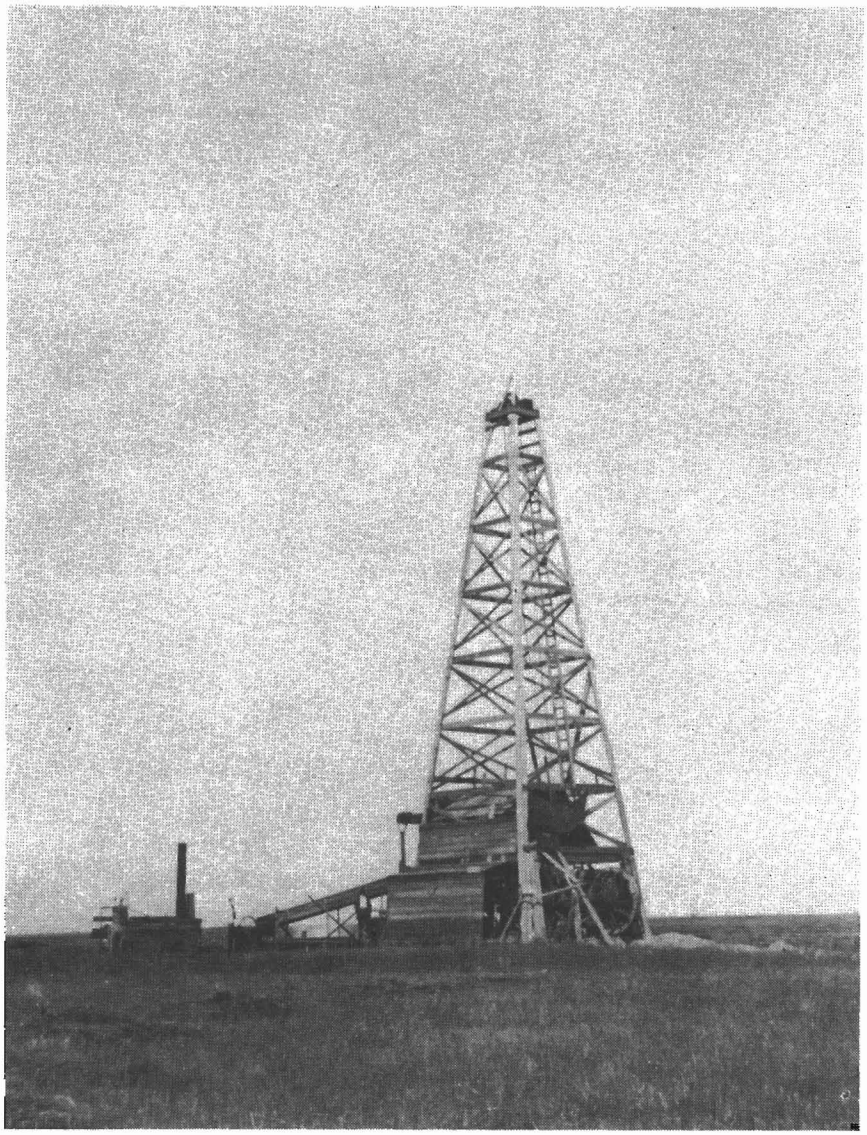
OIL EXPLORATION AND DEVELOPMENT IN THE NORTH DAKOTA WILLISTON BASIN: 1988-1989 UPDATE

by

Thomas J. Heck



MISCELLANEOUS SERIES NO. 74
NORTH DAKOTA GEOLOGICAL SURVEY

NORTH DAKOTA

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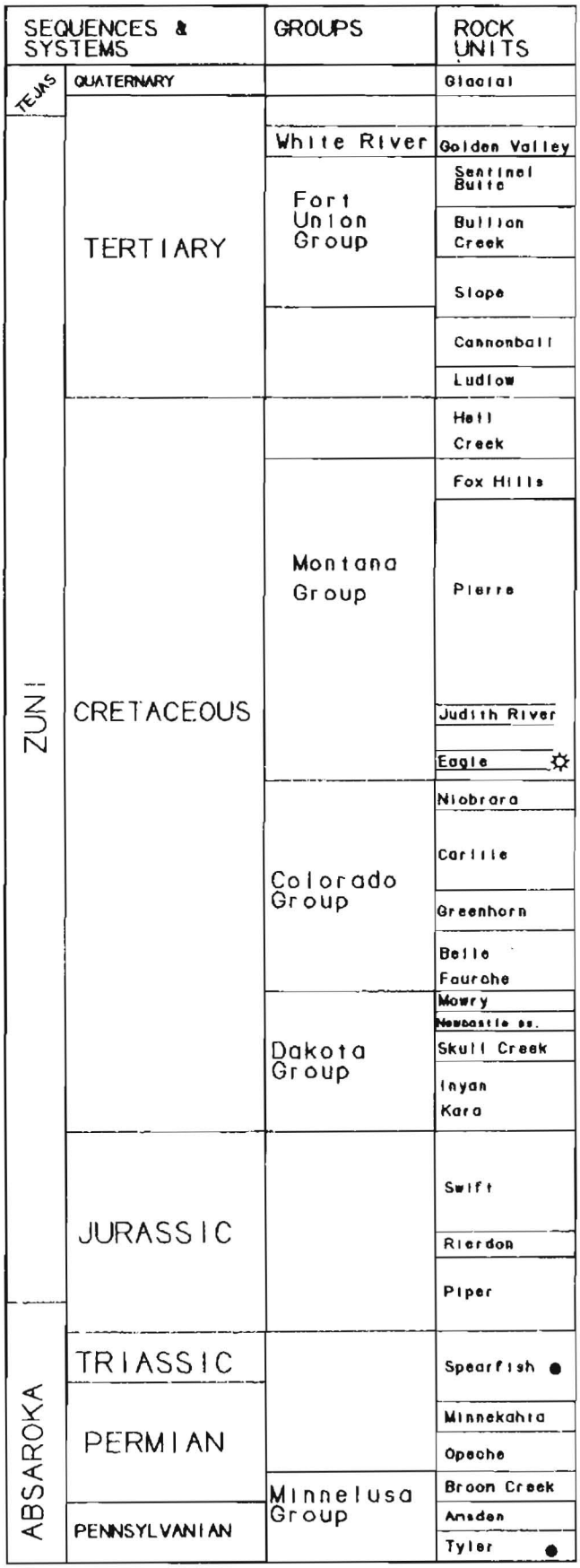

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John P. Bluemle, Acting State Geologist

1990

The cover shows "a standard cable-tool rig drilling for natural gas on the Parker farm south of Westhope, Bottineau County, on June 15, 1910. The operator was North Dakota Gas Co. The boiler was fired with gas from nearby wells (T161N, R80W)." Folsom (1980, p. 10).

CONTENTS

ILLUSTRATIONS

INTRODUCTION

The 1980's saw considerable changes in North Dakota's oil industry. Activity was initially at record highs, a result of the Arab oil embargo and the rapid price increases of the 1970's. In 1982, when oil prices dropped, activity did too. The new, lower levels of activity established at that time were thought by many to be the bottom but, in 1986, over-production by OPEC caused a further precipitous fall in prices from which the oil industry has yet to recover. The late 1980's were a slow period in North Dakota. Current levels of activity are still far below the peaks seen during 1980-1981. This update summarizes the 1980's with the main focus on the events of 1988 and 1989.

The data presented here are largely from the North Dakota Industrial Commission's files as collected by the Oil and Gas Division. Additional data were provided by the State Tax Department and the State Land Department. Help from all the above organizations is gratefully acknowledged. Interpretations of the data however, are my own. With this update, the historical overview of pre-1980 oil exploration in North Dakota, included in previous updates, has been dropped. The reader is referred to Fischer and Bluemle (1987) for this information. A second change is in figure 2, a graph of oil-tax revenue revised from Fischer and Bluemle (1987, fig. 17). The figures used to compile figure 2 more accurately reflect oil-tax revenue collections than did the 1987 figures, which were based primarily on tax disbursements, rather than collections.

THE 1980'S

The year 1980 set records for both the oil industry and for North Dakota. Oil prices were high, averaging $28/barrel (Fischer and Bluemle, 1987; fig. 17); operators were aggressively pursuing new plays and prospects; state lease sales brought record revenues (fig. 1); and tax revenues were climbing (fig. 2). Nearly 600 wells were drilled (fig. 3) in North Dakota in 1980; of these, 182 (31%) were wildcats (fig. 4). New-pool discoveries reached 84 (fig. 5) and production rose to a second new annual high of 40,354,030 barrels (fig. 6).

Most of the records set in 1980 were broken during 1981, the year that marks the peak of the "oil boom" in North Dakota. A total of 267 wildcats were drilled, 102 new pools were discovered, and 834 total wells were drilled. Production surpassed the 1980 record as 45,706,999 barrels of oil were produced, setting a third straight production record. State revenues skyrocketed when the new extraction tax began generating its first revenue (fig. 2) and exceeded 20 percent of the states total revenue (fig. 7). 1981 levels could not be sustained, however, as oil prices began slipping during 1982. Drilling activity slowed although oil production and tax revenues continued to climb. Emphasis shifted toward development drilling and the wildcatting that was done was concentrated in known plays.

