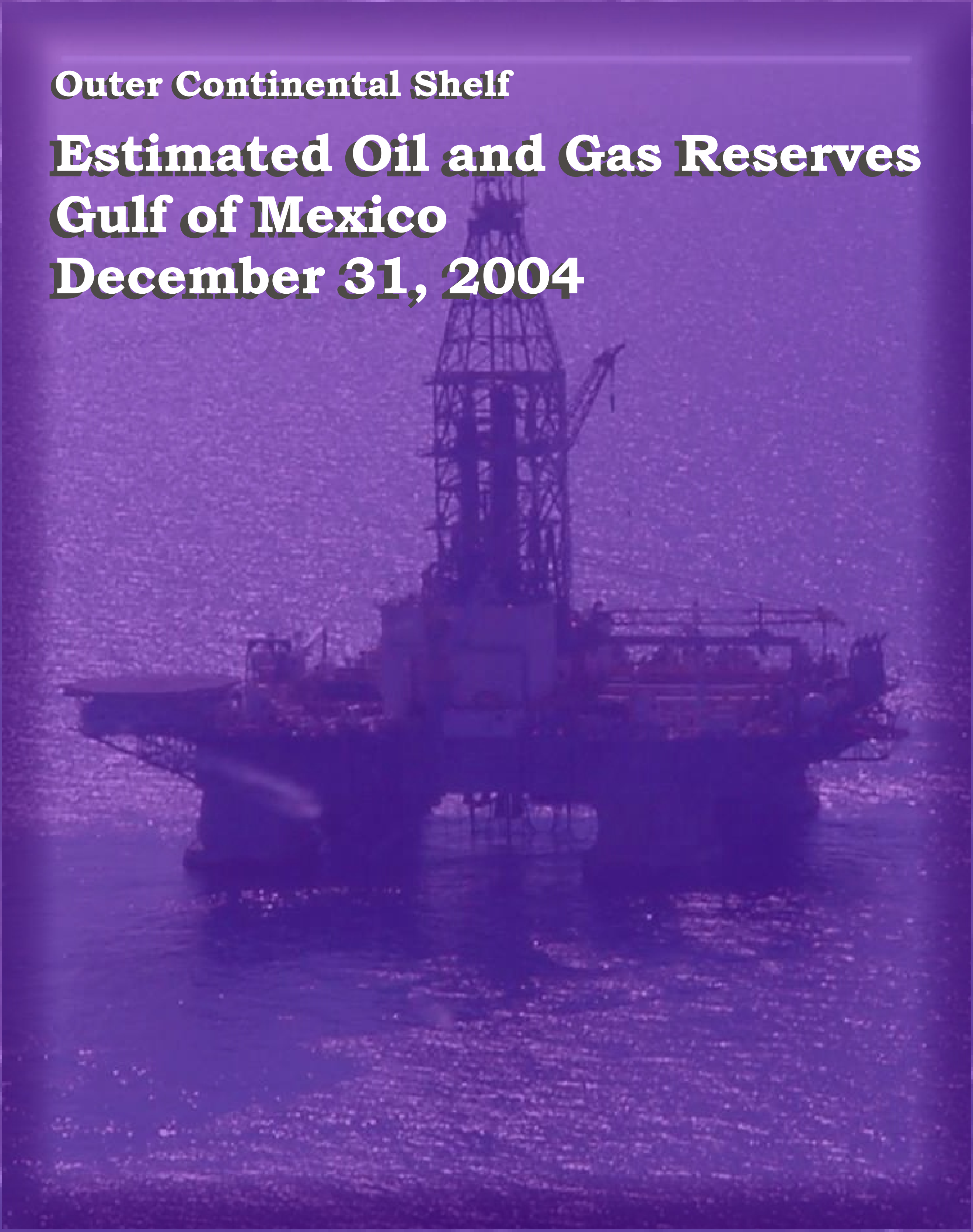
OCS Report
MMS 2008-034

Outer Continental Shelf

Estimated Oil and Gas Reserves
Gulf of Mexico
December 31, 2004



MMS
U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Region

OCS Report
MMS 2008-034

Outer Continental Shelf

Estimated Oil and Gas Reserves, Gulf of Mexico, December 31, 2004

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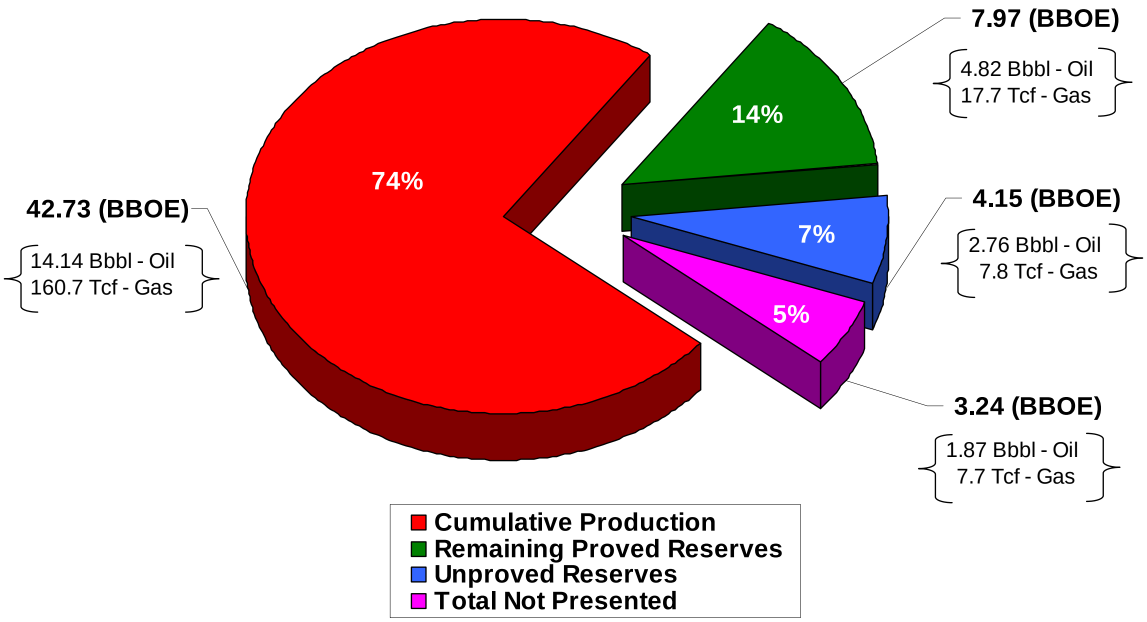
Abstract

As of December 31, 2004, proved reserves in the Gulf of Mexico Outer Continental Shelf (OCS) are estimated to be 18.96 billion barrels of oil and 178.4 trillion cubic feet of gas from 1,172 proved fields. This number includes 34 proved fields added during 2004 and 262 proved, expired, depleted fields. Not included are the 58 unproved active fields. Estimates were derived for individual reservoirs from geologic mapping and reserve evaluation. Cumulative production from the proved fields accounts for 14.14 billion barrels of oil and 160.7 trillion cubic feet of gas. Remaining proved reserves are estimated to be 4.82 billion barrels of oil and 17.7 trillion cubic feet of gas. These reserves are recoverable from 910 proved active fields.

Unproved reserves are estimated to be 2.76 billion barrels of oil and 7.8 trillion cubic feet of gas. These reserves are associated with the 58 unproved active fields studied and the unproved reserves in proved fields. In total, there are 968 proved and unproved active fields located in Federal waters. The unproved reserves, associated with the proved and unproved active fields studied, are not added to proved reserves because of different levels of economic certainty and hydrocarbon assurance. For any field contained partly in State waters and partly in Federal waters, reserves are estimated for the Federal portion only.

In addition to the proved and unproved reserves discussed above, there are 1.87 billion barrels of oil and 7.7 trillion cubic feet of gas that are not presented in the tables and figures of this report. This oil and gas occurs on leases that have not yet qualified (and therefore have not been placed in a field) or they occur as known resources in proved fields, or as known resources in unproved fields. As further drilling and development occur, additional hydrocarbon volumes will become reportable, and MMS anticipates future proved and unproved reserves to increase.



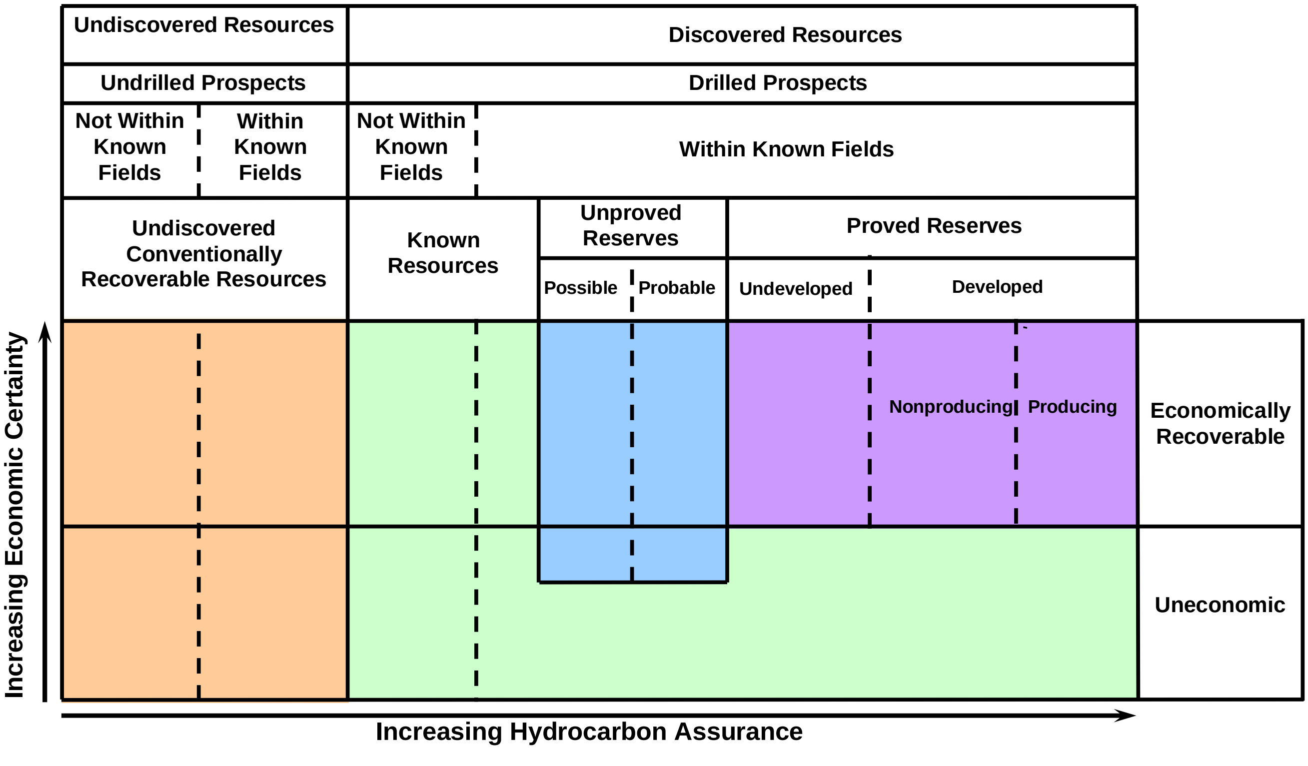
Introduction

This report, which supersedes the Minerals Management Service (MMS) OCS Report MMS 2006-069 (Crawford and others, 2006), presents estimated proved reserves, cumulative production, remaining proved reserves, and unproved reserves as of December 31, 2003, for the Gulf of Mexico (GOM). Reserves growth (an observed phenomenon that occurs when there is an incremental increase through time in the estimates of proved reserves) and undiscovered and known resources are not addressed in this report. A discussion of reserves growth can be found in OCS Report MMS 2001-0087 (Lore and others, 2001). The estimates of reserves for this report were completed in December 2006 and represent the combined efforts of engineers, geologists, geophysicists, paleontologists, and other personnel of the MMS Gulf of Mexico Region, Office of Resource Evaluation, in New Orleans, Louisiana.

As in previous reports, standard methods of estimating reserves were used, including volumetric calculations and performance analyses.

