of producing and shut in wells
1994 Production, BO	1994 annual production, barrels of oil
1994 Production, MCF	1994 annual production, thousand cubic feet of gas
1994 Production, BW	1994 annual production, barrels of water
Number of Wells That Produced Through 1994	Total number of wells that have produced oil and/or gas through field's history
Cumulative Production, BO	Cumulative production, barrels of oil
Cumulative Production, MCF	Cumulative production, thousand cubic feet of gas
Cumulative Production, BW	Cumulative production, barrels of water
Cumulative Production, BOE	Cumulative barrels of oil + cumulative MCF + 6 (not calculated where gas is CO ₂ or low BTU)
Oil Gravity, Degrees API	Gravity of produced oil in degrees API (American Petroleum Institute)
BTU Per Cubic Foot	British Thermal Units per cubic foot of produced gas
Drive Mechanism	Reservoir drive
Trap Type	Reservoir trapping mechanism
Remarks	Remarks

AXIAL BASIN UPLIFT

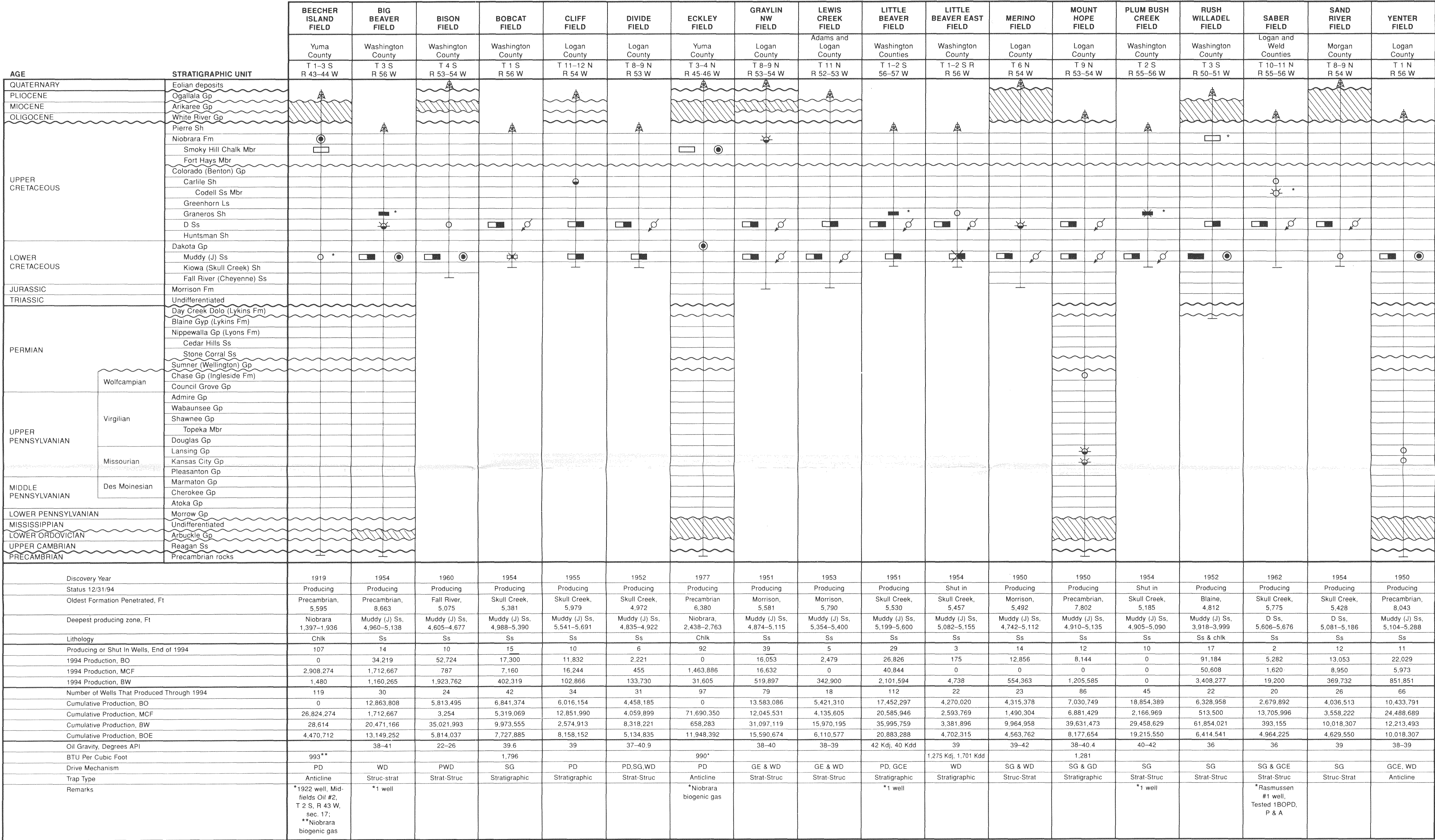


PENETRATION CHARTS OF SELECTED COLORADO OIL AND GAS FIELDS

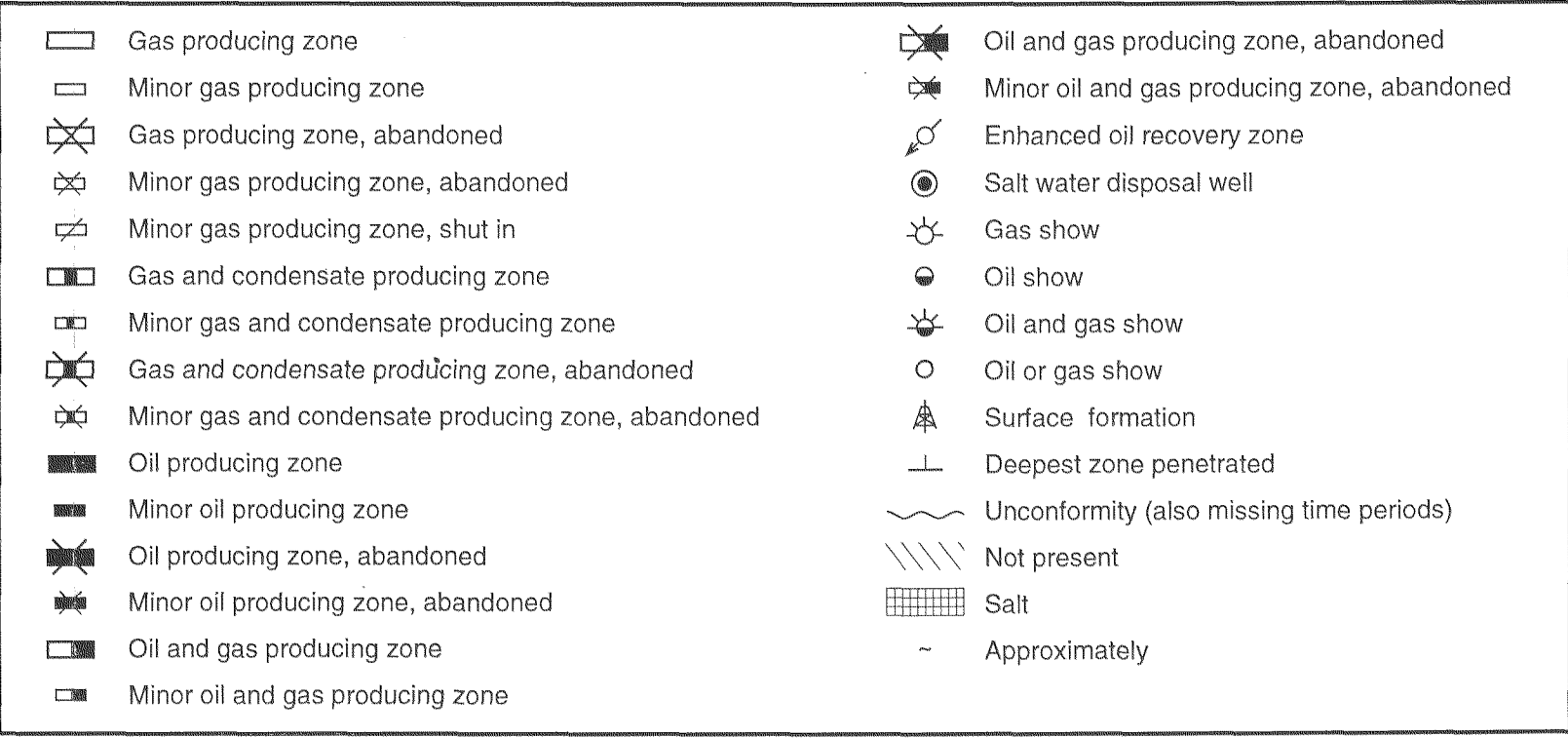
NORTHEAST QUADRANT

By Carol Morgans Tremain Ambrose

EAST DENVER BASIN



EXPLANATION OF SYMBOLS



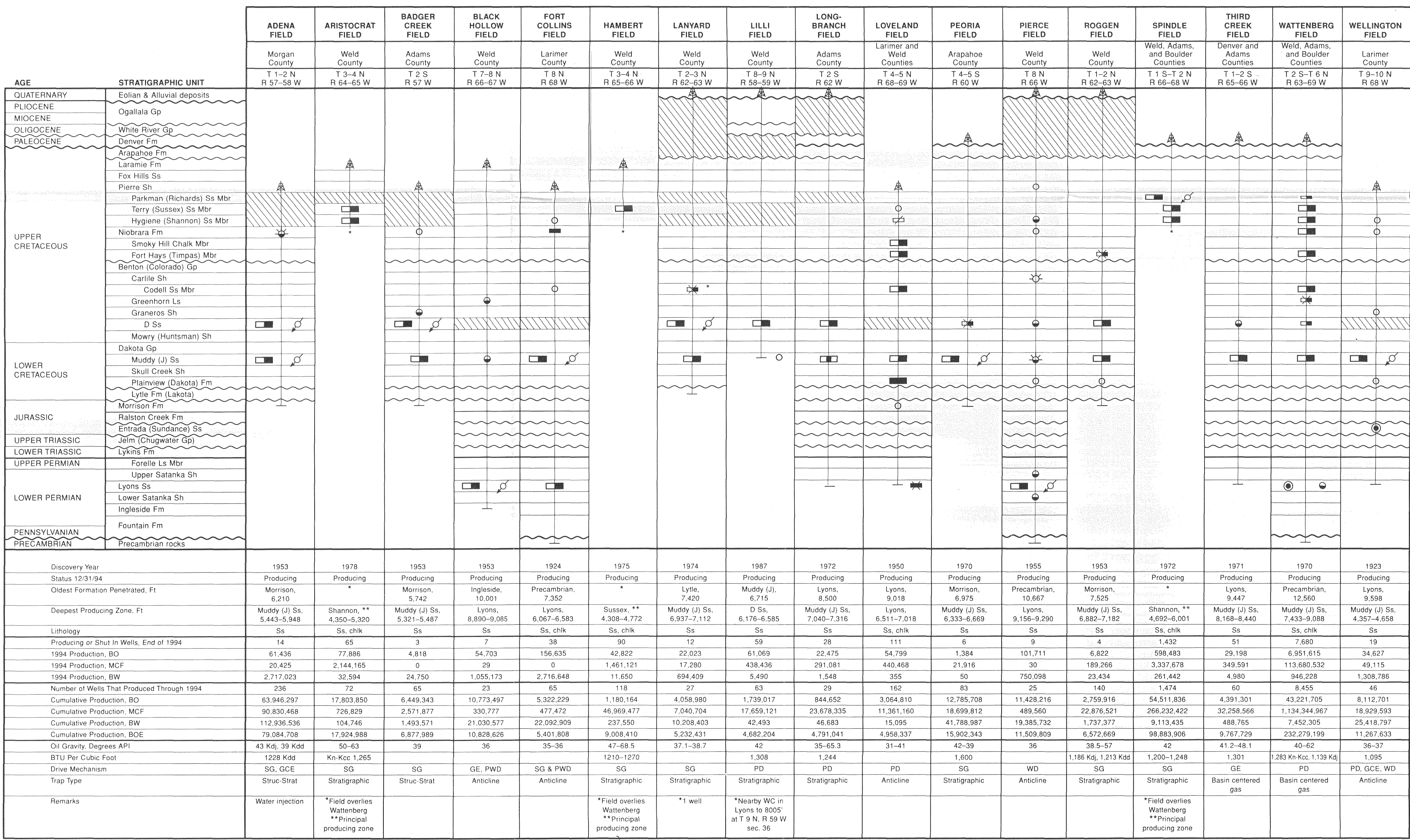
EXPLANATION OF FIELD DATA

Term	Definition
Discovery Year	Year field was discovered
Status 12/31/94	Field status
Oldest Formation Penetrated, Ft	Oldest formation penetrated and depth
Deepest Producing Zone, Ft	Deepest zone that has produced with shallowest and deepest perforations
Lithology	Lithology of producing zones
Producing or Shut In Wells, End of 1994	Number of producing and shut in wells
1994 Production, BO	1994 annual production, barrels of oil
1994 Production, MCF	1994 annual production, thousand cubic feet of gas
1994 Production, BW	1994 annual production, barrels of water