Drilling fell further during 1983 as oil prices continued to fall. Wildcatting (fig. 4) was a third of 1981 levels, reflecting the new, lower oil prices, but development drilling remained high. Oil

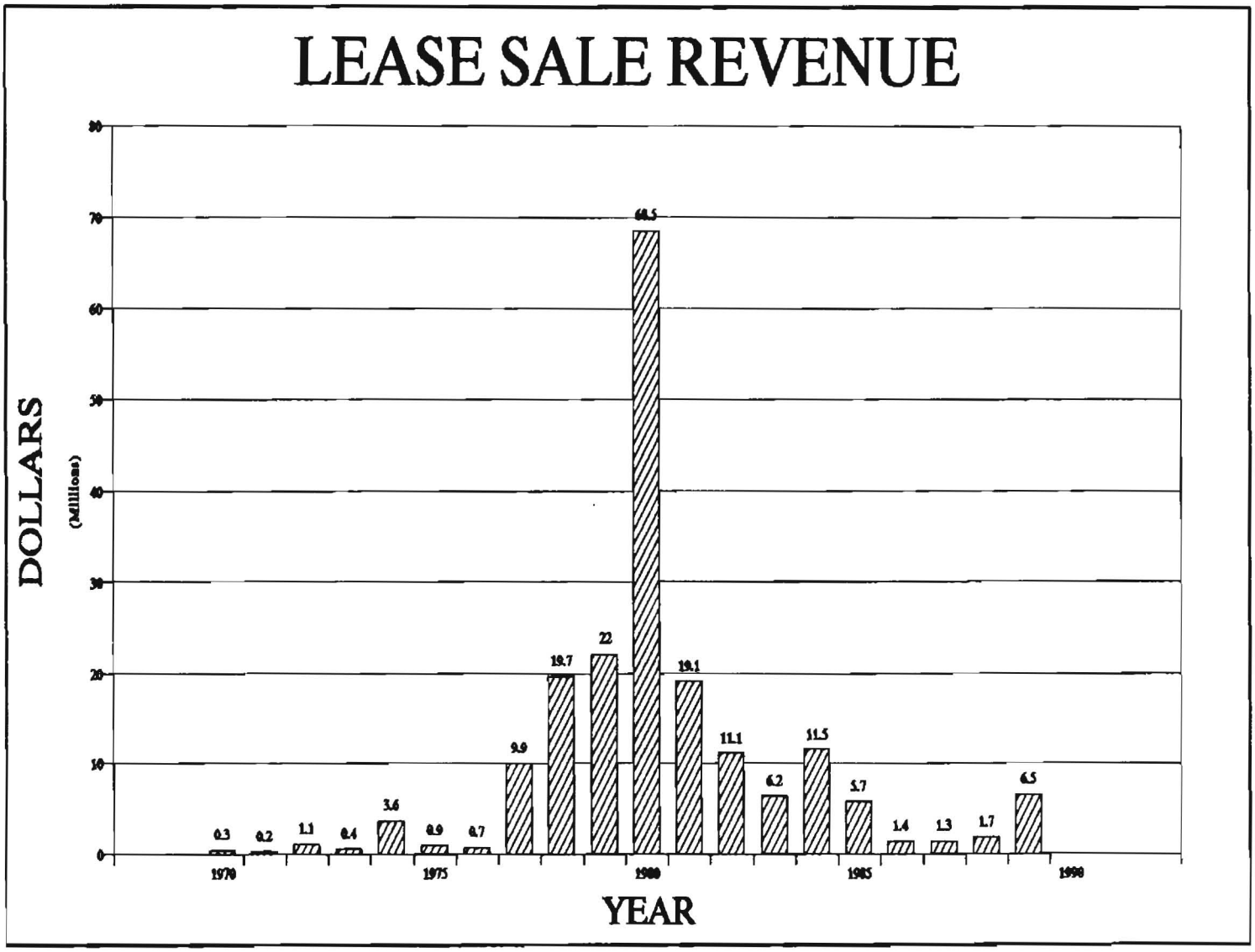

Figure 1. Bar diagram of total annual revenue from quarterly state lease sales held during the years 1970-1989. (Source: N.D. State Land Department).

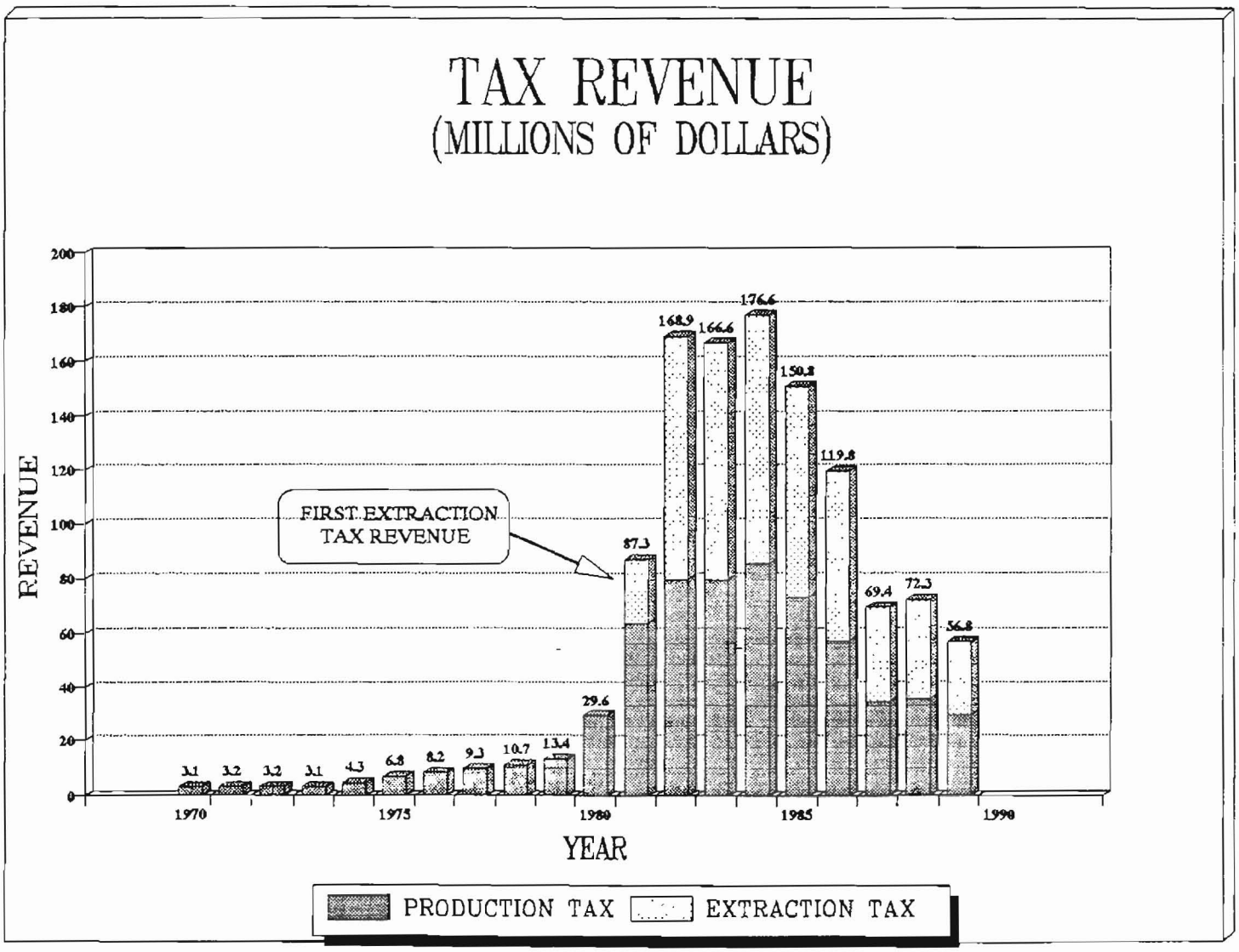

Figure 2. Bar diagram of total tax revenue generated annually from the state production and extraction taxes for the period 1970-1989. Extraction tax went into effect on January 1, 1981. (Source: N.D. State Tax Commission).