Definition of Resource and Reserve Terms

The MMS definitions and classification schema concerning reserves reflect those of the Society of Petroleum Engineers (SPE) and the World Petroleum Congress (WPC), 1996. SPE definitions have been used since 1988. The MMS definitions and classification schema concerning resources are modified as referenced by the U.S. Department of the Interior, 1989. The MMS petroleum resource and reserve classifications are presented in figures 1 and 2.



(Modified from U.S. Bureau of Mines and U.S. Geological Survey, 1980)

Figure 1. MMS conventionally recoverable petroleum resource classifications.

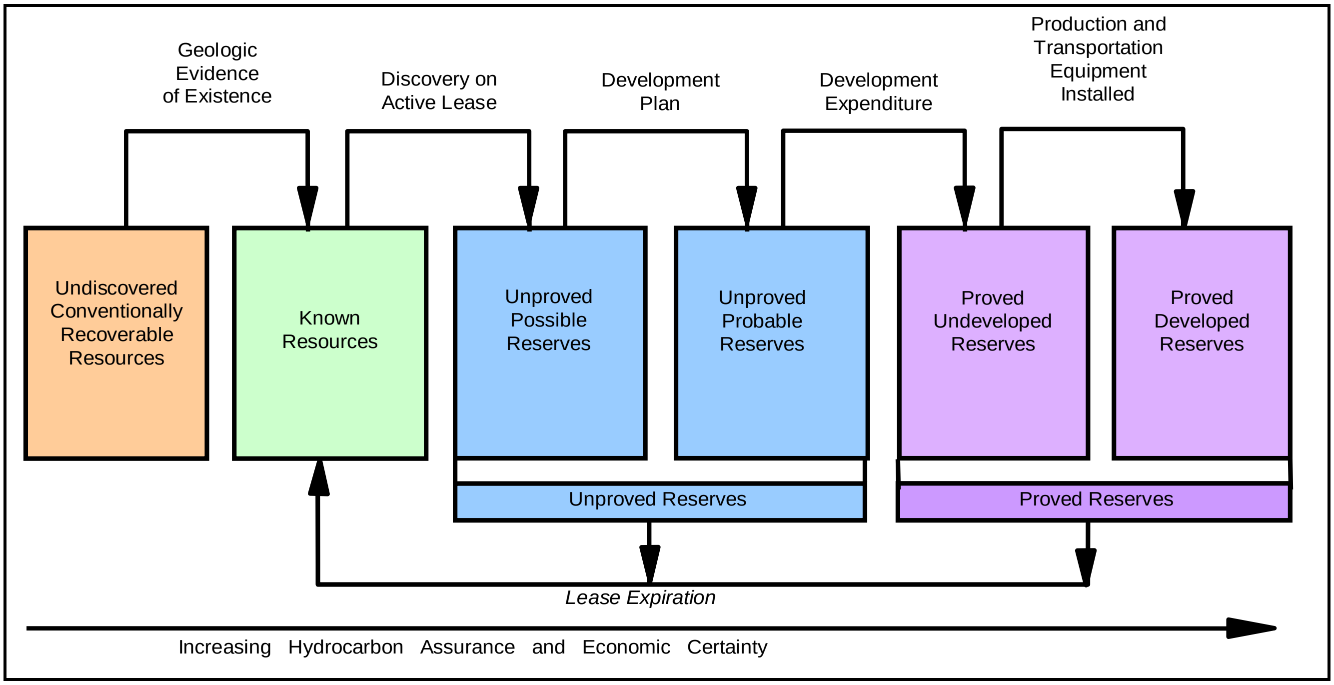


Figure 2. Gulf of Mexico MMS reserve classifications.

Field

A field is an area consisting of a single reservoir or multiple reservoirs all grouped on, or related to, the same general geologic structural feature and/or stratigraphic trapping condition. There may be two or more reservoirs in a field that are separated vertically by impervious strata, laterally by local geologic barriers, or by both. The area may include one OCS lease, a portion of an OCS lease, or a group of OCS leases with one or more wells that have been approved as producible by the MMS pursuant to the requirements of Title 30 Code of Federal Regulations (CFR) 250.115/116, Determination of Well Producibility. A field is usually named after the area and block on which the discovery well is located. Field names or field boundaries may be changed when additional geologic and/or production data initiate such a change. Using geological criteria, the MMS designates a new producible lease as a new field or assigns it to a preexisting field. A further explanation of field naming convention can be found in the "Reserves and Related Data Reported by Area" section on page 6 and in the Field Naming Handbook available on the Gulf of Mexico Region's Internet homepage at http://www.gomr.mms.gov.

Resources

Concentrations of naturally occurring liquid or gaseous hydrocarbons that can conceivably be discovered and recovered are called resources. Normal use encompasses both undiscovered and discovered resources.

Undiscovered Resources

Hydrocarbons estimated on the basis of geologic knowledge and theory to exist outside of known accumulations are *undiscovered resources*. Undiscovered resources analogous to those in existing fields producible with current recovery technology and efficiency, but without any consideration of economic viability, are *undiscovered conventionally recoverable resources.*

Discovered Resources

Hydrocarbons whose location and quantity are known or estimated from specific geologic evidence are *discovered resources*. Discovered resources include known resources, unproved reserves, and proved reserves depending upon economic, technical, contractual, or regulatory criteria.

Known Resources

Hydrocarbons associated with reservoirs penetrated by one or more wells that are on leases that are active, expired, relinquished, or terminated are identified as *known resources*.

Reserves

Those quantities of hydrocarbons which are anticipated to be recovered from known accumulations from a given date forward are reserves. All reserve estimates involve some degree of uncertainty. The uncertainty depends chiefly on the amount of reliable geologic and engineering data available at the time of the estimate and the interpretation of these data. The relative degree of uncertainty may be conveyed by placing reserves into one of two principal classifications, either unproved or proved.

Unproved Reserves

Those quantities of hydrocarbons that can be estimated with some certainty to be potentially recoverable from known reservoirs, assuming future economic conditions and technological developments, are *unproved reserves*. The MMS Gulf of Mexico Regional Field Names Committee designates a new producible lease as a new field or assigns it to a preexisting field. The reserves associated with new producible leases qualified pursuant to 30 CFR 250.115/116 are initially considered unproved reserves. Unproved reserves are less certain to be recovered than proved reserves and are further subclassified as possible and probable reserves to denote progressively increasing certainty in their recoverability. This report does not present individual estimates for possible and probable reserves.

<u>Unproved possible reserves</u> are those unproved reserves which analysis of geological and engineering data suggests are less likely to be commercially recoverable than probable reserves. After a well on a lease qualifies, the reserves associated with the lease are initially classified as unproved possible because the only direct evidence of economic accumulations is a production test or electric log analysis.

<u>Unproved probable reserves</u> are those unproved reserves which analysis of geological and engineering data suggests are more likely than not to be commercially recoverable. Fields that have a Development Operations Coordination Document (DOCD) on file with the MMS would be classified as unproved probable.

Proved Reserves

Those quantities of hydrocarbons which can be estimated with reasonable certainty to be commercially recoverable from known reservoirs and under current economic conditions, operating methods, and government regulations are *proved reserves*. Establishment of current economic conditions includes consideration of relevant historical petroleum prices and associated costs and may involve an averaging period that is consistent with the purpose of the reserve estimate. Proved reserves must have either facilities operational at the time of the estimate to process and transport those reserves to market, or a commitment or reasonable expectation to install such facilities in the future. The application for a permit to install a platform is considered such a commitment. Proved reserves can be subdivided into undeveloped or developed.

<u>Proved undeveloped reserves</u> exist where there is a relatively large expenditure required to install production and/or transportation facilities and a commitment has been made by the operator to develop the field. Proved undeveloped reserves are reserves expected to be recovered from planned development wells or from existing wells where a relatively large expenditure is required for field development.

<u>Proved developed reserves</u> are expected to be recovered from existing wells (including reserves behind pipe). Reserves are considered developed only after the necessary production and transportation equipment has been installed, or when the costs to do so are relatively minor. Proved developed reserves are subcategorized as producing or nonproducing. This distinction is made at the reservoir level.

Proved Developed Producing Reserves are in reservoirs that have produced any time during the 12 months before the reporting date. Once the first reservoir in a field begins production, the reservoir and the field are considered proved developed producing.

Proved Developed Nonproducing Reserves are in reservoirs that have not produced during the 12 months prior to the reporting date. This category includes off-production reservoirs behind pipe and reservoirs awaiting workovers or transportation facilities. If all reservoirs in a field are off production, the field is considered proved developed nonproducing.

<u>Remaining proved reserves</u> are the quantities of proved reserves currently estimated to be recoverable. Estimates of remaining proved reserves equal proved reserves minus cumulative production.

Reference Standard Conditions for Production and Reserves

Production data are the metered volumes of raw liquids and gas reported to the MMS by Federal unit and lease operators. Oil volume measurements and reserves are corrected to reference standard conditions of 60°F and one atmosphere (14.696 pounds per square inch absolute [psia]); gas measurements and reserves are corrected to 60°F and 15.025 psia. To convert gas volumes to 14.696 psia, multiply by 1.022 (DOE, 1989). Continuously measured volumes from production platforms and/or leases are allocated to individual wells and reservoirs on the basis of periodic well test gauges. These procedures introduce approximations in both production and remaining reserves data.

MMS Reporting of Reserve and Resource Data

OCS reserve estimates have been published by the Gulf of Mexico Region annually since 1977, presenting end-of-year totals starting with 1975. From 1977 to 1981, the estimates were published as United States Geological Survey (USGS) Open-File reports. The 1982 report was a joint publication between the USGS and the newly formed MMS, which assumed the OCS mission responsibilities at that time. The MMS has continued the reporting since 1983. The first report provided by MMS that also includes unproved reserve estimates was published in 1995.

Figure 3 shows the relationship of evaluated data to hydrocarbon assurance. The data are progressively aggregated on both a geologic and a geographic basis at each step of the evaluation process (the reservoir level through the region level). The most detailed studies of discovered resources are MMS individual field studies. These studies are based on analysis at the reservoir level (an example being a single fault trap in a single sand) and are used as the basis for the reporting of discovered and undiscovered resources. The geologic aggregation begins at the top of the figure at the reservoir level and progresses downward through the sand, pool, play, chronozone, series, and system to the regional level. Reservoirs correlated to a specific sand are aggregated to form the sand reporting level, which becomes the basis for further aggregations of data. A play is defined primarily (though not exclusively) by depositional style, geologic age at the chronozone level, and geographic area. Pools are based on the same characteristics of a play, but are specific to an individual field. Fields may contain one or more pools, with each pool representing a separate play. The geographic aggregation begins at the bottom of the figure, also at the reservoir level, and progresses upward through the field, area, and planning area to the regional level.

