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CONTENTS



Abstract ✓

Introduction UNITED STATES (DEPARTMENT OF THE INTERIOR)

Definition of reserve and resource terms GEOLOGICAL SURVEY,

Fields reported by area *no TM*

Studies conducted *cm*

Field-size distribution *twanah*

Yearly estimated remaining reserves 5

Number of fields discovered by year 5

Conclusions Estimated Oil and Gas Reserves, 10

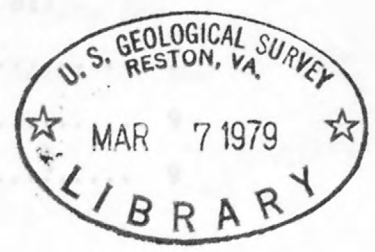
References cited Gulf of Mexico Outer Continental Shelf, 10

January 1, 1978

Figure 1. Index map showing outer Continental Shelf leasing areas off Texas and Louisiana.

By Floyd T. Bryan, John H. Knipmeyer, and E. Kenneth Schluntz

- Histogram showing field-size distribution of oil fields, and oil and gas fields.
- Pict showing remaining reserves by year.
- Graph showing number of discoveries by year.



Open-File Report 79-551

Table 1. Estimated demonstrated 1979 and gas reserves, January 1, 1978

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This report has not been edited for conformity with Geological Survey editorial standards or stratigraphic nomenclature.

CONTENTS

	Page
Abstract	1
Introduction	1
Definition of reserve and resource terms	2
Fields reported by area	2
Studies conducted	5
Field-size distribution	6
Yearly estimated remaining reserves	8
Number of fields discovered by year	8
Conclusions	10
References cited	10

ILLUSTRATIONS

Figure 1. Index map showing Outer Continental Shelf leasing areas off Texas and Louisiana	4
2. Histogram showing field-size distribution of gas fields	7
3. Histogram showing field-size distribution of oil fields, and oil and gas fields	7
4. Plot showing remaining reserves by year	9
5. Graph showing number of discoveries by year	9

TABLE

Table 1. Estimated demonstrated oil and gas reserves, January 1, 1978	3
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Estimated Oil and Gas Reserves,
Gulf of Mexico Outer Continental Shelf,

January 1, 1978

By Floyd T. Bryan, John H. Knipmeyer, and E. Kenneth Schluntz

ABSTRACT

Remaining reserves of oil* and gas in the Gulf of Mexico Outer Continental Shelf area have been estimated as 34.2 trillion cubic feet of gas and 2.7 billion barrels of oil as of January 1, 1978. These reserves are recoverable from 318 fields under the Federal submerged lands off the coasts of Louisiana and Texas.

Original recoverable reserves are estimated to have been 69 trillion cubic feet of gas and 7 billion barrels of oil from 334 fields in the same geographic area. Included in this number are 16 fields that are depleted and abandoned. Not included are 35 new fields, discovered since September 1, 1976, that are not sufficiently developed to permit a reasonably accurate estimate of reserves. Estimates were made for individual reservoirs in 210 fields and on a field-wide basis for the other 124 fields.

INTRODUCTION

This report, which supersedes USGS Open-File Report 78-87 (Bryan, Knipmeyer, and Schluntz, 1978), presents estimates of original recoverable

*The term "oil" as used in this report includes crude oil, condensate, and gas-plant liquids.

reserves, cumulative production through 1977, and estimates of remaining recoverable reserves as of January 1, 1978. The estimates of reserves were completed in September 1978.

As in the previous report, standard methods of estimating reserves were used, including volumetric calculations, decline curves, material balance, and mathematical simulation. A brief description of each method can be found in Open-File Report 78-87.

Acknowledgments

The estimates presented here incorporate contributions by geologists, engineers, and other personnel of the U.S. Geological Survey's Metairie, Louisiana, office and incorporate four field studies conducted for the National Research Council.