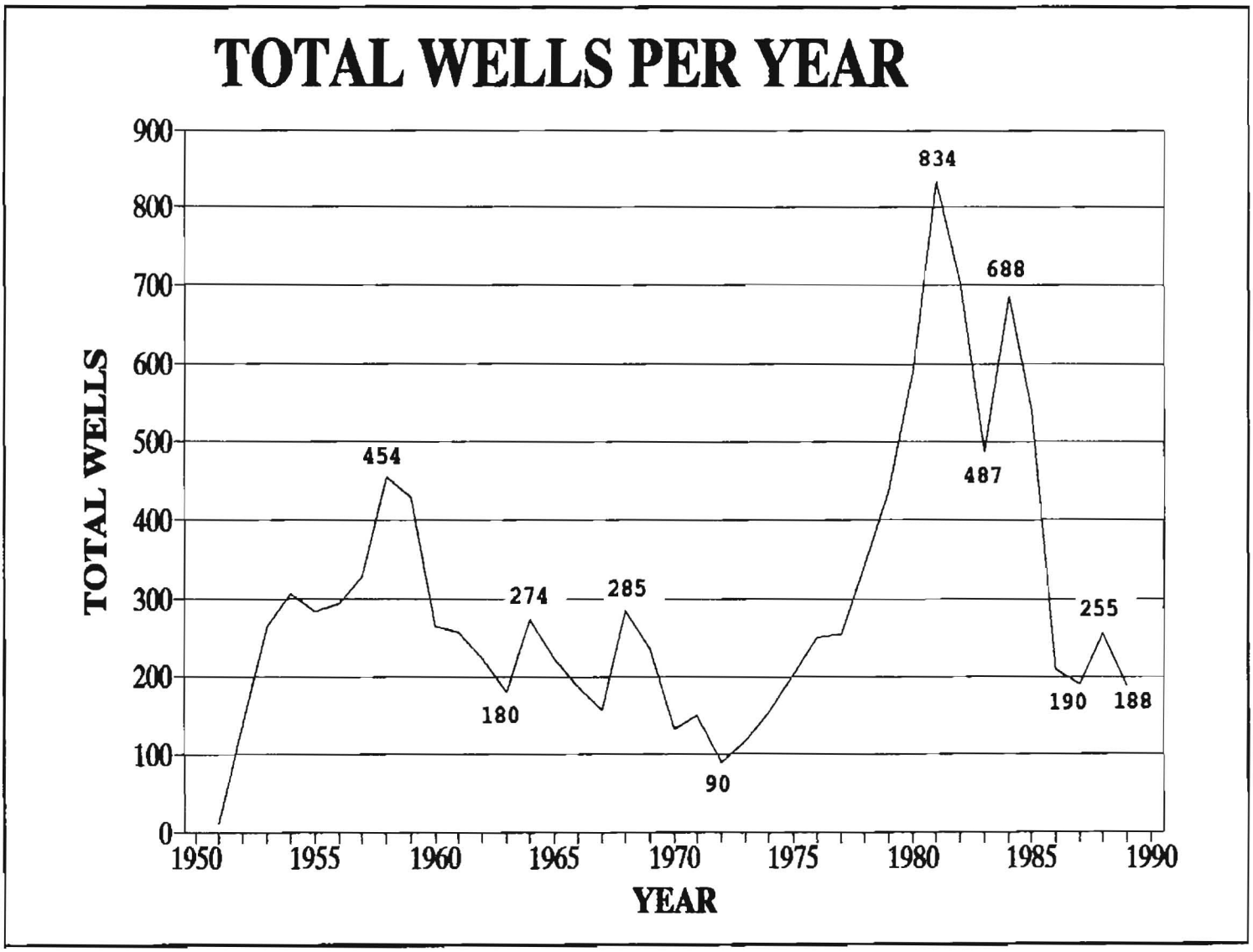

Figure 3. Graph of total number of oil wells drilled annually in North Dakota since 1951. (Source: N.D. Oil and Gas Division).

production rose yet again, as did tax revenues. Drilling rebounded slightly during 1984 as more wildcat and development wells were completed. North Dakota oil production reached an all-time peak of 52,654,336 barrels in 1984 (fig. 6) but, because of lower oil prices, tax revenues decreased for the first time since 1973 (fig. 2). Drilling declined during 1985 as oil prices slid further and began to fluctuate and during 1986, over-production by OPEC caused a rapid price drop to below $10 a barrel for some crudes. Drilling virtually ceased as companies found that it was too often an uneconomic venture. Prices gradually rose during late 1986 and early 1987, but drilling did not resume its former levels.

To summarize, 1980-1985 was a period of record oil prices, revenues, and drilling followed by gradual decline. In 1986, a major price drop caused drilling to plummet and, since then, drilling has remained fairly constant at 1960's levels (fig. 3). Declines in production, as fields age and uneconomic wells are plugged, are not being offset at present drilling levels.

1988

STATISTICS

1988 records a slight increase in drilling over 1987, with a total of 255 wells drilled (fig. 3); of these 67 were wildcats (fig. 4). Most of the 19 new pools (fig. 5) and the new fields (fig. 8) discovered in 1988 were completed in the Madison Formation (table 1 & appendix I). McKenzie County, with six new pools added, was the most active area. Success rates for the year were nearly 52% for all wells and slightly greater than 16% for wildcats. The 1988 numbers are an improvement over 1987, when only 190 total wells and 54 wildcats were drilled. The overall success rate dropped by 2%, but the wildcat success rate rose by 1%. During 1988, 2,077,049 feet of hole were drilled, an increase of almost 400,000 feet. Oil production declined by 2,008,411 barrels to 39,355,884 barrels, a 5% drop (fig. 6).

DRILLING ACTIVITY

Perhaps the most significant oil field activity during 1988 was the increase in horizontally drilled wells. During 1987, Meridian Oil had completed its #33-11 MOI well, the first horizontally drilled Bakken Formation well and the second horizontally drilled well in North Dakota. The well, drilled in Elkhorn Ranch Field in Billings County, was completed for an initial potential (IP) of 258 barrels of oil per day (BOPD). During 1988, eight more horizontal Bakken wells were completed. One of the eight, the Meridian #31-7H MOI, was the discovery well for the Cinnamon Creek-Bakken Pool. Of the eight, only one was not drilled by Meridian. The exception, drilled by Conoco Inc., was the second horizontally drilled Bakken well in North Dakota. Another horizontal well, the Meridian Oil #33-19H, drilled in Bicentennial Field, had an IP of 443 BOPD. Of the eight horizontal Bakken wells completed during 1988, none were dry. Production from the nine horizontal Bakken wells at the end of 1988 was 1,094 BOPD. The horizontal Bakken play has generated more activity in North Dakota than any event since the 1986 Winnipegosis reef discovery at Tablelands Field in Saskatchewan, which triggered a large lease play in north-central North Dakota.

One of the year's better conventional discoveries was made by CNG near Glenburn in Bottineau County. The CNG-#1-13 Routledge (sec. 13, T159N, R82W), discovered