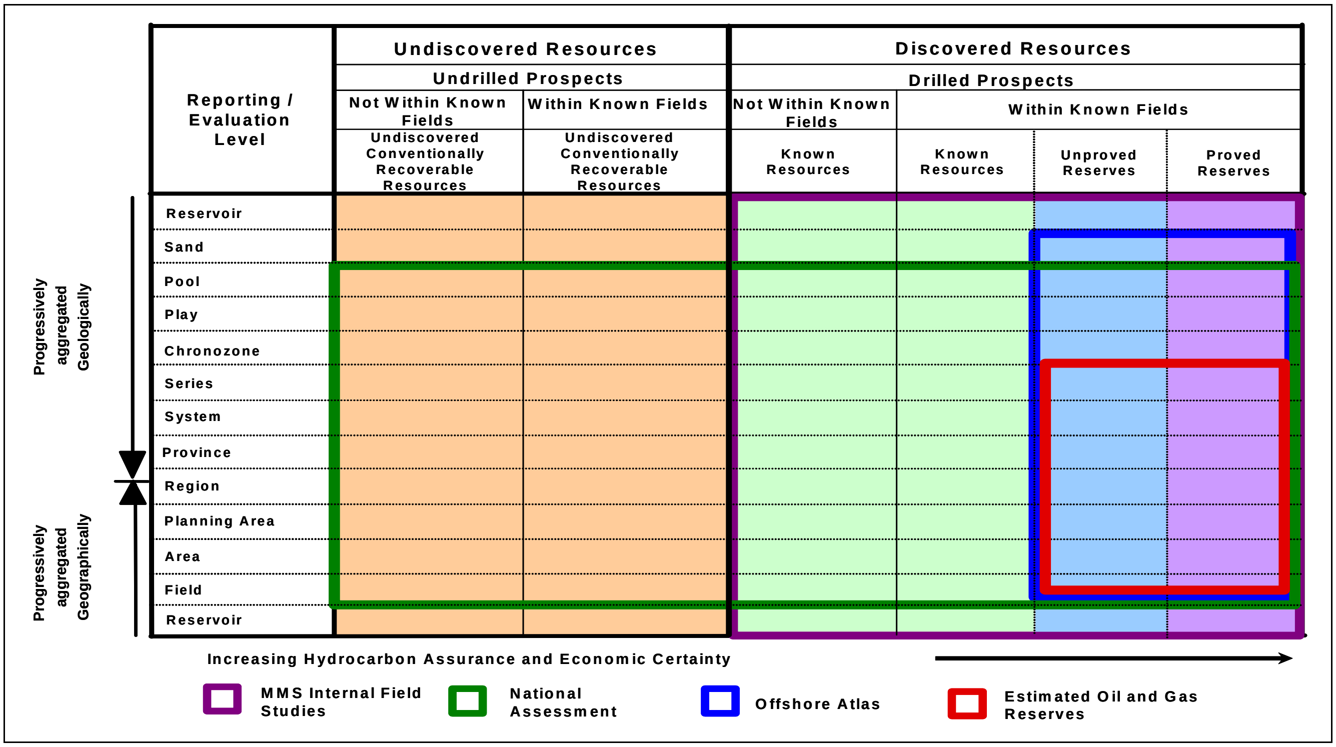


Figure 3. MMS evaluation of reserves and resources.

This report, ***Estimated Oil and Gas Reserves***, presents reserve data for the field level through the series level (see figure 3). This report is based on aggregation of MMS internal field studies completed at the reservoir and sand levels. All of the reservoir level data have been linked to the sand, pool, play, chronozone, and series level to support the Offshore Atlas Project (OAP).

The MMS OCS Report MMS 2001-086, ***Atlas of Gulf of Mexico Gas and Oil Sands as of January 1, 1999***, released in September 2001 on CD-ROM, provides a detailed geologic reporting of oil and gas proved and unproved reserves. Reserves data on more than 10,000 sands have been placed into 65 established geological plays in Federal waters. This is the second MMS release of a comprehensive framework of geologic and reserve data and the associated attributes for each specific sand and field. Play, chronozone, series, system, province, and region levels can also be evaluated with the data provided.

The MMS OCS Report MMS 2001-087, ***2000 Assessment of Conventionally Recoverable Hydrocarbon Resources of the Gulf of Mexico and Atlantic Outer Continental Shelf as of January 1, 1999,*** also known as the National Assessment, addresses proved and unproved reserves, reserves appreciation, and undiscovered resources. To maintain credibility, an estimate of undiscovered resources must be based on discovered resources. The OAP supported this report by providing a framework of hydrocarbon plays that allowed for the logical extension of existing production rather than just a conceptual estimate. This report, made available in October 2001 on CD-ROM, contains reserves and resource estimates by play, planning area, water depth, and region.

For information on these reports, contact the Gulf of Mexico Region’s Public Information Office at 1-800-200-GULF or 504-736-2519, or visit the GOM Region’s Internet homepage at http://www.gomr.mms.gov.

Methods Used for Estimating Reserves

Reserve estimates from geological and engineering analyses have been completed for the 1,172 proved fields. Reserves accountability is dependent on the drilling and development phases of fields. When a field is in the unproved category, geophysical mapping and limited well data are the basis for defining reservoir limits. Once a field is moved into the proved category and more data become available, the reserve estimate is re-evaluated. Well logs, well file data, seismic data, and production data are continually analyzed to improve the accuracy of the reserve estimate. As a field is depleted and/or abandoned, the proved reserves of productive reservoirs are assigned a value equal to the amount produced and the reserve estimate of non-producing reservoirs is converted to known resources. Currently, there are 262 proved expired, depleted fields.

Estimation of reserves is done under conditions of uncertainty. The method of estimation is called deterministic if the estimate is a single “best estimate” based on known geological, engineering, and economic data. The method of estimation is called probabilistic when the known geoscience, engineering, and economic data are used to generate a continuous range of estimates and their associated probabilities (SPE/AAPG/WPC/SPEE, 2007). Reserve estimates in this report are deterministic.

Methods used for estimating reserves can be categorized into three groups: analog, volumetric, and performance. The accuracy of the proved reserve estimate improves as more reservoir data become available to geoscientists and engineers. Resources are based on analogy with similar fields, reservoirs, or wells in the same area. Reserve estimates in this report are based primarily on volumetric and performance methods.

Analog

In the estimation of resources by analogy, geoscientists use seismic data to generate maps of the extent of subsurface formations. Before any wells have been drilled on a prospect, estimates of undiscovered resources are based on analogy with similar fields, reservoirs, or wells in the same area. The seismic data help geoscientists identify prospects and resources, but do not provide enough direct data to estimate reserves.

The effective pore space, water saturation, net hydrocarbon thickness, pressure, volume, and temperature data, all necessary to complete resource estimates for prospects, come from nearby field and reservoir well data. After one or more wells are drilled and found productive, a volumetric estimate is done. These estimates, while incorporating existing data, still rely on some information obtained from analogs.

Volumetric

In a volumetric reserve estimate, data from drilled wells and seismic surveys are used to develop geologic interpretations. The effective pore space (porosity), water saturation, and net hydrocarbon thickness of the subsurface formations are calculated through evaluation of well logs, core analysis, and formation test data. Subsurface formations are mapped to determine area and net hydrocarbon thickness for each reservoir. Reservoir pressure, fluid volume, and temperature data from formation fluid samples are used to determine the change in volume of oil and gas that flow from higher pressure conditions deep underground to lower pressure conditions at the surface. All of these data are compiled, analyzed and applied to standard equations for the calculation of hydrocarbons in place within the reservoirs. Standard recovery factor equations are then applied to the in-place estimates to calculate proved and unproved reserves.

Performance Methods

In performance-technique methods, reserves are estimated by using mathematical or graphical techniques of production decline curve analysis and material balance. These techniques are used throughout the oil industry in assessing individual well, reservoir, or field performance and in forecasting future reserves. In decline analysis, a plot of daily production rate against time is most frequently used. Once a well or reservoir can no longer produce at its maximum capacity, the production rate declines. This production rate plotted against time can be extrapolated into the future to predict the remaining reserves. Another type of decline analysis is daily production rate plotted against cumulative production, which can also be used to predict remaining reserves. The declining daily rate is extrapolated to predict remaining reserves.

Another performance method, material balance, is used to estimate the amount of hydrocarbons in place. Given the premise that the pressure-volume relationship of a reservoir remains constant as hydrocarbons are produced, it is possible to equate expansion of reservoir fluids with reservoir voidage caused by fluid withdrawal minus any water influx. For depletion-drive gas reservoirs, a plot of the pressure/gas compressibility factor (P/Z) versus cumulative gas production provides an estimate of gas-in-place. Recoverable gas reserves are extrapolated to an abandonment reservoir pressure.

Reserves and Related Data Reported by Area

The Gulf of Mexico has been divided into three planning areas for administrative purposes; these planning areas as of December 31, 2004 (Western, Central, and Eastern) are shown in figures 4, 5, and 6, respectively. Each planning area is subdivided into protractions, which in turn are divided into numbered blocks. Fields in the Gulf of Mexico are identified by the protraction area name and block number of discovery – for example, East Cameron Block 271 Field.

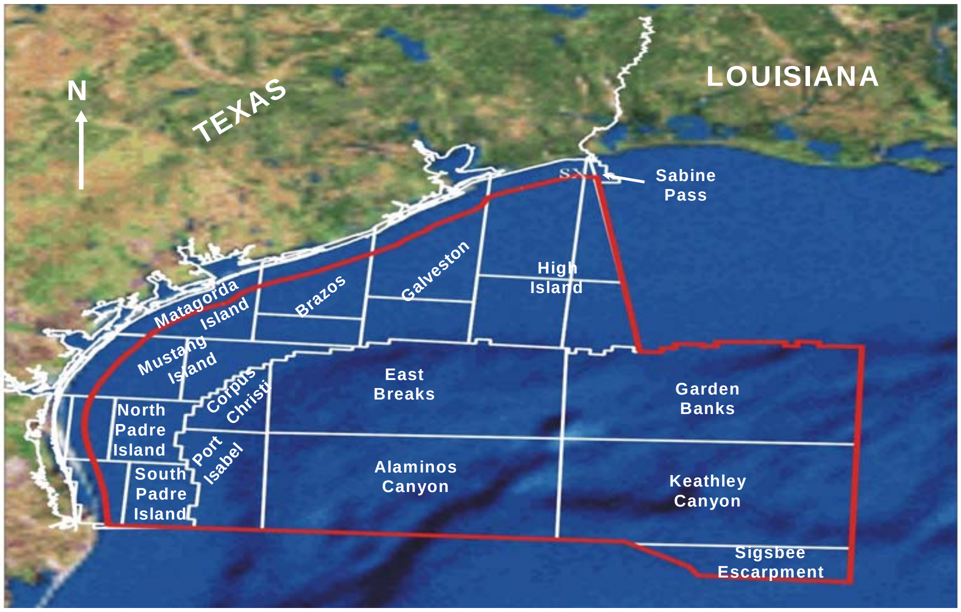


Figure 4. Western Planning Area, Gulf of Mexico, Outer Continental Shelf.

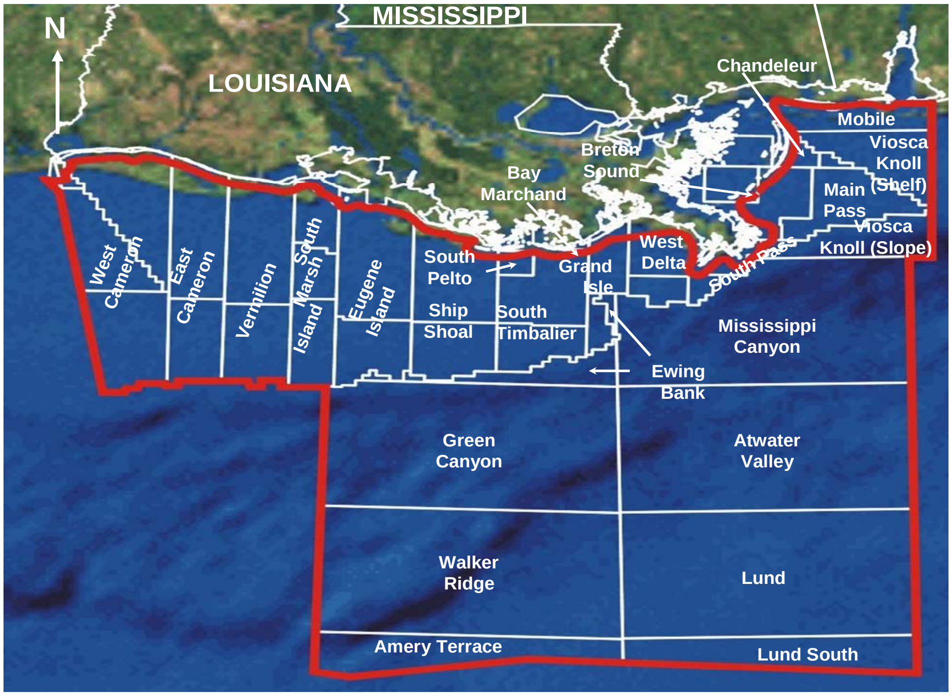


Figure 5. Central Planning Area, Gulf of Mexico, Outer Continental Shelf.

Figure 6. Eastern Planning Area, Gulf of Mexico, Outer Continental Shelf.

As the field is developed, the limits may expand into adjacent blocks and areas. These adjacent blocks are then identified as part of the original field and are given that field name. Statistics in this report are presented as area totals compiled under each field name. All of the data associated with East Cameron Block 271 Field are therefore included in the East Cameron totals, although part of the field extends into the adjacent area of Vermilion. There are four exceptions to the above field-naming techniques: Tiger Shoal and Lighthouse Point, included in South Marsh Island; Coon Point, included in Ship Shoal; and Bay Marchand, included in South Timbalier.