DEFINITION OF RESERVE AND RESOURCE TERMS

The reserve and resource terminology in this report conforms with that published by Miller and others (1975, p.8-9). Essentially, reserves of oil and gas are defined as concentrations of naturally occurring hydrocarbons which can be economically extracted using existing technology and whose amount can be estimated from geologic evidence supported directly by engineering measurements.

For a more detailed definition the reader should refer to the circular cited above, or to Open-File Report 78-87 which provides additional information on the application of certain terms to the Gulf of Mexico area.

FIELDS REPORTED BY AREA

Estimates of all producing fields as well as all fields discovered prior to September 1976 are included in area totals (table 1). The areas (fig. 1)

Table 1.--Estimated demonstrated oil and gas reserves for 334 fields,

Gulf of Mexico Outer Continental Shelf and Slope, January 1, 1978

[Demonstrated reserves: the sum of measured and indicated reserves. Liquids expressed in millions of barrels, gas in billions of cubic feet. "Liquids" include crude oil, condensate, and gas-plant products sold; "gas" includes both associated and nonassociated dry gas. Remaining recoverable reserves estimated as of January 1, 1978.]

Area (fig. 1)	Fields ^{1/} (total 334)	Original recoverable reserves		Cumulative production		Remaining recoverable reserves	
		Liquids	Gas	Liquids	Gas	Liquids	Gas
Mustang Island.....	4	0.3	220	0	0	0.3	220
Brazos.....	7	7.6	740	3.7	190	3.9	550
Galveston ^{2/}	5	55	1090	24	610	31	480
High Island.....	36	165	4490	5	550	160	3940
West Cameron.....	46	171	11700	76	4700	95	7000
East Cameron.....	31	131	5900	72	3300	59	2600
Vermilion.....	41	301	7800	149	4900	152	2900
South Marsh Island.	28	447	7800	189	3800	258	4000
Eugene Island.....	36	830	8500	600	4800	230	3700
Ship Shoal.....	30	820	6900	530	4200	290	2700
South Timbalier ^{3/}	17	1050	3140	740	1940	310	1200
South Pelto.....	3	62	151	36	66	26	85
Grand Isle.....	10	800	2770	610	1650	190	1120
West Delta.....	13	1030	3150	750	2200	280	950
South Pass.....	9	620	1560	380	870	240	690
Main Pass.....	15	550	2500	300	1200	250	1300
Mississippi Canyon.	3	130	790	0	0	130	790
Total.....	334	7169.9	69,201	4464.7	34,976	2705.2	34,225

^{1/} Represents 318 of the 353 active (Sept. 1978) fields and 16 formerly productive, now-abandoned fields.

^{2/} And East Breaks Area.