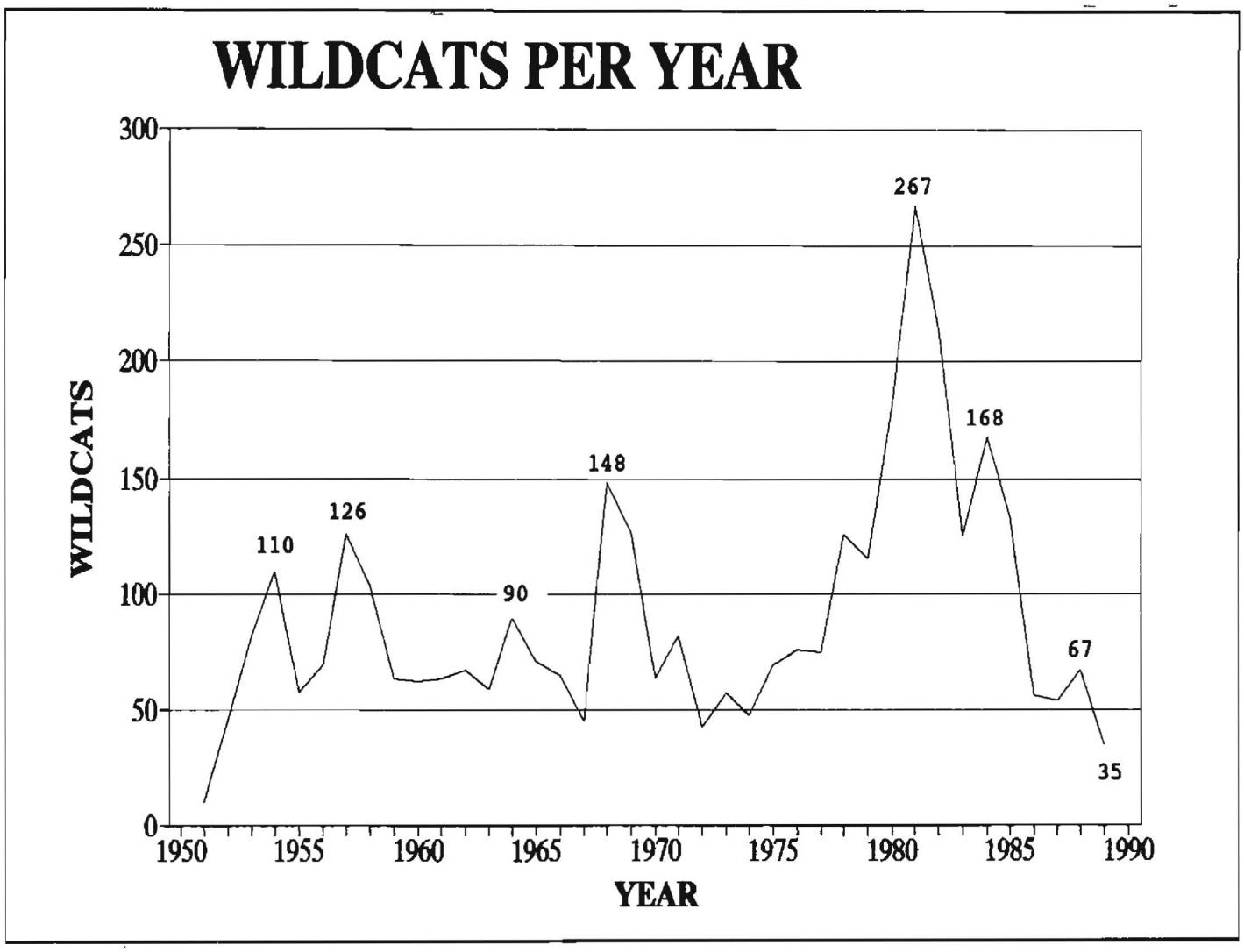

Figure 4. Graph of total number of exploratory wells drilled annually in North Dakota since 1951.

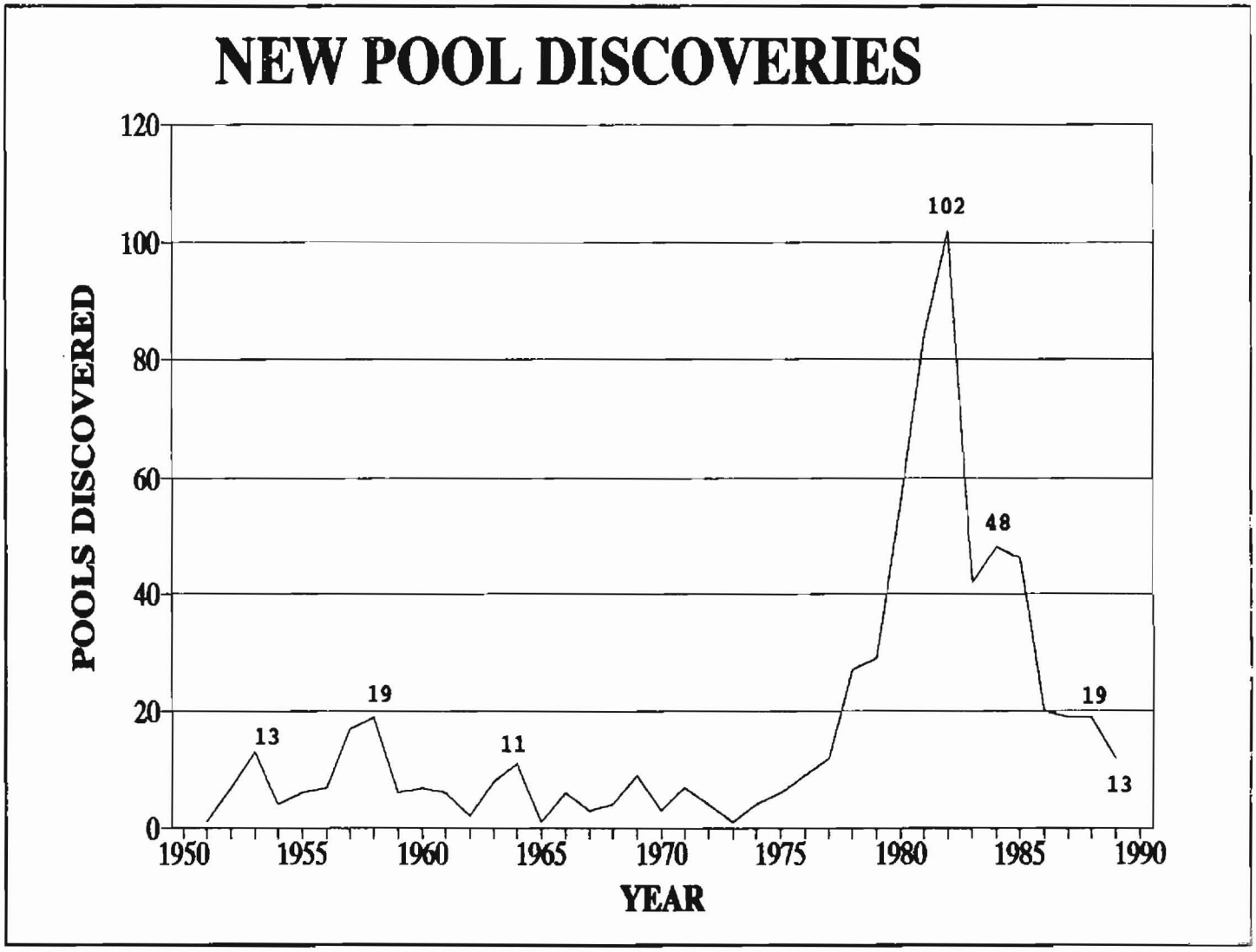

Figure 5. Graph of number of oil pools discovered annually since 1951.

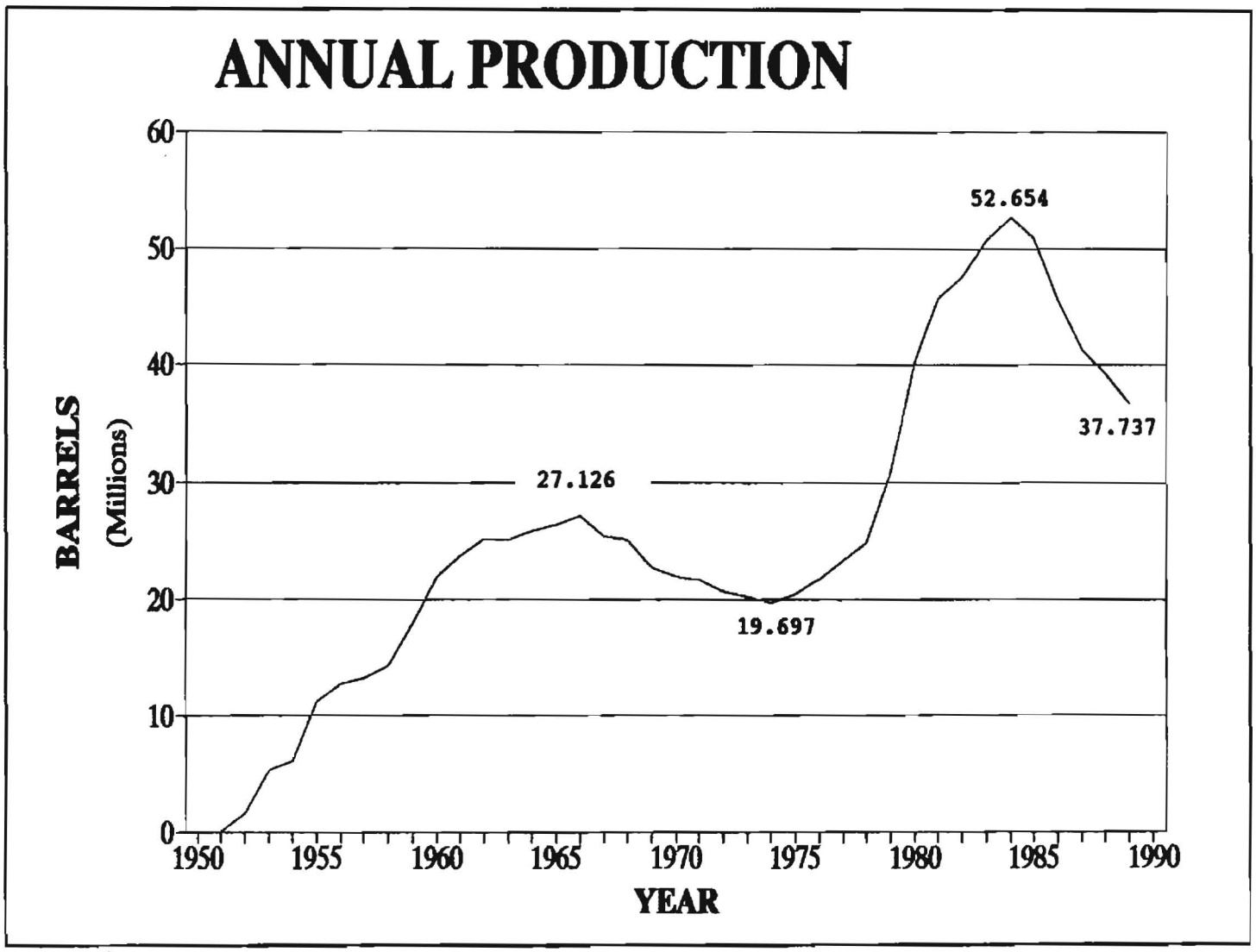

Figure 6. Graph of annual oil production since 1951.