Through December 31, 2004, there were 968 proved and unproved active fields in the federally regulated part of the Gulf of Mexico. An updated list of the active and expired fields can be found in the ***OCS Operations Field Directory*** (updated monthly) on the GOM Region's Internet homepage. There were 910 proved, active, producing, and non-producing fields and 58 unproved active fields studied. Included are the 262 proved expired, depleted fields, abandoned after producing 3.1 percent barrel oil equivalent of the total cumulative oil and gas production. Not studied were 96 fields expired, relinquished, or terminated without production. These fields may also be included in the ***Indicated Hydrocarbon List*** that can be found by visiting the GOM Region's Internet homepage. In 2004, 7 proved fields were depleted, and 23 proved and 3 unproved fields expired.

Reserves data and various classifications of fields, leases, boreholes, and completions are presented as area totals in tables 1 and 2, and the table 3 series. Dashes on these tables are used to preserve the proprietary nature of data. (The table 3 series will be discussed in the section "Reserves Reported by Geologic Age," beginning on page 12.)

Table 1. Estimated oil and gas reserves for 1,172 proved fields and 58 unproved fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 2004.

(Reserves: oil expressed in millions of barrels at 60 °F and 1 atmosphere; gas in billions of cubic feet at 60 °F and 15.025 psia.)

Area(s) (Figs. 4, 5, and 6)	Number of fields						Proved reserves		Cumulative production through 2004		Remaining proved reserves		Unproved reserves	
	Proved active prod	Proved active nonprod	Proved expired depleted	Unproved		Expired nonprod	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas
				active	studied									
Western Planning Area														
Western Shelf														
Brazos	23	2	13	0	0	2	11	3,668	10	3,297	1	371	0	74
Galveston	19	3	23	1	1	3	61	2,101	51	1,888	10	213	0	57
High Island and Sabine Pass	73	4	48	1	1	9	392	15,228	364	14,423	28	805	10	336
Matagorda Island	22	1	5	0	0	3	24	5,169	22	4,881	2	288	1	397
Mustang Island	12	0	15	1	1	6	6	1,814	5	1,646	1	168	13	158
N.& S.Padre Island	5	0	6	1	1	0	0	551	0	501	0	50	0	14
Western Slope														
Alaminos Canyon	3	0	0	4	4	1	71	114	49	70	22	44	331	457
East Breaks	18	0	0	4	4	3	214	2,278	133	1,191	81	1,087	27	162
Garden Banks	28	1	4	3	3	4	664	3,851	405	2,698	259	1,153	160	585
Western Slope (Other)*	0	0	0	1	1	1	0	0	0	0	0	0	8	4
Western Planning Area Subtotal	***203***	***11***	***114***	***16***	***16***	***32***	***1,443***	***34,774***	***1,039***	***30,595***	***404***	***4,179***	***550***	***2,244***
Central Planning Area														
Central Shelf														
Chandeleur	6	2	4	0	0	0	0	366	0	342	0	24	0	4
East Cameron	47	4	15	0	0	0	330	10,544	317	10,257	13	287	3	105
Eugene Island	66	6	11	1	1	6	1,627	19,246	1,553	18,397	74	849	37	256
Grand Isle	14	2	5	0	0	1	975	4,802	942	4,575	33	227	19	116
Main Pass and Breton Sound	60	5	16	1	0	6	1,092	6,473	995	5,961	97	512	6	35
Mobile	19	3	5	0	0	4	0	2,087	0	1,699	0	388	0	127
Ship Shoal	45	4	13	0	0	4	1,373	12,005	1,312	11,451	61	554	21	183
South Marsh Island	38	5	8	0	0	0	918	14,197	846	13,512	72	685	11	280
South Pass	11	1	1	1	1	0	1,075	4,336	1,044	4,173	31	163	2	72
South Pelto	9	0	0	0	0	0	156	1,155	145	1,016	11	139	4	19
South Timbalier	47	3	8	1	1	3	1,570	10,273	1,447	9,052	123	1,221	35	368
Vermilion	66	2	16	0	0	2	558	16,237	513	15,583	45	654	18	315
Viosca Knoll (Shelf)	14	0	13	1	1	1	11	483	10	379	1	104	0	12
West Cameron and Sabine Pass	81	4	26	2	2	2	207	19,802	195	18,855	12	947	6	151
West Delta	20	1	3	0	0	2	1,366	5,441	1,332	5,225	34	216	11	76
Central Slope														
Ewing Bank	14	2	0	1	1	2	320	656	241	483	79	173	40	91
Green Canyon	25	7	2	10	10	16	2,287	3,535	690	1,921	1,597	1,614	1,431	951
Mississippi Canyon	33	2	1	11	11	8	3,151	8,434	1,176	5,112	1,975	3,322	387	1,326
Viosca Knoll (Slope)	17	2	1	1	1	3	502	2,736	348	2,020	154	716	79	186
Central Slope (Other)**	0	3	0	8	4	3	1	361	0	0	1	361	101	155
Central Planning Area Subtotal	***632***	***58***	***148***	***38***	***33***	***63***	***17,519***	***143,169***	***13,106***	***130,013***	***4,413***	***13,156***	***2,211***	***4,828***
Eastern Planning Area Subtotal*	***2***	***4***	***0***	***4***	***4***	***1***	***1***	***502***	***0***	***76***	***1***	***426***	***0***	***694***
GOM Total:	***837***	***73***	***262***	***58***	***53***	***96***	***18,963***	***178,445***	***14,145***	***160,684***	***4,818***	***17,761***	***2,761***	***7,766***
	1,172													

*Western Slope (Other) includes Corpus Christi, Keathley Canyon, and Port Isabel.
**Central Slope (Other) includes Atwater Valley, Lund, and Walker Ridge.
***Eastern Planning Area includes DeSoto Canyon, Destin Dome, Lloyd Ridge, and others.

Figure 7 provides a geographical representation of locations for the 1,172 proved fields in the Gulf of Mexico. The bar heights in the figure are proportional to total proved reserves (barrel of oil equivalent) for each decade.

Figure 8 provides a geographical representation of the 58 unproved active fields in the Gulf of Mexico. Estimates of unproved reserves are presented as planning area subtotals**.** The bar heights in the figure are proportional to total unproved reserves (barrel of oil equivalent) for each unproved field.

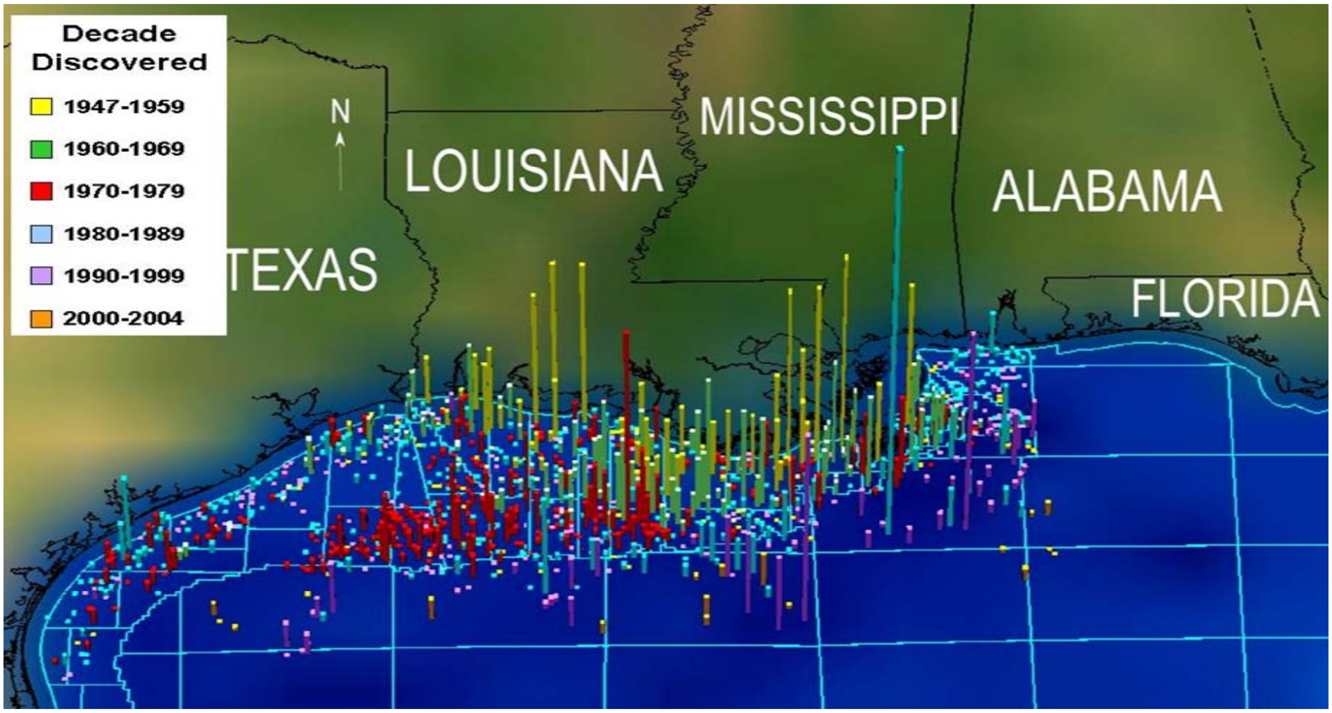


Figure 7. Gulf of Mexico, 1,172 proved fields (910 active and 262 depleted.)

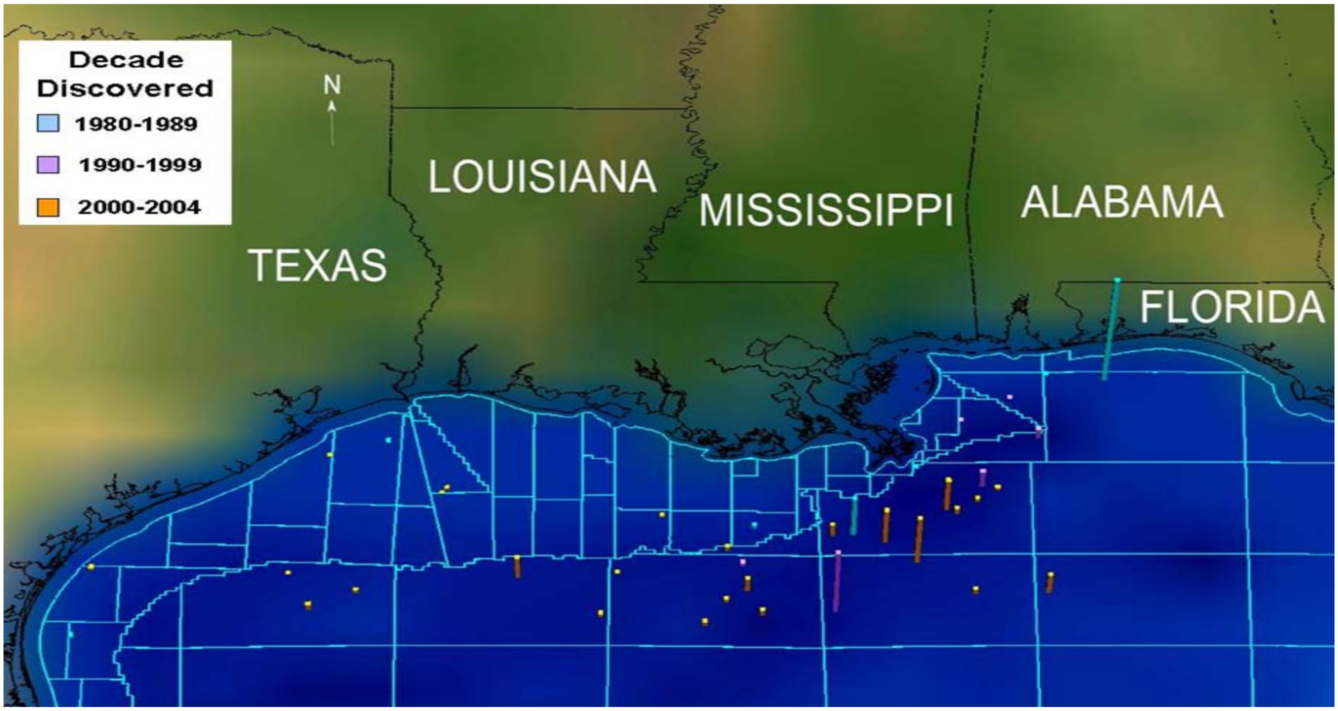


Figure 8. Gulf of Mexico, 58 unproved active fields.