^{3/} And Bay Marchand Area

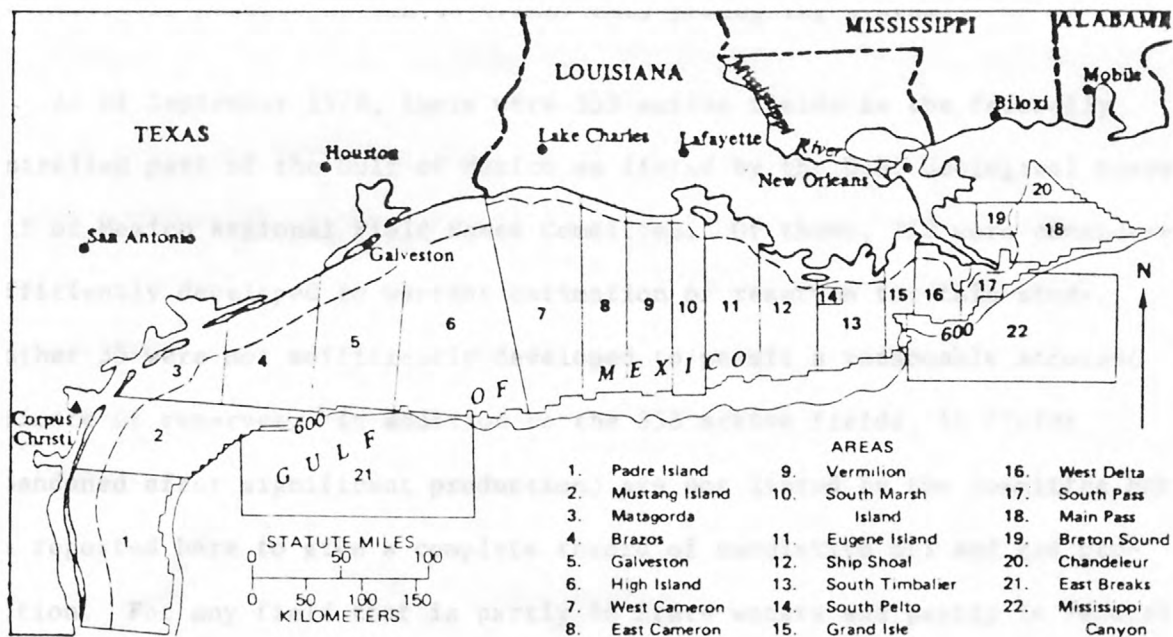


Figure 1.—Index map showing Outer Continental Shelf leasing areas off Texas and Louisiana. Dashed lines, shown at 3 marine leagues (9 nautical miles) from the Texas coast and 3 nautical miles from the Louisiana coast, indicate boundary between State and Federal waters. Solid line indicates 600-foot water depth.

are those delineated by the Bureau of Land Management for administrative purposes. The reserves reported in table 1 include estimates for 334 fields and constitute the current listing in the U.S. Geological Survey's Field and Reservoir Reserve Estimates (FRRE) data-processing system.

As of September 1978, there were 353 active fields in the federally controlled part of the Gulf of Mexico as listed by the U.S. Geological Survey, Gulf of Mexico Regional Field Names Committee. Of these, 318 were considered sufficiently developed to warrant estimation of reserves for this study. Another 35 were not sufficiently developed to permit a reasonably accurate estimate of reserves. In addition to the 353 active fields, 16 fields (abandoned after significant production) are not listed by the committee but are reported here to give a complete record of cumulative oil and gas production. For any field that is partly in State waters and partly in Federal waters, reserves are estimated for the Federal portion only.