Elms Field, which currently produces from six wells. Through 1989, the field had produced more than 200,000 BO from the Wayne porosity at a depth of only 4,500 feet. This field is typical of north-central North Dakota, where production is from shallow depths with good production rates. It is no mystery why companies continue to explore there.

Table 1 -1988 and 1989 New Pool Discoveries Listed by County and Formation

		1988	1989
Billings County			
	Total	1	1
	Bakken	0	1
	Duperow	1	0
Bottineau County			
	Total	3	0
	Madison	3	0
Burke County			
	Total	1	0
	Madison	1	0
Divide County			
	Total	1	2
	Duperow	0	1
	Madison	0	1
	Red River	1	0
Dunn County			
	Total	1	0
	Madison	1	0
McKenzie County			
	Total	6	5
	Bakken	1	0
	Birdbear	0	1
	Duperow	1	1
	Gunton	1	0
	Madison	1	2
	Red River	1	1
	Stonewall	1	0
Mountrail County			
	Total	0	1
	Madison	0	1
Ward County			
	Total	1	0
	Madison	1	0
Williams County			
	Total	5	3
	Bakken	0	1
	Madison	3	2
	Stonewall	2	0

Another significant discovery was made in Ward County by Cenex with the completion of the #15-34 Fedje (sec. 34, T154N, R84W). This well, which produces from the Mohall porosity, is the discovery well for Torning Field. The IP of the discovery well was only 31 BOPD, but it is significant because no other production occurs within 12 miles, no Mohall production within 60 miles, and the field proved that a large, relatively unexplored part of North Dakota has oil potential. During 1988, Cenex completed a total of three producers and three dry holes in the field. The best of the producers was the #9-11 Sundsbak (sec. 11, T153N, R84W) which had an IP of 149 BOPD. To reiterate, the significance lies not in the production rates, but in the potential for other discoveries in the area.

Wabek Field, discovered during 1985, lies approximately 18 miles west of Torning Field in Mountrail County. Prior to 1988, only four wells had been completed in the Sherwood porosity, Wabek's pay zone. During 1988, 17 additional wells were completed and production was extended into Ward County. These new wells had an average IP of 218 BOPD. Two of the wells, the Presidio Exploration Inc.'s #11-2 Erickson Fee and #44-31 Tvedt, had IP's of 453 and 484 BOPD

respectively. During 1988, while in the midst of development, Wabek produced 785,092 barrels of oil. This field promises to be one of the largest Sherwood fields in the state. It has spurred considerable interest in the area.

Another 1985 discovery that saw considerable development activity during 1988 is Smith Field in Renville County. A total of nine wells were drilled in the field during 1988 and, of them, seven were productive. This field, like Wabek, produces from the Sherwood, but has Bluell pay too. The IP of the seven wells averaged 240 BOPD and two of the wells flowed nearly 400 BOPD.

Several interesting finds were made in western North Dakota during 1988. Sun Exploration discovered the Hay Creek Red River pool in sec. 9, T150N, R104W, McKenzie County with the completion of their #1 Langwald well. The well flowed 817 BO, 805 MCFG, and 38 BWPD. Through 1989 it had produced 173,172 BO.

Texaco, Inc. discovered Stockyard Creek Field, a Madison producer, in Williams County with their completion of the #18-1 Otto Boss in sec. 18, T154N, R99W. The well flowed 272 BO, 221 MCFG, and 0 BWPD and it has made more than 71,000 BO through 1989. Texaco successfully extended the field during late 1988, but this well, the State of North Dakota "K" #1, has not equaled the discovery well.

Meridian Oil discovered the Duperow pool in Pierre Creek Field in T147N, R102W, McKenzie County. Since the discovery, three additional wells have been completed and nearly 350,000 BO produced. This field is an excellent example of the multi-pay potential in western North Dakota.

Infill/development programs accounted for much of the 1988 drilling. Active programs in north-central North Dakota included those at Cimbel and Haram Fields in Bottineau County. Tyler/Madison reservoirs were the target near Davis Creek and Dance Creek Fields as well as in several of the nearby older fields in Stark County. The Billings Nose saw considerable activity as the Bakken Formation shale was targeted with both vertical and horizontal wells.

1989

STATISTICS

Total drilling decreased 67 wells from its 1988 level (fig. 3) to 188 wells, 35 of which were wildcats (fig. 4). The seven wildcats that were completed represented a 20% wildcat success rate and the overall success rate exceeded 57%, improvements of 4% and 5% respectively over 1988 rates. New-pool discoveries, however, fell to 13 (fig. 5 and appendix II) and new fields to two (fig. 9). This can be partially attributed to the fact that drilling levels were lower. Once again, more discoveries were made in McKenzie County than anywhere else (table 1) and the Madison was again the most commonly completed formation. During the year, 1,557,827 feet of hole were drilled, a drop of 519,222 feet or 25%. Oil production fell to 36,737,516 barrels, a decrease of 2,618,368 barrels (6.7%) (fig. 6). Figure 10 approximately locates all the fields producing at the end of 1989.

DRILLING ACTIVITY

During 1989, 29 horizontal wells were completed, almost a four-fold increase over 1988. Of these, only one was classified as a wildcat well, Meridian Oil's #43-7H, the discovery well for Four Eyes-Bakken Pool. Development drilling accounts for the remaining 28 wells and at least one well was drilled in each of

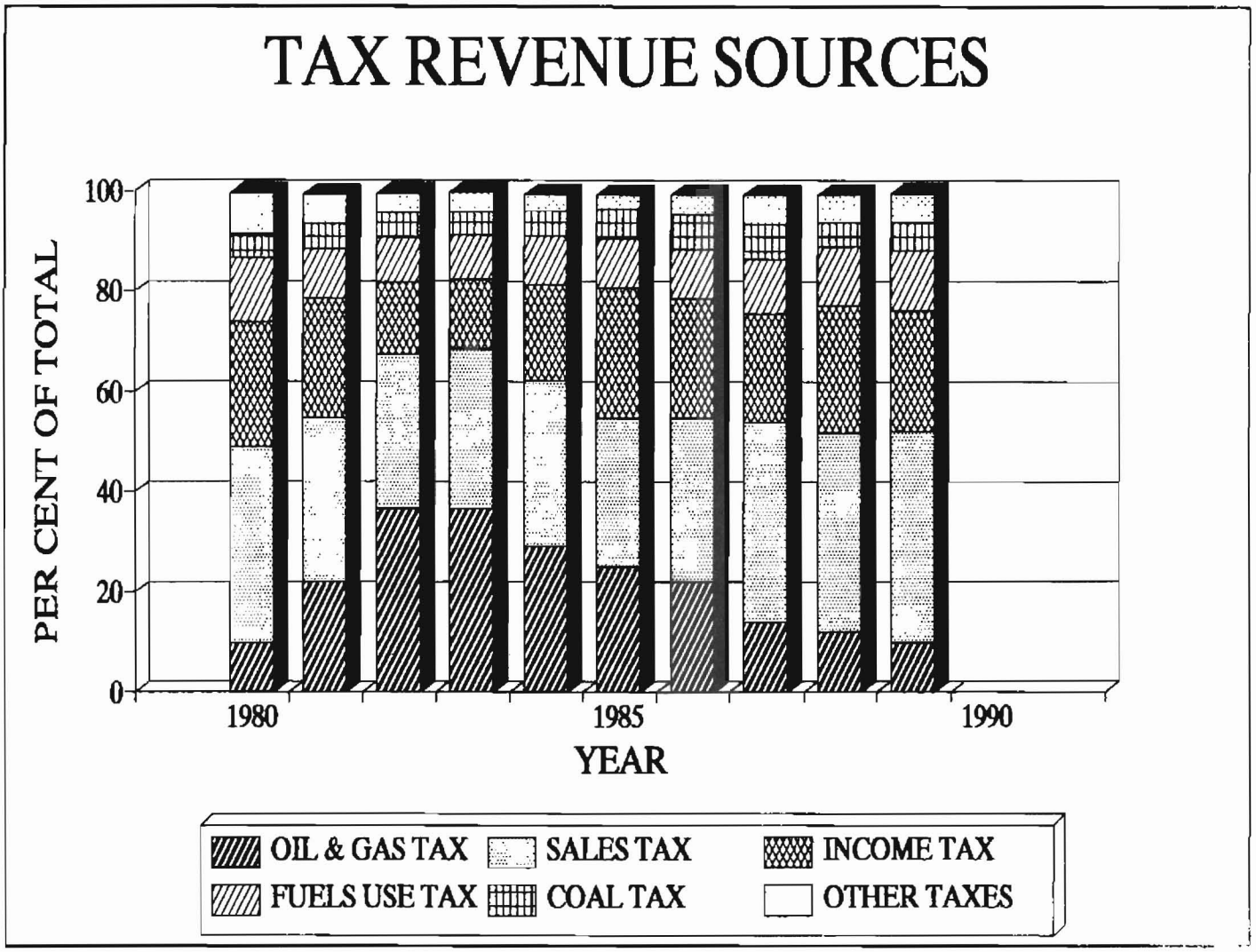

Figure 7. Bar diagram of state tax revenue sources.