Table 2. Status of oil and gas leases, boreholes, and completions by area, Gulf of Mexico, Outer Continental Shelf, December 31, 2004.

(All statistics associated with fields are presented within area totals compiled under each field name.)

Area(s) (Figs. 4, 5, and 6)	Number of leases					Number of boreholes		Number of active completions
	Proved active	Proved depleted	Unproved qualified	Unqualified active	Expired	Drilled	Abandoned	
Western Planning Area								
Western Shelf								
Brazos	40	49	0	70	333	567	423	189
Galveston	36	65	1	135	562	677	590	132
High Island and Sabine Pass	201	150	3	207	978	3,347	2,370	1,269
Matagorda Island	49	36	0	37	150	614	402	304
Mustang Island	31	24	2	62	397	430	325	155
N.& S.Padre Island	14	13	2	61	303	158	128	48
Western Slope								
Alaminos Canyon	4	0	11	539	133	46	25	9
East Breaks	36	3	4	238	422	342	221	130
Garden Banks	71	14	2	510	794	554	384	179
Western Slope (Other)*	7	0	1	608	267	18	16	0
Western Planning Area Subtotal	***489***	***354***	***26***	***2,467***	***4,339***	***6,753***	***4,884***	***2,415***
Central Planning Area								
Central Shelf								
Chandeleur	11	10	0	16	31	82	58	27
East Cameron	141	107	0	111	612	2,195	1,533	940
Eugene Island	225	106	1	110	484	5,176	3,465	2,102
Grand Isle	56	26	0	40	145	1,891	1,484	588
Main Pass and Breton Sound	156	83	4	102	401	3,064	1,783	1,597
Mobile	39	8	0	16	96	164	101	65
Ship Shoal	179	84	0	125	483	3,553	2,206	1,606
South Marsh Island	138	64	0	81	322	2,857	1,771	1,309
South Pass	47	16	2	21	91	2,303	1,415	1,073
South Pelto	21	4	0	4	30	408	289	213
South Timbalier	143	53	7	122	463	3,177	1,989	1,477
Vermilion	153	134	0	146	575	3,035	2,064	1,238
Viosca Knoll (Shelf)	29	16	0	76	208	238	160	44
West Cameron and Sabine Pass	235	216	9	266	931	3,589	2,562	1,457
West Delta	93	42	0	35	184	2,901	1,920	1,056
Central Slope								
Ewing Bank	32	7	1	64	234	321	218	121
Green Canyon	94	7	17	663	656	876	621	282
Mississippi Canyon	131	9	17	521	645	1,361	891	474
Viosca Knoll (Slope)	42	4	1	37	126	320	180	165
Central Slope (Other)**	31	0	4	893	417	96	79	4
Central Planning Area Subtotal	***1,996***	***996***	***63***	***3,449***	***7,134***	***37,607***	***24,789***	***15,838***
Eastern Planning Area Subtotal* ***	***10***	***0***	***5***	***231***	***347***	***74***	***62***	***7***
GOM Total:	***2,495***	***1,350***	***94***	***6,147***	***11,820***	***44,434***	***29,735***	***18,260***

*Western Slope (Other) includes Corpus Christi, Keathley Canyon, and Port Isabel.

**Central Slope (Other) includes Atwater Valley, Lund, and Walker Ridge.

***Eastern Planning Area includes DeSoto Canyon, Destin Dome, Lloyd Ridge, and others.

The status of Gulf of Mexico OCS Federal oil and gas leases as of December 31, 2004, is presented in table 2. There are 8,736 active leases (2,495 proved active, 94 unproved qualified, and 6,147 unqualified active) and 12,360 relinquished leases (1,350 proved depleted and 11,820 expired).

Definitions for the lease subgroups of table 2 are:

Proved Active — Leases within the designated 910 proved active fields presented in table 1.

Proved Depleted — Leases relinquished after oil and gas production. The leases associated with the 262 depleted fields are represented here along with other produced, relinquished leases that are part of currently active fields.

Unproved Qualified — Leases associated with the 58 unproved active fields. The leases have qualified as producible under 30 CFR 250.115/116, but the operators have not established a commitment to produce. These fields may be classified as unproved possible or unproved probable.

Chronostratigraphy					Biostratigraphy		MMS Chronozone
Province	System	Subsystem	Series		Foraminifer & Ostracod (O)	Nannoplanktin	
			Holocene		Globorotalia inflata		
Cenozoic	Quaternary		Pleistocene	Upper	Globorotalia flexuosa Sangamon fauna	Emiliania huxleyi (base of acme) Gephyrocapsa oceanica (flood) Gephyrocapsa caribbeanica (flood)	PLU
				Middle	Trimosina "A"	Helicosphaera inversa Gephyrocapsa parallela Pseudoemiliania ovata	PLM
				Lower	Stilostomella antillea Trimosina "A" (acme) Hyalinea "B" / Trimosina "B" Angulogerina "B" Uvigerina hispida	Pseudoemiliania lacunosa "C" (acme) Calcidiscus macintyrei	PLL
	Tertiary	Neocene	Pliocene	Upper	Globorotalia crassula (acme) Lenticulina 1 Globoquadrina altispira Textularia 1	Discoaster brouweri	PU
				Lower	Buccella hannai (acme) Buliminella 1 Globorotalia plesiotumida (acme)	Sphenolithus abies Sphenolithus abies "B" Discoaster quintatus	PL
			Miocene	Upper	Globorotalia menardii (coiling change right-to-left) Textularia "X" Robulus "E" Bigenerina "A" Cristellaria "K" Bolivina thalmanni	Discoaster quinqueramus Discoaster berggrenii "A" Minylithus convallis Catinaster mexicanus Discoaster prepentaradiatus (increase)	MUU
					Discorbis 12 Bigenerina 2 Uvigerina 3	Helicosphaera walbersdorfensis Coccolithus miopelagicus	MLU
				Middle	Globorotalia fohsi robusta Textularia "W" Globorotalia peripheroacuta	Discoaster kugleri Discoaster kugleri (acme) Discoaster sanmiguelensis (increase)	MUM
					Bigenerina humblei Cristellaria "I" Cibicides opima	Sphenolithus heteromorphus Sphenolithus heteromorphus (acme)	MMM
					Cristellaria / Robulus / Lenticulina 53 Amphistegina "B" Robulus 43 Cibicides 38	Helicosphaera ampliaperta Discoaster deflandrei (acme) Discoaster calculosus	MLM
				Lower	Cristellaria 54 / Eponides 14 Gyroidina "K" Catapsydrax stainforthi	Reticulofenestra gartneri Sphenolithus disbelemnos	MUL
					Discorbis "B" Marginulina "A"	Orthorhabdus serratus Triquetrorhabdulus carinatus	MML
					Siphonina davisi Lenticulina hanseni	Discoaster saundersi Helicosphaera recta	MLL
		Paleogene	Oligocene	Upper	Robulus "A" Heterostegina texana Camerina "A" Bolivina mexicana	Dictyococcites bisectus Sphenolithus delphix	OU
				Lower	Nonion struma Textularia warreni	Sphenolithus pseudoradians Ismolithus recurvus	OL
			Eocene	Upper	Hantkenina alabamensis Camerina moodybranchensis	Discoaster saipanensis Cribrocentrum reticulatum Sphenolithus obtusus	EU
				Middle	Nonionella cockfieldensis Discorbis yeguaensis	Micrantholithus procerus Pemma basquensis Discoaster lodoensis	EM
				Lower	Globorotalia wilcoxensis	Chiasmolithus californicus Toweius crassus Discoaster multiradiatus	EL
			Paleocene	Upper	Morozovella velascoensis Vaginulina longiforma Vaginulina midwayana	Fasciculithus tympaniformis	LU
				Lower	Globorotalia trinidadensis Globigerina eugubina	Chiasmolithus danicus	LL
Mesozoic	Cretaceous	Upper	Gulfian		Abathomphalus mayaroensis Rosita fornicata Dicarinella concavata Hedbergella amabilis	Micula decussata Micula prinsii FAD Lithastrinus moratus Stoverius achylosus	KUU
					Dicarinella hagni Planulina eaglefordensis Rotalipora cushmani Favusella washitaensis Rotalipora gandolfii	Lithraphidites acutus	KLU
		Lower	Comanchean		Cythereis fredericksburgensis (O) Ammobaculites goodlandensis	Hayesites albiensis Braarudosphaera hockwoldensis	KUL
					Dictyoconus walnutensis Eocytheropteron trinitiensis (O) Orbitolina texana Rehacythereis? aff. R. glabrella (O)	Rucinolithus irregularis	KML
			Coahuilan		Ticinella bejaouaensis Choffatella decipiens Schulerídea acuminata (O)	Diadorhombus rectus Polycostella beckmanni	KLL
	Jurassic	Upper			Gallaecytheridea postrotunda (O) Epistomina uhligi Epistomina mosquensis Alveosepta jaccardi Paalzowella feifeli	Stephanolithion bigotii bigotii Stephanolithion bigotii maximum Stephanolithion speciosum	JU
		Middle			Reinholdella crebra	Watznaueria crucicentralis	JM

Abbreviated MMS Gulf of Mexico biostratigraphic chart illustrating chronostratigraphy, biostratigraphy, and MMS chronozones codes. For the complete chart visit : http:/www.gomr.mms.gov/homepg/whatsnew/papers/biochart.pdf.

Figure 9. Gulf of Mexico geologic time scale.

***Unqualified Active* —** Active exploratory leases not yet qualified as producible or associated with any field.

***Expired* —** Leases relinquished by the operator without having produced any oil or gas, although some were once qualified as producible under 30 CFR 250.115/116. There are 96 expired fields with no production.

The total number of boreholes drilled and the number of boreholes plugged and abandoned are also shown in table 2. There were 897 boreholes spudded during 2004, compared with 893 during 2003, and 941 during 2002. The last column of table 2 presents the total number of active completions per area. Active completions are defined as those with perforations open to the formation and not isolated by permanent plugs; service wells (injection, disposal, or water source) are included. The presence or absence of production or injection is not considered. The number of boreholes and the number of active completions listed in this report are based on reports received by the MMS at the time the count was made in 2007. These numbers may change as data are received, processed, and edited.

Reserves Reported by Geologic Age

In this report, the 1,172 proved and 58 unproved fields have been classified at the geologic series level. The different geologic age classifications currently in use by MMS are shown in figure 9. Paleontological examinations of borehole cuttings, along with regional analysis of geological and geophysical data, were used in determining the age classifications. Hundreds of additional foraminiferal and nannofossil bioevents were incorporated into an update of the MMS Biostratigraphic Chart (www.gomr.mms.gov/homepg/whatsnew/papers/biochart.pdf) to aid in geologic mapping, stratigraphic correlation, and paleobathymetric zonation. Using standardized global stratigraphic concepts, this new version of the chart incorporates the latest information currently used as biostratigraphic datum markers by industry paleontologists for the Mesozoic and Cenozoic geologic provinces. This biostratigraphic chart update reduces the disjoint between the industry/academia biostratigraphic naming convention and the MMS-standard chronozone naming convention, hence MMS reserves allocations.

Table 3 shows the distribution of reserves and production data by geologic age and planning area. Tables 3a through 3e also show the distribution of reserves and production data by geologic age, but further subdivide the planning areas as area totals. Please note that this report contains the term "Span Ages," which is used to denote a geologic age classification that spans more than one series (see tables 3 and 3e).

Table 3. Estimated oil and gas reserves for 1,172 proved and 58 unproved fields by geologic age, Gulf of Mexico, Outer Continental Shelf, December 31, 2004.

(Reserves: oil expressed in millions of barrels at 60 ºF and 1 atmosphere, gas in billions of cubic feet at 60 ºF and 15.025 psia.)