Number of Wells That Produced Through 1994	Total number of wells that have produced oil and/or gas through field's history
Cumulative Production, BO	Cumulative production, barrels of oil
Cumulative Production, MCF	Cumulative production, thousand cubic feet of gas
Cumulative Production, BW	Cumulative production, barrels of water
Cumulative Production, BOE	Cumulative barrels of oil + cumulative MCF $\pm$ 6 (not calculated where gas is CO ₂ or low BTU)
Oil Gravity, Degrees API	Gravity of produced oil in degrees API (American Petroleum Institute)
Drive Mechanism	Reservoir drive
Trap Type	Reservoir trapping mechanism
Remarks	Remarks

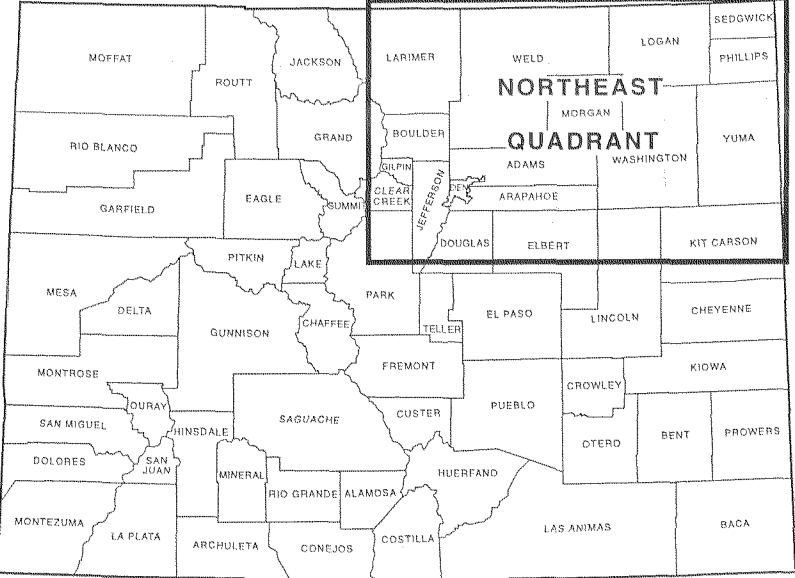
ABBREVIATIONS

API.....American Petroleum Institute	MB.....Member
BO.....Barrels of Oil	MCF.....Thousand Cubic Feet
BOE.....Barrels of Oil Equivalent	MCFD.....Thousand Cubic Feet Per Day
BOPD.....Barrels of Oil Per Day	Msp.....Mississippi
BTU.....British thermal units	N.....North
Carb.....Carbonates	N ₂Nitrogen