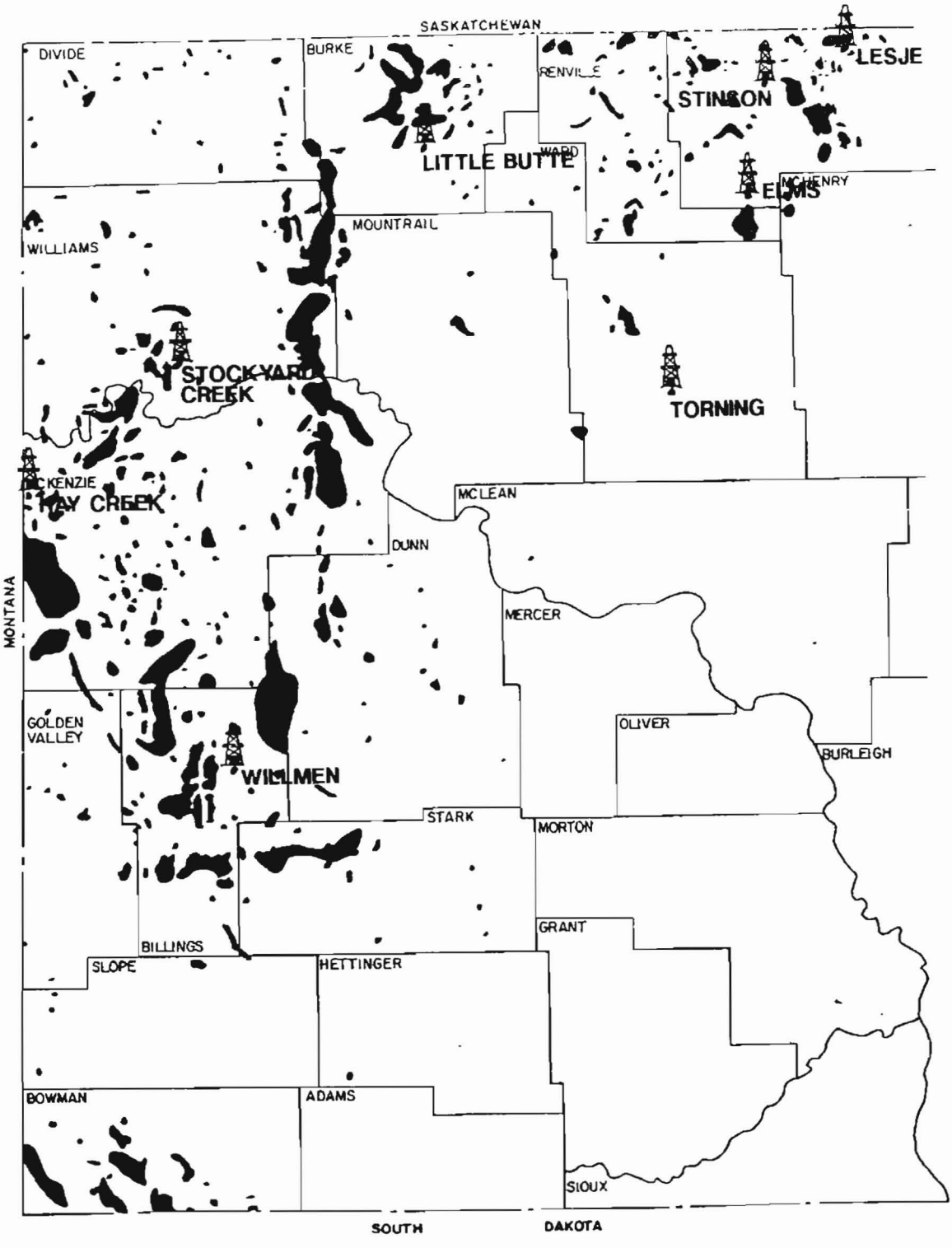

Figure 8. Map of western North Dakota with 1988 new field discoveries shown.

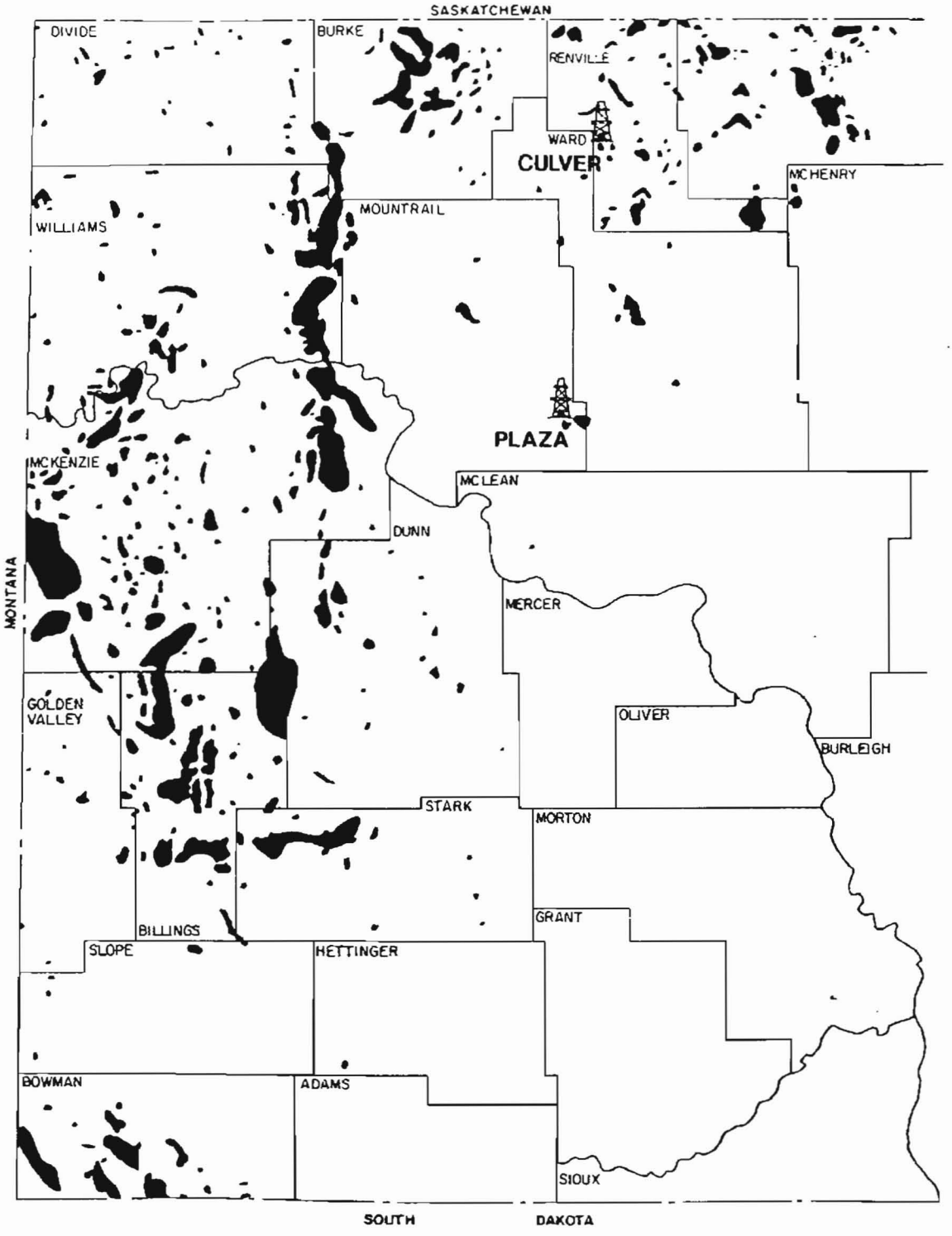

Figure 9. Map of western North Dakota with 1989 new field discoveries shown.