Area	Number of proved reservoirs	Proved reserves		Cumulative production through 2004		Remaining proved reserves		Number of unproved reservoirs	Unproved reserves	
		Oil	Gas	Oil	Gas	Oil	Gas		Oil	Gas
Western Planning Area										
Pleistocene	1,077	280	7,693	182	7,108	98	585	152	42	299
Pliocene	838	953	8,146	691	6,343	262	1,803	136	136	519
Miocene	2,365	210	18,907	166	17,128	44	1,779	258	40	975
Pre-Miocene	8	0	28	0	16	0	12	0	0	0
Span Ages	0	0	0	0	0	0	0	15	332	451
Western Planning Area Subtotal	***4,288***	***1,443***	***34,774***	***1,039***	***30,595***	***404***	***4,179***	***561***	***550***	***2,244***
Central Planning Area										
Pleistocene	3,394	1,090	20,122	999	19,057	91	1,065	284	71	454
Pliocene	9,347	5,999	47,789	5,082	44,701	917	3,088	737	204	1,179
Miocene	11,064	9,421	72,584	7,025	64,655	2,396	7,929	795	498	2,244
Pre-Miocene	36	0	2,042	0	1,600	0	442	8	0	138
Span Ages	22	1,009	632	0	0	1,009	632	35	1,438	813
Central Planning Area Subtotal	***23,863***	***17,519***	***143,169***	***13,106***	***130,013***	***4,413***	***13,156***	***1,859***	***2,211***	***4,828***
Eastern Planning Area										
Miocene	11	1	502	0	76	1	426	11	0	203
Pre-Miocene	0	0	0	0	0	0	0	1	0	491
Eastern Planning Area Subtotal	***11***	***1***	***502***	***0***	***76***	***1***	***426***	***12***	***0***	***694***
GOM Total	***28,162***	***18,963***	***178,445***	***14,145***	***160,684***	***4,818***	***17,761***	***2,432***	***2,761***	***7,766***

Data from table 3a were used to generate the Pleistocene reserves trend presented in figure 10 and correspond to the *Globorotalia flexuosa* through *Uvigerina hispida* biozones. Production within the Pleistocene extends from the Galveston area to east of the modern-day mouth of the Mississippi River. Pleistocene productive sands are limited in the east and west because of a lack of sediment influx at the edge of the depocenter. Deepwater Pleistocene production occurs in the East Breaks through Mississippi Canyon areas, and well control suggests sands continue beyond the Sigsbee Escarpment. Through December 31, 2004, the Pleistocene produced from 390 fields. Proved reserves were 1.37 billion barrels (Bbbl) and 27.8 trillion cubic feet (Tcf). Remaining proved reserves were 0.19 Bbbl and 1.7 Tcf.

Table 3a. Estimated oil and gas reserves for Pleistocene reservoirs in 390 proved and 10 unproved fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 2004.

(Reserves: oil expressed in millions of barrels at 60 ºF and 1 atmosphere, gas in billions of cubic feet at 60 ºF and 15.025 psia.)

Area	Number of proved reservoirs	Proved reserves		Cumulative production through 2004		Remaining proved reserves		Number of unproved reservoirs	Unproved reserves	
		Oil	Gas	Oil	Gas	Oil	Gas		Oil	Gas
Western Planning Area										
Alaminos Canyon	0	0	0	0	0	0	0	1	0	5
East Breaks	31	8	171	6	131	2	40	4	1	56
Galveston	2	0	15	0	15	0	0	0	0	0
Garden Banks	108	132	1,371	44	1,050	88	321	60	38	153
High Island and Sabine Pass	936	140	6,136	132	5,912	8	224	87	3	85
Western Slope (Other)*	0	0	0	0	0	0	0	0	0	0
Western Planning Area Subtotal	***1,077***	***280***	***7,693***	***182***	***7,108***	***98***	***585***	***152***	***42***	***299***
Central Planning Area										
East Cameron	331	189	1,386	182	1,319	7	68	42	1	31
Eugene Island	797	323	5,579	300	5,386	23	193	26	2	21
Ewing Bank	51	34	219	26	153	8	66	16	23	48
Grand Isle	33	0	87	0	77	0	9	5	0	7
Green Canyon	144	87	567	72	448	15	119	53	14	61
Main Pass and Breton Sound	4	0	16	0	16	0	0	0	0	0
Mississippi Canyon	27	7	700	5	561	2	139	10	8	19
Ship Shoal	272	67	1,787	64	1,734	3	53	12	1	9
South Marsh Island	427	241	1,863	224	1,769	17	94	32	3	52
South Pass	26	1	241	1	240	0	1	1	0	0
South Pelto	5	0	6	0	6	0	0	4	0	7
South Timbalier	191	45	994	41	893	4	101	18	3	23
Vermilion	513	77	1,689	68	1,603	9	86	43	12	90
Viosca Knoll (Slope)	1	0	10	0	0	0	10	1	0	18
West Cameron and Sabine Pass	548	19	4,841	16	4,727	3	114	20	4	46
West Delta	24	0	137	0	125	0	12	0	0	0
Central Slope (Other)**	0	0	0	0	0	0	0	1	0	22
Central Planning Area Subtotal	***3,394***	***1,090***	***20,122***	***999***	***19,057***	***91***	***1,065***	***284***	***71***	***454***
Eastern Planning Area Subtotal***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
GOM Total	***4,471***	***1,370***	***27,815***	***1,181***	***26,165***	***189***	***1,650***	***436***	***113***	***753***

*Western Slope (Other) includes Corpus Christi, Keathley Canyon, and Port Isabel.

**Central Slope (Other) includes Atwater Valley, Lund, and Walker Ridge.

***Eastern Planning Area includes DeSoto Canyon, Destin Dome, Lloyd Ridge, and others.

Data from table 3b were used to generate the Pliocene reserves trend presented in figure 11 and correspond to *the Globorotalia crassula (acme)* through *Globorotalia plesiotumida (acme)* biozones. Production within the Pliocene extends from south of Galveston in the west to south of Mobile Bay in the east. Pliocene deepwater production extends extend into the areas of East Breaks, Garden Banks, Green Canyon, Ewing Bank, and Mississippi Canyon. Well control suggests Pliocene sands extend at least as far as the Sigsbee Escarpment. Through December 31, 2004, the Pliocene produced from 528 fields. Proved reserves were 6.95 Bbbl and 55.9 Tcf. Remaining proved reserves were 1.18 Bbbl and 4.9 Tcf.

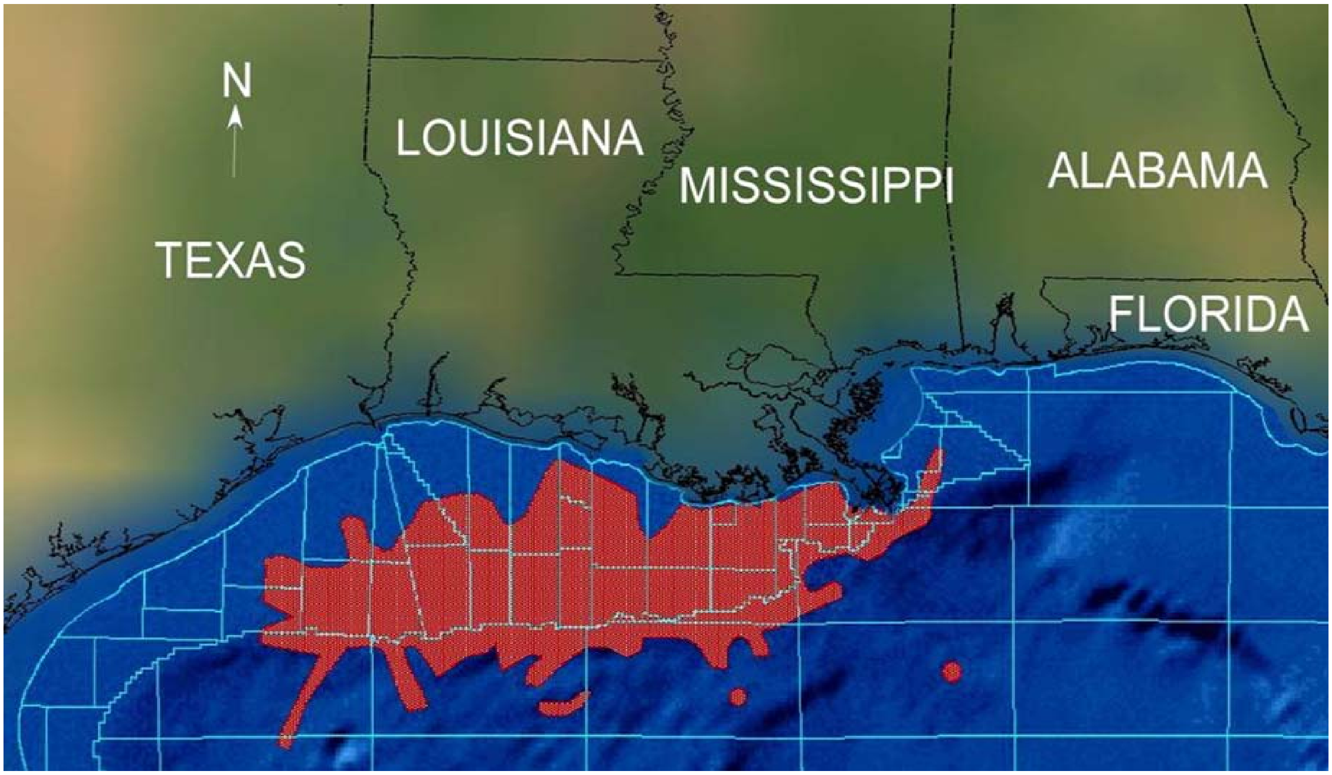


Figure 10. Pleistocene reserves trend.

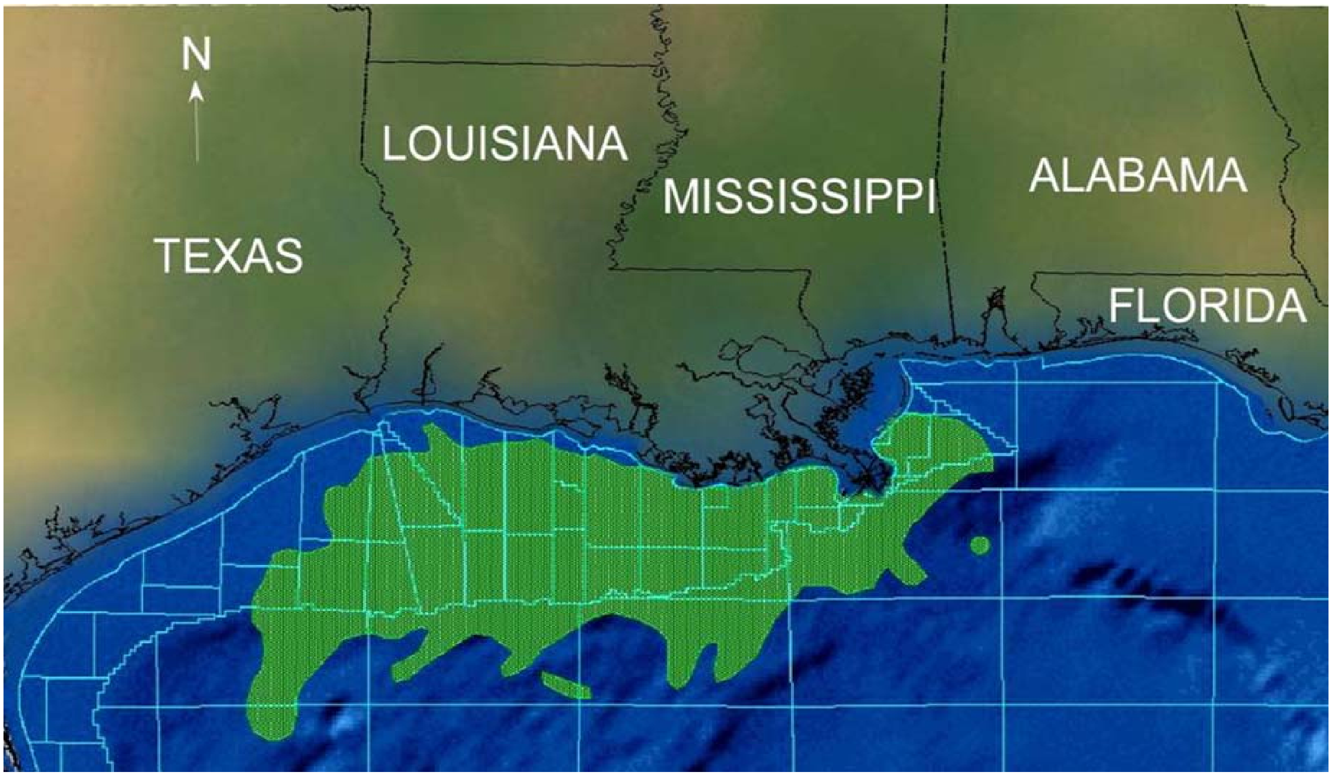


Figure 11. Pliocene reserves trend.