Cgl.....Conglomerate	P & A.....Plugged and Abandoned
Chk.....Chalk	PD.....Pressure Depletion
CO ₂Carbon dioxide	Penn.....Pennsylvanian
Crk.....Creek	IPm.....Morrow Fm.
Dolo.....Dolomite	IPt.....Topeka
E.....East	Prod.....produced
Fm.....Formation	PWD.....Partial Water Drive
Fract.....Fracture	Qz.....Quartzite
Fl.....Feet	R.....Range
GCE.....Gas Cap Expansion	SGD.....Solution Gas
GD.....Gas Drive	Sh.....Shale
GE.....Gas Expansion	Slst.....Siltstone
Gp.....Group	Ss.....Sandstone
H ₂ S.....Hydrogen Sulphide	Strat.....Stratigraphic
Jm.....Jurassic	Struc.....Structural
Gyp.....Gypsum	SW.....Southwest
Kcc.....Codell Sandstone	T.....Township
Kcm.....Cedar Mountain Formation	TD.....Total depth
Kd.....Dakota Formation	Tfu.....Fort Union Formation
Kdd.....D Sandstone	Tw.....Wasatch Formation
Kdj.....Muddy (J) Sandstone	W.....West
Kf.....Frontier Formation	WC.....Wildcat (exploration) well
Kn.....Niobrara Formation	WD.....Water Drive
Ls.....Limestone	