STUDIES CONDUCTED

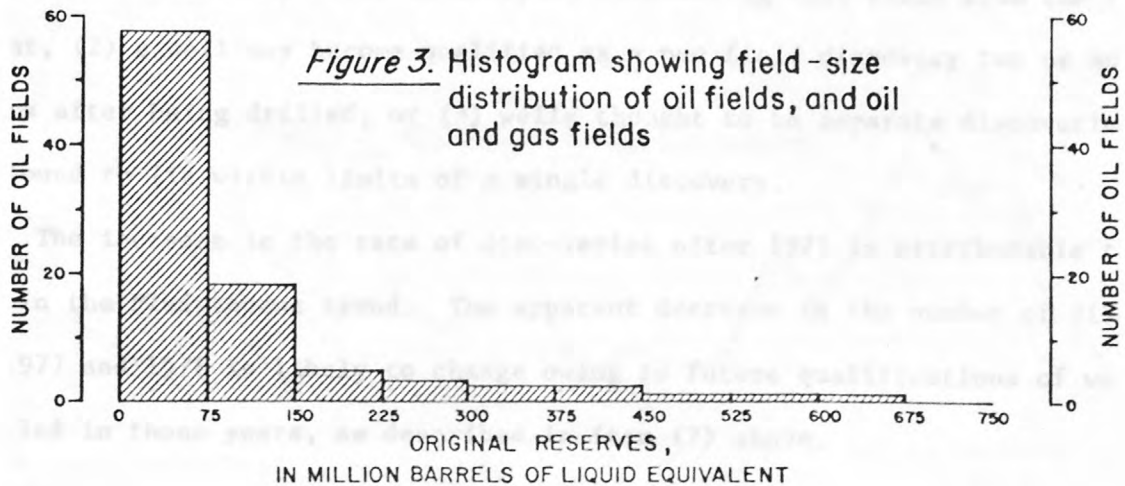
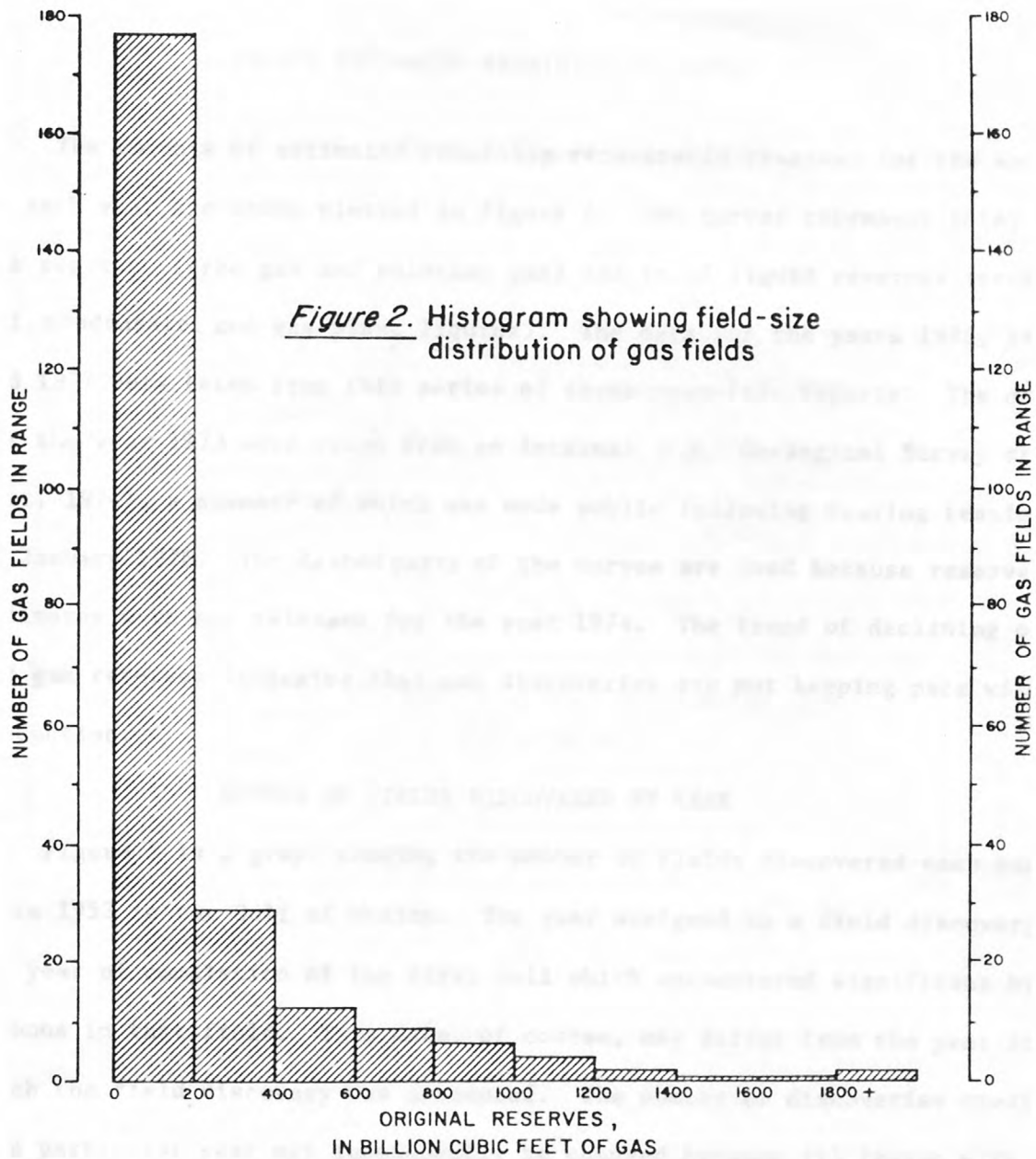
Estimates of 210 fields are based on studies of 4,800 individual reservoirs. For each reservoir, a volumetric estimate was made, and for many of them, at least one other estimation method was also used. The subsequent performance of each reservoir is periodically compared to the original predictions. The tabulation includes studies of four fields (aggregating 250 reservoirs) by the consulting firm of Atwater, Carter, Miller, and Heffner for the National Research Council. These studies, by reservoir, were made available to the U.S. Geological Survey; however, only the field totals were published (National Research Council, 1978, p. 14-18).