Table 3b. Estimated oil and gas reserves for Pliocene reservoirs in 528 proved and 19 unproved fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 2004.

(Reserves: oil expressed in millions of barrels at 60 ºF and 1 atmosphere, gas in billions of cubic feet at 60 ºF and 15.025 psia.)

Area	Number of proved reservoirs	Proved reserves		Cumulative production through 2004		Remaining proved reserves		Number of unproved reservoirs	Unproved reserves	
		Oil	Gas	Oil	Gas	Oil	Gas		Oil	Gas
Western Planning Area										
Alaminos Canyon	3	71	114	49	70	22	44	1	7	5
East Breaks	139	205	1,782	126	916	79	866	33	26	106
Galveston	19	1	70	1	66	0	4	0	0	0
Garden Banks	85	475	2,241	329	1,504	146	737	48	100	342
High Island and Sabine Pass	592	201	3,939	186	3,787	15	152	54	3	66
Western Slope (Other)*	0	0	0	0	0	0	0	0	0	0
Western Planning Area Subtotal	***838***	***953***	***8,146***	***691***	***6,343***	***262***	***1,803***	***136***	***136***	***519***
Central Planning Area										
East Cameron	543	64	4,704	61	4,591	3	113	55	1	47
Eugene Island	1,507	879	7,861	847	7,562	32	299	132	15	63
Ewing Bank	107	248	386	198	313	50	73	17	15	40
Grand Isle	191	43	1,797	41	1,761	2	36	13	1	5
Green Canyon	178	1,114	2,224	600	1,447	514	777	80	68	166
Main Pass and Breton Sound	117	65	722	58	691	7	31	1	0	1
Mississippi Canyon	255	497	2,636	379	2,428	118	208	59	54	350
Ship Shoal	1,761	1,025	7,265	984	6,909	41	356	102	9	89
South Marsh Island	685	358	3,519	324	3,277	34	242	53	5	55
South Pass	796	538	2,328	522	2,223	16	105	24	1	50
South Pelto	145	49	58	48	55	1	3	2	2	7
South Timbalier	1,039	401	4,961	351	4,528	50	433	119	12	184
Vermilion	831	256	4,173	234	4,007	22	166	45	3	63
Viosca Knoll (Slope)	22	47	105	33	83	14	22	4	9	8
West Cameron and Sabine Pass	640	28	3,904	27	3,743	1	161	20	2	37
West Delta	530	387	1,146	375	1,083	12	63	11	7	14
Central Slope (Other)**	0	0	0	0	0	0	0	0	0	0
Central Planning Area Subtotal	***9,347***	***5,999***	***47,789***	***5,082***	***44,701***	***917***	***3,088***	***737***	***204***	***1,179***
Eastern Planning Area Subtotal*	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
GOM Total	***10,185***	***6,952***	***55,935***	***5,773***	***51,044***	***1,179***	***4,891***	***873***	***340***	***1,698***

*Western Slope (Other) includes Corpus Christi, Keathley Canyon, and Port Isabel.

**Central Slope (Other) includes Atwater Valley, Lund, and Walker Ridge.

***Eastern Planning Area includes DeSoto Canyon, Destin Dome, Lloyd Ridge, and others.

Data from table 3c were used to generate the Miocene reserves trend presented in figure 12 and correspond to the *Globorotalia menardii (coiling change right-to-left)* through *Lenticulina hanseni* biozones. Production within the Miocene extends from North Padre Island in the west to east of the Mississippi River. Miocene productive sands also extend into deepwater from East Breaks and Garden Banks in the west to Ewing Bank, Green Canyon, Viosca Knoll, Mississippi Canyon, Atwater Valley, Destin Dome, Desoto Canyon, and Lloyd Ridge in the east. Wells indicate sands continue beyond the Sigsbee Escarpment. Through December 31, 2004, the Miocene produced from 689 fields. Proved reserves were 9.63 Bbbl and 92.0 Tcf. Remaining proved reserves were 2.44 Bbbl and 10.1 Tcf.

Data from table 3d were used to generate the Pre-Miocene reserves trend presented in figure 13 and include the Oligocene, Eocene, and Paleocene in the Tertiary series, and the Cretaceous and Jurassic series. These reservoirs include Jurassic Norphlet sands and Lower Cretaceous Carbonates. Production within the Jurassic is limited to east of the Mississippi River in the Mobile area. Well control suggests reservoir sands continuing eastward into Destin Dome. Through December 31, 2004, these trends produced from 23 fields. Proved reserves were less than 0.01 Bbbl and 2.1 Tcf. Remaining proved reserves were less than 0.01 Bbbl and 0.5 Tcf.

Data from table 3e were used to generate reserves for the reservoirs in fields that span ages from Upper Pleistocene to the Lower Paleogene in the Pre-Miocene trend. Proved reserves were 1.0 Bbbl and 0.6 Tcf.

Table 3c. Estimated oil and gas reserves for Miocene reservoirs in 689 proved and 21 unproved fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 2004.

(Reserves: oil expressed in millions of barrels at 60 ºF and 1 atmosphere, gas in billions of cubic feet at 60 ºF and 15.025 psia.)

Area	Number of proved reservoirs	Proved reserves		Cumulative production through 2004		Remaining proved reserves		Number of unproved reservoirs	Unproved reserves	
		Oil	Gas	Oil	Gas	Oil	Gas		Oil	Gas
Western Planning Area										
Brazos	418	11	3,668	10	3,297	1	371	46	0	74
East Breaks	5	1	325	0	144	0	181	0	0	0
Galveston	390	60	2,015	50	1,806	10	209	34	0	57
Garden Banks	7	59	240	34	145	25	95	9	22	91
High Island and Sabine Pass	664	50	5,153	45	4,723	5	430	60	4	185
Matagorda Island	452	24	5,169	22	4,882	2	287	70	1	396
Mustang Island	319	5	1,786	5	1,630	1	156	33	13	158
N.& S.Padre Island	110	0	551	0	501	0	50	6	0	14
Western Slope (Other)*	0	0	0	0	0	0	0	0	0	0
Western Planning Area Subtotal	***2,365***	***210***	***18,907***	***166***	***17,128***	***44***	***1,779***	***258***	***40***	***975***
Central Planning Area										
Chandeleur	28	0	366	0	342	0	24	5	0	4
East Cameron	402	77	4,454	74	4,347	3	107	15	0	27
Eugene Island	1,256	425	5,805	405	5,449	20	356	154	20	172
Ewing Bank	10	38	50	17	16	21	34	5	3	3
Grand Isle	719	933	2,919	901	2,737	32	182	101	18	104
Green Canyon	14	79	112	20	26	59	86	15	10	29
Main Pass and Breton Sound	1,419	1,027	5,735	938	5,254	89	481	11	6	34
Mississippi Canyon	148	2,646	5,098	793	2,123	1,853	2,975	87	327	957
Mobile	32	0	357	0	325	0	32	1	0	1
Ship Shoal	788	280	2,953	264	2,807	16	146	49	11	85
South Marsh Island	893	319	8,816	297	8,465	22	351	79	3	173
South Pass	568	536	1,767	521	1,711	15	56	6	1	22
South Pelto	397	106	1,090	96	955	10	135	8	2	5
South Timbalier	1,126	1,124	4,319	1,056	3,631	68	688	101	20	160
Vermilion	967	225	10,374	210	9,974	15	400	90	3	162
Viosca Knoll (Shelf)	30	11	171	10	153	1	18	2	0	0
Viosca Knoll (Slope)	101	455	2,621	314	1,937	141	684	16	70	160
West Cameron and Sabine Pass	1,237	160	11,058	152	10,386	8	672	23	0	69
West Delta	918	979	4,158	957	4,017	22	141	25	4	62
Central Slope (Other)**	11	1	361	0	0	1	361	2	0	15
Central Planning Area Subtotal	***11,064***	***9,421***	***72,584***	***7,025***	***64,655***	***2,396***	***7,929***	***795***	***498***	***2,244***
Eastern Planning Area Subtotal*	***11***	***1***	***502***	***0***	***76***	***1***	***426***	***11***	***0***	***203***
GOM Total	***13,440***	***9,632***	***91,993***	***7,191***	***81,859***	***2,441***	***10,134***	***1,064***	***538***	***3,422***

*Western Slope (Other) includes Corpus Christi, Keathley Canyon, and Port Isabel.

**Central Slope (Other) includes Atwater Valley, Lund, and Walker Ridge.

***Eastern Planning Area includes DeSoto Canyon, Destin Dome, Lloyd Ridge, and others.

Table 3d. Estimated oil and gas reserves for Pre-Miocene reservoirs in 23 proved and 2 unproved fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 2004.

(Reserves: oil expressed in millions of barrels at 60 ºF and 1 atmosphere, gas in billions of cubic feet at 60 ºF and 15.025 psia.)

Area	Number of proved reservoirs	Proved reserves		Cumulative production through 2004		Remaining proved reserves		Number of unproved reservoirs	Unproved reserves	
		Oil	Gas	Oil	Gas	Oil	Gas		Oil	Gas
Western Planning Area										
Mustang Island and N. & S. Padre	8	0	28	0	16	0	12	0	0	0
Western Slope (Other)*	0	0	0	0	0	0	0	0	0	0
Western Planning Area Subtotal	***8***	***0***	***28***	***0***	***16***	***0***	***12***	***0***	***0***	***0***
Central Planning Area										
Main Pass and Breton Sound	1	0	0	0	0	0	0	0	0	0
Mobile	21	0	1,730	0	1,375	0	355	4	0	126
Viosca Knoll (Shelf)	14	0	312	0	225	0	87	4	0	12
Central Slope (Other)**	0	0	0	0	0	0	0	0	0	0
Central Planning Area Subtotal	***36***	***0***	***2,042***	***0***	***1,600***	***0***	***442***	***8***	***0***	***138***
Eastern Planning Area Subtotal*	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***1***	***0***	***491***
GOM Total	***44***	***0***	***2,070***	***0***	***1,616***	***0***	***454***	***9***	***0***	***629***

*Western Slope (Other) includes Corpus Christi, Keathley Canyon, and Port Isabel.