WEST DENVER BASIN



COLORADO STATE INDEX MAP



OIL AND GAS FIELD INDEX MAP OF THE NORTHEAST QUADRANT OF COLORADO

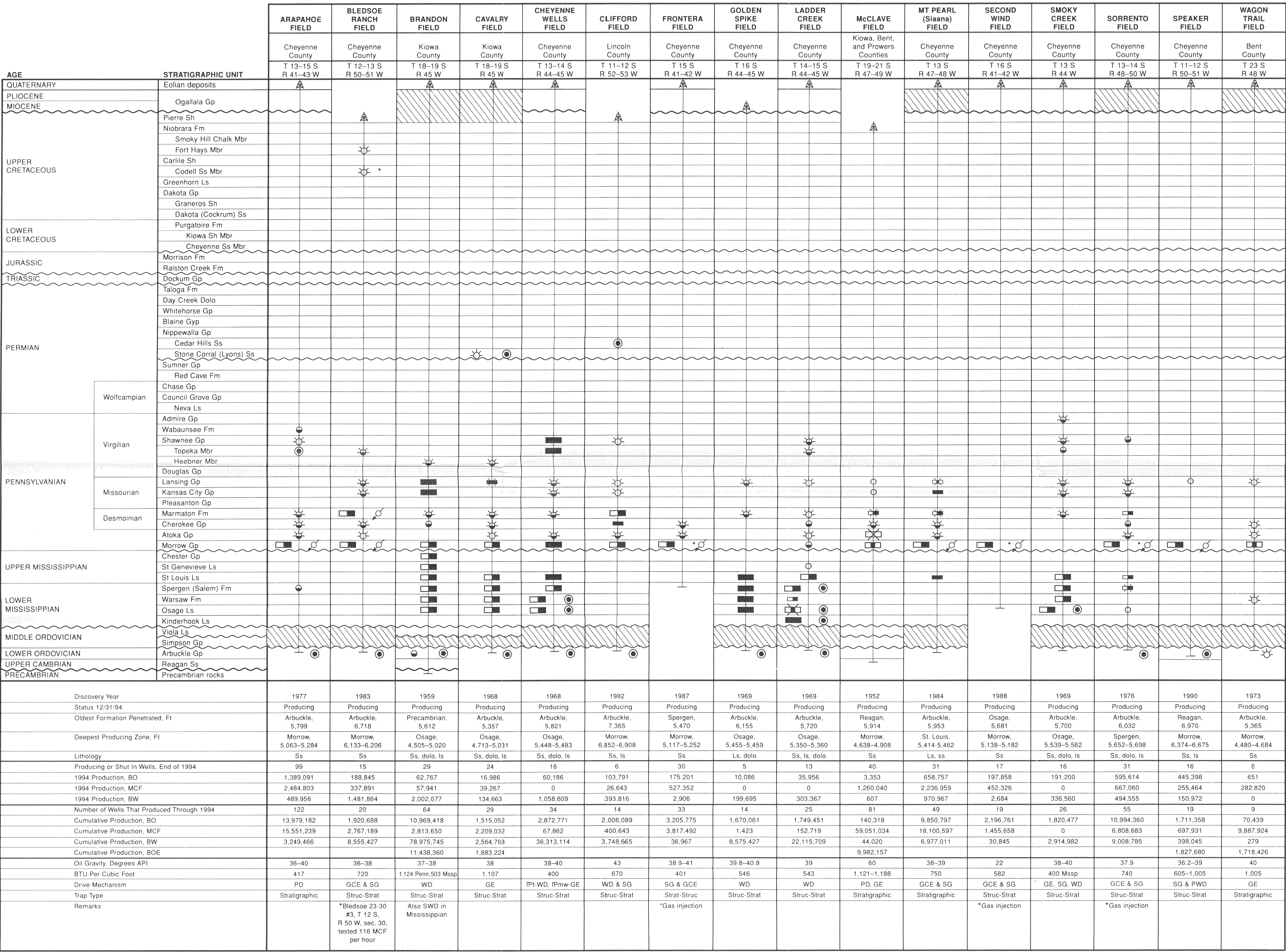


PENETRATION CHARTS OF SELECTED COLORADO OIL AND GAS FIELDS

SOUTHEAST QUADRANT

By Carol Morgans Tremain Ambrose

LAS ANIMAS ARCH



HUGOTON EMBAYMENT