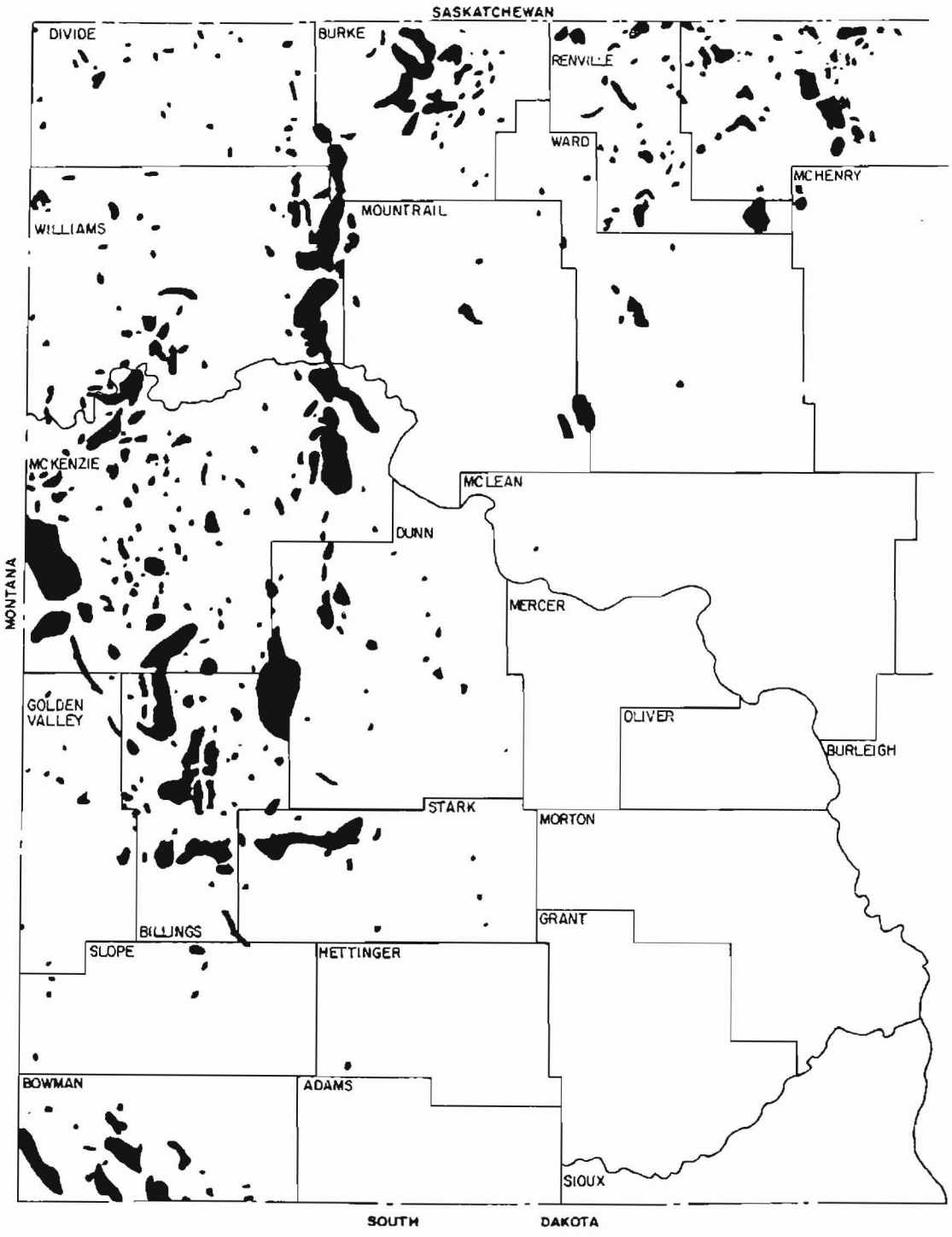

Figure 10. Map of western North Dakota with the approximate extent of all known oil fields at the end of 1989.

Elkhorn Ranch, Bicentennial, Roosevelt, Rough Rider, Pierre Creek, Poker Jim, Demores, Buckhorn, and Morgan Draw Fields. Temple Field's Bakken Pool was also discovered in 1989 by Dekalb Energy at their #22-24 McCoy in sec. 24, T159N, R96W, Williams County. The Bakken play had considerable impact on drilling in North Dakota. More than 15% of the wells drilled in 1989 were horizontal Bakken wells. Daily production from horizontal Bakken wells at the end of 1989 had risen to 5,132 BOPD, a five-fold increase over 1988.

Several significant discoveries were made during the year. The first, and most important discovery, was at Plaza Field in Mountrail County. Bluell pay was found downdip of the Sherwood "shoal" producing in Wabek Field. Eight wells were completed during the year with an average IP of 309 BOPD. In Wabek itself, seven more wells were drilled, with four completed producers. Through 1989, Wabek Field had produced nearly two million barrels and Plaza Field, with less than one year onstream, made more than 240,000 barrels and is still being actively developed.

A second find was the Antelope-Red River pool discovered by Amerada Hess at their #30-23 McKeen in McKenzie County. The well, located in sec. 30, T153N, R94W, had an IP of 113 BO, 1452 MCF, and 28 BWPD and has produced more than 17,000 BO and nearly 175,000 MCF to date. This well was a part of larger individual efforts by Amerada Hess and Oryx Exploration to evaluate the potential of the Cambro-Ordovician section on the Nesson Anticline and in the central part of the Williston Basin. Additional wells were drilled in Beaver Lodge, Tioga, Dimmick Lake, and North Fork Fields by these two companies as a part of the program.

Conoco and Wyoming Resources completed several prolific Red River development wells in Buffalo Wallow Field, while Kerr-McGee completed another Red River development well in Boxcar Butte Field. Their #2 Haugen well (sec. 9, T148N, R102W, McKenzie County), was completed for 755 BO, 592 MCF, and 11 BWPD.

Raymond T. Duncan recompleted the #1 Rivers well in Dolphin Field. This well, which had discovered the field's Souris River Pool, was recompleted in the Rival for 720 BO and 563 MCFGPD and produced 112,514 BO during 1989. Unfortunately, the only offset well drilled to date was dry.

Comdisco Exploration discovered Todd Field with the completion of their #1-32 Foster in sec. 32, T154N, R101W, Williams County. The well flowed 218 BO, 108 MCF, and 5 BWPD from the Rival Interval (the Rival Interval is sometimes referred to as the "Nesson pay", but the North Dakota Geological Survey discourages that usage because the name Nesson was pre-empted by the Jurassic Nesson Formation). An offset well was completed later in the year in Todd Field and further development work is pending.

The Birdbear was the target in North Branch Field as four wells were recompleted or drilled during 1989. IP's ranged between 243 and 490 BOPD and averaged 356 BOPD. More than 86,000 BO were produced in a combined total of 605 days of production for a sustained average of 142 BOPD. The Birdbear Formation is a promising target.

Development of the Buford-Madison pool continued with three new completions in three attempts. Of the seven new wells drilled in Torning Field, only one produced. This 1988 discovery has been an elusive target. Nine development wells were drilled in Sherwood and

Mouse River Park Fields. Of these, seven were successful, proving that there still is life in some of the older fields.

Finally, at 3:15 P. M. on October 23, 1989, North Dakota's billionth barrel of oil was produced. Appropriately, the oil was taken from an oil well located one mile from the Clarence Iverson #1 well in Beaver Lodge Field, the discovery well for oil in North Dakota. A gathering in Williston celebrated the event.

SUMMARY

During 1988 and 1989, the two years covered in this update, several important events occurred. Activity has remained low, at the 1960's level, reflecting unstable oil prices and uncertain economics, but a bright spot has been the steady increase in drilling in the horizontal Bakken play. Development drilling in several fields, notably in Plaza and Wabek Fields, was tremendously successful. Recompletions in several older wells found new zones and one wildcat opened a large part of North Dakota to exploration when oil was discovered in a "nonproductive" area. Several companies began programs to evaluate the deep potential of western North Dakota; this should lead to the discovery of some significant new fields. A number of the last two year's discoveries were one-well finds. Even with rising Bakken production and the discovery of Wabek, Plaza, and all the other new pools, North Dakota's annual production continued to decline during 1988 and 1989. The 1989 rate of decline increased by nearly 2% over 1988's. Given the fact that a large percentage of North Dakota's revenue comes from oil taxes, lease sales, and state and federal royalties, some method of increasing production in the state must be found to offset the decline.