Reserve estimates for the remaining 124 fields in FRRE were made on a field-wide basis from production studies or, for nonproducing fields, from volumetric studies. Contracts have been negotiated with consultants for the study of 64 of these 124 fields so that all developed fields will have been studied on a reservoir basis by the end of 1979.

Each abandoned lease that had significant production of oil or gas is assigned a value for original recoverable hydrocarbons equal to the amount actually produced, regardless of whether that study was on a reservoir-by-reservoir basis or a field-wide basis. Past oil and gas production is thereby reported, although by definition no recoverable reserves remain in such tracts.

FIELD-SIZE DISTRIBUTION

The distribution of the various sizes of field reserves is shown in figures 2 and 3. Figure 2 shows the field-size distribution of the original recoverable reserves of 243 gas fields. Figure 3 shows, combined, the field-size distribution of the original recoverable reserves of 68 oil fields and 23 oil and gas fields. For convenience of comparison in figure 3, gas reserves are expressed in terms of "liquids equivalent." Using a conversion factor based on heating values, 6,000 cubic feet of gas is equivalent to 1 barrel of liquid. Both histograms exhibit a log-normal distribution. In each category most of the fields are in the smallest class of fields, but most of the reserves are in the larger classes of fields. More than 75 percent of the gas reserves (fig. 2) are in the larger fields; more than 80 percent of the liquid reserves (fig. 3) are in the larger fields.



YEARLY ESTIMATED REMAINING RESERVES

The amounts of estimated remaining recoverable reserves for the end of each year are shown plotted in figure 4. The curves represent total gas reserves (free gas and solution gas) and total liquid reserves (crude oil, condensate, and gas-plant liquids). The data for the years 1975, 1976, and 1977 were taken from this series of three open-file reports. The data for the year 1973 were taken from an internal U.S. Geological Survey study (Oct. 1974), a summary of which was made public following hearing testimony in January 1976. The dashed parts of the curves are used because reserve estimates were not released for the year 1974. The trend of declining oil and gas reserves indicates that new discoveries are not keeping pace with production.

NUMBER OF FIELDS DISCOVERED BY YEAR

Figure 5 is a graph showing the number of fields discovered each year since 1953 in the Gulf of Mexico. The year assigned to a field discovery is the year of completion of the first well which encountered significant hydrocarbons in that field. This date, of course, may differ from the year in which the field discovery was announced. The number of discoveries credited to a particular year may subsequently be changed because (1) leases with "qualified" wells may later be dropped, eliminating that field from the total count, (2) a well may become qualified as a new field discovery two or more years after being drilled, or (3) wells thought to be separate discoveries may be found to lie within limits of a single discovery.

The increase in the rate of discoveries after 1971 is attributable to drilling in the Pleistocene trend. The apparent decrease in the number of discoveries in 1977 and 1978 is likely to change owing to future qualifications of wells drilled in those years, as described in item (2) above.

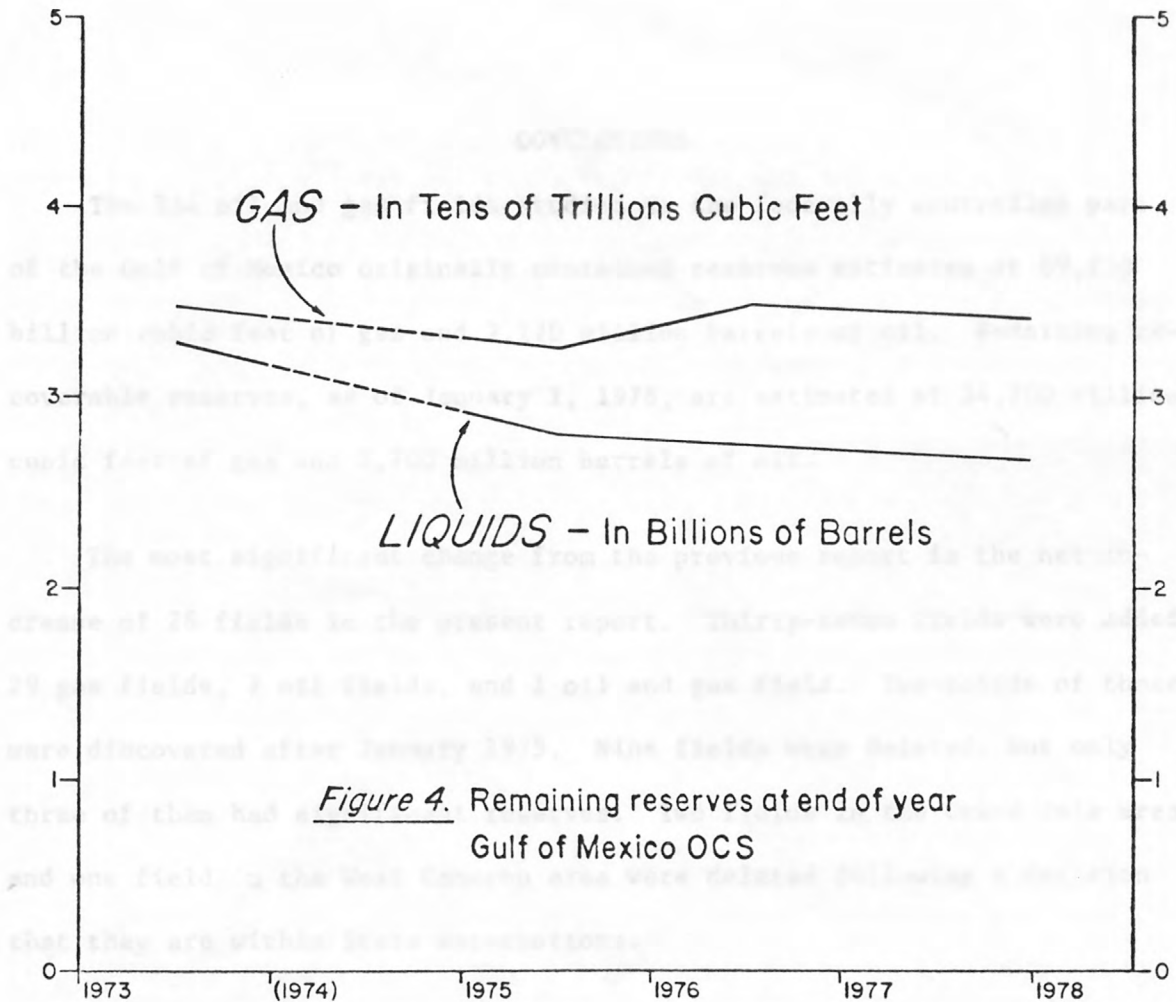
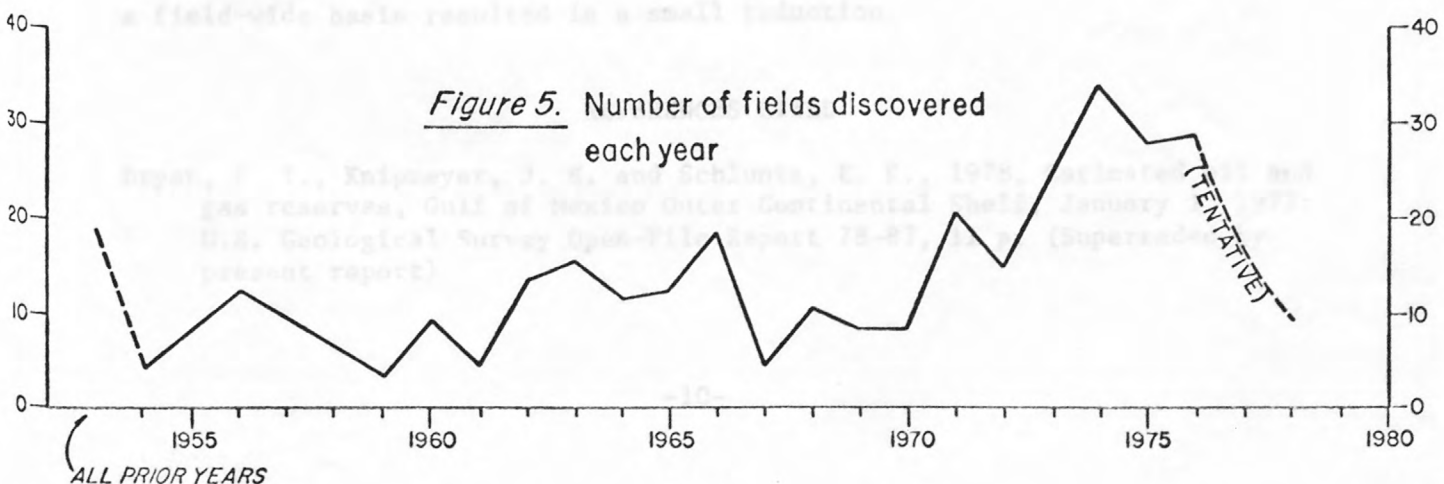