APPENDIX I--Oil and Gas Discovery Wells
In North Dakota During 1988

COUNTY FILE NO. ORDER NO.	COMP. DATE	OPERATOR, WELL NAME, LOCATION	FIELD -POOL (NUMBER OF WELLS CURRENTLY IN POOL)	TOTAL DEPTH -SPACING	PERFORATED INTERVAL	IP (CUR. -BOPD)	GRAV.	GOR	WATER
McKenzie 12262 5127	1/24/88	Sun Exploration & Production Co. Langwald #1 SESW sec. 9-150N-104W	Hay Creek Red River (1)	12,910' 160	12,680-12,684' 12,702-12,713'	817 (43)	51.0°	985	38
Bottineau 12298 5125	1/25/88	CNG Producing Co. Routledge #1-13 SWSE sec. 13-159N-82W	Elms Wayne (6)	4,650' 40	4,480-4,496'	125 (70)	25.8°	0	45
McKenzie 12238 5141	2/10/88	Meridian Oil Inc. Federal #14-30 SWSW sec. 30-147N-102W	Pierre Creek Duperow (4)	13,150' 160	11,196-11,206'	349 (88)	42.7°	731	0
Burke 12271 5175	2/15/88	Thermal Exploration, Inc. Chrest #22-26 SENW sec. 26-161N-91W	Little Butte Bluell (2)	7,056' 80	6,840-6,846'	39 (19)	33.4°	1270	35
Williams 9800 5178	2/21/88	Dallas Engineering Inc. Simpson #1 NWSE sec. 27-158N-97W	New Home Madison (1)	14,433' 40	9,014-9,107' 9,180-9,250'	9 (0)	NA	0	46
McKenzie 7200 5196	4/27/88	Ladd Petroleum Corp. Folkvord-State #1-36 NENE sec. 36-146N-105W	Squaw Gap Gunton (1)	12,902' 160	12,407-12,418'	11 PNA	42°	1400	13
Billings 6913 5215	5/12/88	Total Petroleum, Inc. A. W. Thompson #1 SENW sec. 9-143N-99W	Whitetail Duperow (1)	14,400' 320	11,742-11,750'	193 (183)	43°	1100	0

APPENDIX I--Continued

COUNTY FILE NO. ORDER NO.	COMP. DATE	OPERATOR, WELL NAME, LOCATION	FIELD -POOL (NUMBER OF WELLS CURRENTLY IN POOL)	TOTAL DEPTH -SPACING	PERFORATED INTERVAL	IP (CUR. -BOPD)	GRAV.	GOR	WATER
Ward 12365 5232	5/18/88	Cenex Fedje #15-34 SWSE sec. 34-154N-84W	Torning Mohall (5)	6,260' 80	6,099-6,106' 6,118-6,122' 6,142-6,144'	31 (9)	26°	TSTM	79
Divide 10928 5259	5/20/88	Louisiana Land & Exploration Co. Ahab 23-30 #1 NESW sec. 30-163N-100W	Gooseneck Red River (1)	11,189' 160	11,026-11,040'	42 (SI)	31°	286	120
Williams 8296 5258	5/26/88	Texaco, Inc. Temple #30-16 SESE sec. 30-157N-96W	Ray Stonewall (1)	13,660' 320	12,905-12,908' 12,921-12,924' 12,934-12,941'	146 (45)	55.0°	9602	17
Williams 11164 5216	6/13/88	Samuel Gary Jr. & Associates Hemsing #2-33 SWSE sec. 33-158N-95W	West Tioga Stonewall (3)	12,966' 320	12,355-12,360' 12,481-12,486' 12,525-12,533'	60 (52)	42°	2150	5
Bottineau 12423 5271	6/23/88	Wacker Oil Inc. Kjelshus 21-15 #1 NENW sec. 15-163N-78W	Lesje Madison (1)	3,250' 40	3,064-3,106'	83 (36)	33.4°	TSTM	76
McKenzie 9501 5267	7/16/88	Samedan Oil Corp. Federal-Rivet #6-1X SWNE sec. 6-146N-102W	Pierre Creek Stonewall (3)	13,286' 320	12,784-12,796'	387 (62)	41°	1498	TR
Dunn 12400 5257	7/18/88	Meridian Oil Inc. Griggs #33-9 NWSE sec. 9-142N-99W	Willmen Fryburg (1)	13,660' 160	9,428-9,448'	54 (30)	37°	426	27

APPENDIX I--Continued

COUNTY FILE NO. ORDER NO.	COMP. DATE	OPERATOR, WELL NAME, LOCATION	FIELD -POOL (NUMBER OF WELLS CURRENTLY IN POOL)	TOTAL DEPTH -SPACING	PERFORATED INTERVAL	IP (CUR. -BOPD)	GRAV.	GOR	WATER
Williams 12487 5298	9/1/88	Texaco Inc. Otto Boss #18-1 NWSE sec. 18-154N-99W	Stockyard Creek Nesson (4)	9,806' 160	9,660-9,672' 9,692-9,704'	272 (107)	36.8°	812	0
Williams 11517 5289	9/3/88	BWAB Inc. Mortenson #33-44 SESE sec. 33-155N-96W	West Capa Madison (1)	12,950' 160	8,232-8,262'	36 (9)	42.3°	972	68
McKenzie 9037 5335	9/9/88	Geolinear Co. Fettig #1 SESE sec. 21-149N-94W	Squaw Creek Mission Canyon (1)	14,501' 160	9,450-9,452' 9,458-9,464' 9,476-9,482' 9,494-9,498'	94 (40)	42.7°	862	12
Bottineau 12521 5327	9/30/88	Wacker Oil Inc. Stead 34-14 #1 SWSE sec. 14-162N-81W	Stinson Madison (4)	3,900' 40	3,590-3,630'	152 (43)	36.3°	NA	90
McKenzie 12531 5256	12/22/88	Meridian Oil Inc. #31-7H MOI NWNE sec. 7-145N-102W	Cinnamon Creek Bakken (1)	13,407'MD Zone 1/ Zone 2	10,899-13,407'	74 (37)	41°	880	0

APPENDIX II--Oil and Gas Discovery Wells
In North Dakota During 1989

COUNTY FILE NO. ORDER NO.	COMP. DATE	OPERATOR, WELL NAME, LOCATION	FIELD -POOL (NUMBER OF WELLS CURRENTLY IN POOL)	TOTAL DEPTH -SPACING	PERFORATED INTERVAL	IP (CUR. -BOPD)	GRAV.	GOR	WATER
McKenzie 7535 5426	2/17/89	Pennzoil Exploration & Production Pennzoil-Depco Federal #14-14F SWSW sec. 14-147N-101W	Bull Moose Birdbear (1)	11,350' 160	10,874-10,881'	11 PNA	41.1°	900	125
Williams 7712 5416	3/10/89	D. C. Dudley & Associates Gjorven #14-21 SWSW sec. 21-155N-98W	Brooklyn Nesson (1)	10,116' 160	9,751-9,765'	85 (35)	42°	1120	145
Divide 12085 5473	5/8/89	Raymond T. Duncan Rivers #1 SWNE sec. 29-161N-95W	Dolphin Nesson (1)	10,810' 160	7,508-7,514'	823 (379)	39°	750	0
Mountrail 12625 5205	5/15/89	Home Petroleum Corp. Van Beckhout State #21-16 NENW sec. 16-152N-88W	Plaza Bluell (8)	7,650' 80	7,400-7,422'	272 (147)	35.9°	410	0
McKenzie 9860 5538	6/8/89	Conoco Inc. Ketterling 21 #1 SENW sec. 21-151N-104W	Dore Madison (1)	12,935' 160	8,838-8,850' 8,991-9,006' 9,320-9,350'	7 (0)	NA	NA	10
McKenzie 12589 5580	6/18/89	Amerada Hess Corp. McKeen #30-23 NESW sec. 30-153N-94W	Antelope Red River (1)	14,720' 320	13,568-13,757' 13,578-13,582' 13,588-13,592' 13,644-13,666'	113 (77)	54°	11947	28
Divide 9083 5573	7/8/89	BWAB Inc. Ibarra #11-13 SWNW sec. 11-161N-99W	Garnet Duperow (1)	11,686' 160	9,274-9,278'	256 (160)	32°	390	3

APPENDIX II--Continued

COUNTY FILE NO. ORDER NO.	COMP. DATE	OPERATOR, WELL NAME, LOCATION	FIELD -POOL (NUMBER OF WELLS CURRENTLY IN POOL)	TOTAL DEPTH/ SPACING	PERFORATED INTERVAL	IP (CUR. BOPD)	GRAV.	GOR	WATER
Williams 12030 5537	7/18/89	Comdisco Exploration Inc. Foster #1-32 NWNW sec.32-154N-101W	Todd Nesson (2)	9,437' 160	9,198-9,218'	218 (86)	37°	500	5
McKenzie 12648 5574	7/29/89	Wyoming Resources Corp. Yellowstone #1 NWNW sec. 16-150N-104W	Hay Creek Duperow (1)	12,809' 160	10,902-10,922'	80 (64)	38.6°	400	42
Billings 12619 5620	8/15/89	Meridian Oil Inc. #43-7E MOI NESE sec. 7-143N-100W	Four Eyes Bakken (1)	14,228'MD 160	11,982-12,024' 13,974-14,227'	49 (35)	40°	956	4
Williams 11893 5684	10/13/89	DEKALB Energy Co. McCoy #22-24 SENW sec. 24-159N-96W	Temple Bakken (2)	11,245' 160	9,420-9,431'	28 (12)	40.4°	1600	7
Renville 12771 5703	12/14/89	JN Exploration & Production Mau #43-17 NESE sec. 17-160N-86W	Culver Sherwood/Bluell (2)	5,683' 80	5,480-5,490' 5,523-5,527'	165 (162)	26.5°	240	3
McKenzie 11847 5734	12/25/89	Meridian Oil Inc. #31-33 MOI NWNE sec. 33-147N-102W	Hay Draw Ratcliffe (1)	13,200' 160	9,245-9,260'	96 (126)	32°	906	125

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