Figure 4. Remaining reserves at end of year
Gulf of Mexico OCS



CONCLUSIONS

The 334 oil and gas fields studied in the federally controlled part of the Gulf of Mexico originally contained reserves estimated at 69,200 billion cubic feet of gas and 7,170 million barrels of oil. Remaining recoverable reserves, as of January 1, 1978, are estimated at 34,200 billion cubic feet of gas and 2,700 million barrels of oil.

The most significant change from the previous report is the net increase of 28 fields in the present report. Thirty-seven fields were added: 29 gas fields, 7 oil fields, and 1 oil and gas field. Two-thirds of these were discovered after January 1975. Nine fields were deleted, but only three of them had significant reserves. Two fields in the Grand Isle area and one field in the West Cameron area were deleted following a decision that they are within State waterbottoms.

Estimated reserves of the 37 newly reported fields increased the total estimated originally recoverable gas by 4 percent and the oil by 3 percent. Modifications of previous field-wide estimates for an additional 55 fields, which have now been studied on a reservoir-by-reservoir basis, decreased the total of estimated original reserves by approximately 1 percent even though some individual field changes were large. Changes in the estimates made on a field-wide basis resulted in a small reduction.

REFERENCES CITED

Bryan, F. T., Knipmeyer, J. H. and Schluntz, E. K., 1978, Estimated oil and gas reserves, Gulf of Mexico Outer Continental Shelf, January 1, 1977: U.S. Geological Survey Open-File Report 78-87, 11 p. (Superseded by present report)

Miller, Betty M., and others, 1975, Geological estimates of undiscovered recoverable oil and gas resources in the United States: U.S. Geological Survey Circ. 725, 78 p.

National Research Council, 1978, The potential for increasing production of natural gas from existing fields in the near term; A final report to the Secretary of the Interior from the Committee on Gas Production Opportunities: National Academy of Sciences, Washington, D.C., 110 p.



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Geological Survey Circ. 125, 78 p.
gas resources in the United States; U.S.
1975, Geological estimates of undiscovered

National Research Council, 1978, The potential for increasing production
of natural gas from existing fields in the near term; A final report
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Opportunities: National Academy of Sciences, Washington, D.C., 110 p.

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