**Central Slope (Other) includes Atwater Valley, Lund, and Walker Ridge.

***Eastern Planning Area includes DeSoto Canyon, Destin Dome, Lloyd Ridge, and others.

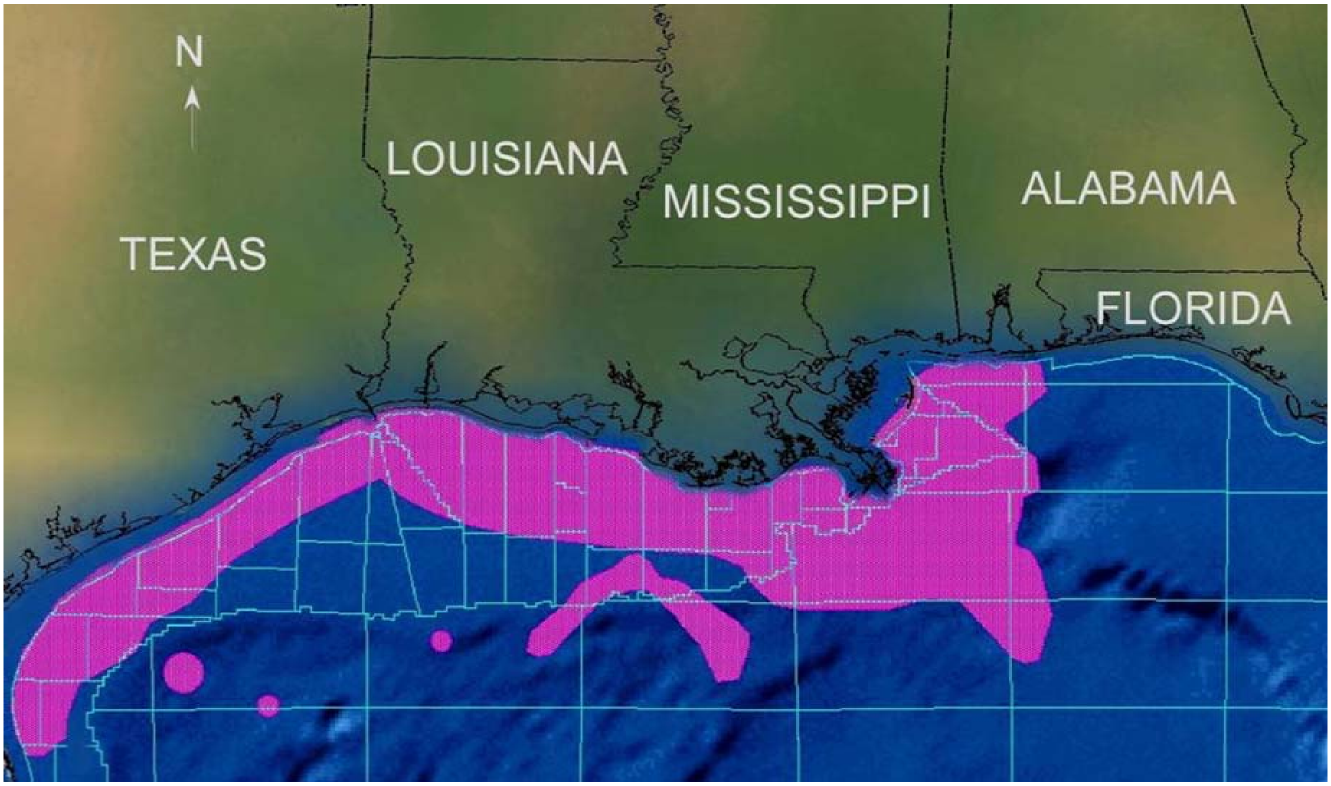


Figure 12. Miocene reserves trend.

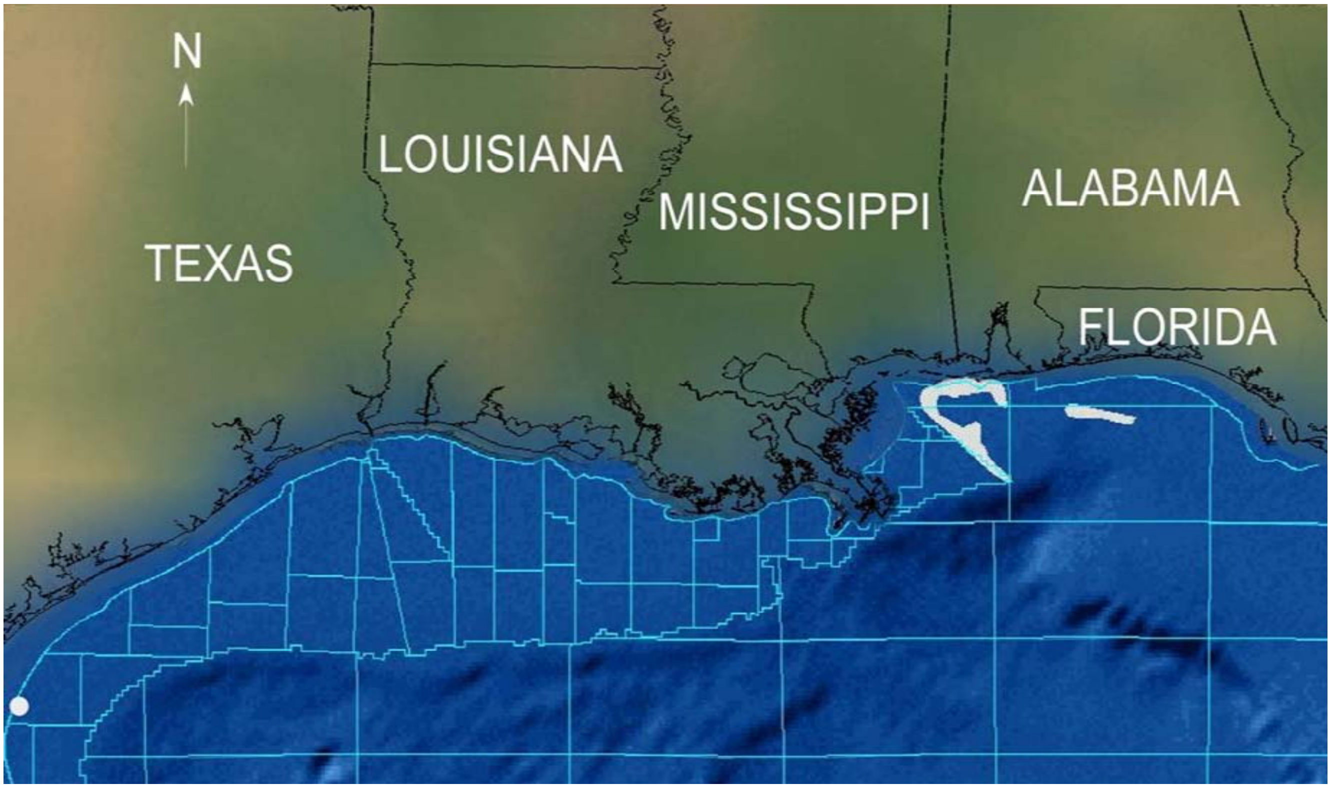


Figure 13. Pre-Miocene reserves trend.

Table 3e. Estimated oil and gas reserves for reservoirs that Span Ages in 3 proved and 10 unproved fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 2004.

(Reserves: oil expressed in millions of barrels at 60 ºF and 1 atmosphere, gas in billions of cubic feet at 60 ºF and 15.025 psia.)

Area	Number of proved reservoirs	Proved reserves		Cumulative production through 2004		Remaining proved reserves		Number of unproved reservoirs	Unproved reserves	
		Oil	Gas	Oil	Gas	Oil	Gas		Oil	Gas
Western Planning Area										
Alaminos Canyon	0	0	0	0	0	0	0	14	324	447
Western Slope (Other)*	0	0	0	0	0	0	0	1	8	4
Western Planning Area Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***15***	***332***	***451***
Central Planning Area										
Green Canyon	22	1,009	632	0	0	1,009	632	12	1,337	695
Central Slope (Other)**	0	0	0	0	0	0	0	23	101	118
Central Planning Area Subtotal	***22***	***1,009***	***632***	***0***	***0***	***1,009***	***632***	***35***	***1,438***	***813***
Eastern Planning Area Subtotal*	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
GOM Total	***22***	***1,009***	***632***	***0***	***0***	***1,009***	***632***	***50***	***1,770***	***1,264***

*Western Slope (Other) includes Corpus Christi, Keathley Canyon, and Port Isabel.

**Central Slope (Other) includes Atwater Valley, Lund, and Walker Ridge.

***Eastern Planning Area includes DeSoto Canyon, Destin Dome, Lloyd Ridge, and others.

Figure 14 shows the percentages of reserves and production data by geologic age. This figure matches the chronostratigraphy by the MMS in the abbreviated Gulf of Mexico biostratigraphic chart presented in figure 9. This figure exhibits that Miocene is the predominant reserves trend in the Gulf of Mexico, with the largest percentage of proved reserves, cumulative production, and remaining proved reserves.

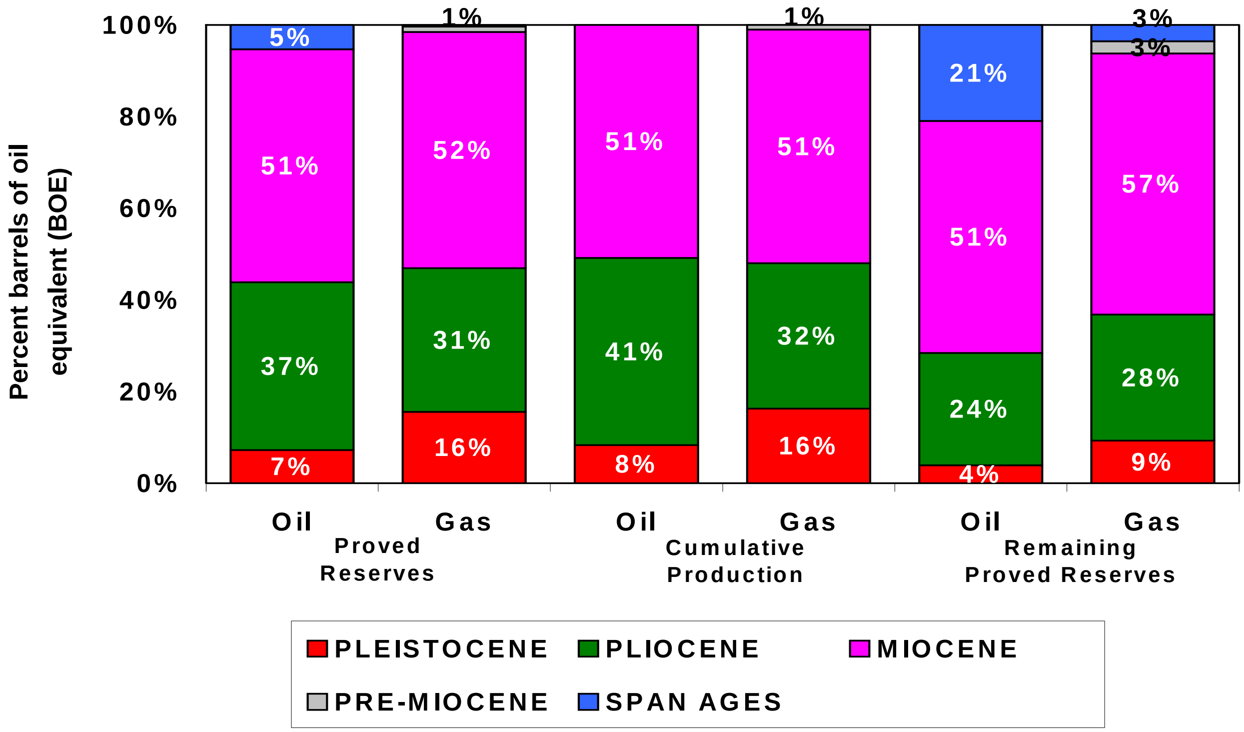


Figure 14. Distribution of reserves and production data by geologic age.

Historical Exploration and Discovery Pattern and Trends

In large part, the following section was taken from ***An Exploration and Discovery Model: a Historic Perspective - Gulf of Mexico Outer Continental Shelf*** by Gary Lore (1994). The information presented has been updated to reflect the current database.

It is informative to review the historic exploration and development activities that resulted in the world-class hydrocarbon-producing basin that is the Gulf of Mexico. Each of the decades of activity will be examined by reviewing the status of exploration and development activity and the number of fields and quantities of proved reserves discovered during each decade. The discovery year is defined as the year in which the first well encountering significant hydrocarbons reached total depth. This date may differ from the year in which the field discovery was announced.

Figures 15-20 depict locations of proved fields by decade with bar heights proportional to total proved reserves in barrels of oil equivalent (BOE). Figure 15 shows the locations of the proved fields discovered prior to December 31, 1959. As expected, initial development was in shallower, nearshore waters concentrated mainly in the areas off central and western Louisiana. This development primarily reflected the gradual extension of existing inland drilling and development technologies into the open-water marine environments, and the infancy of marine seismic acquisition activities. Early exploratory drilling in very shallow water on the shelf utilized barges and platforms. The mid-1950's witnessed the introduction of submersible and jack-up drilling rigs. During this period, 271 exploratory wells were drilled, culminating in the discovery of 68 proved fields. It was also during this period that 6 of the top 10 fields in the Gulf of Mexico, based on proved reserves, were discovered, the fourth largest being West Delta 30.

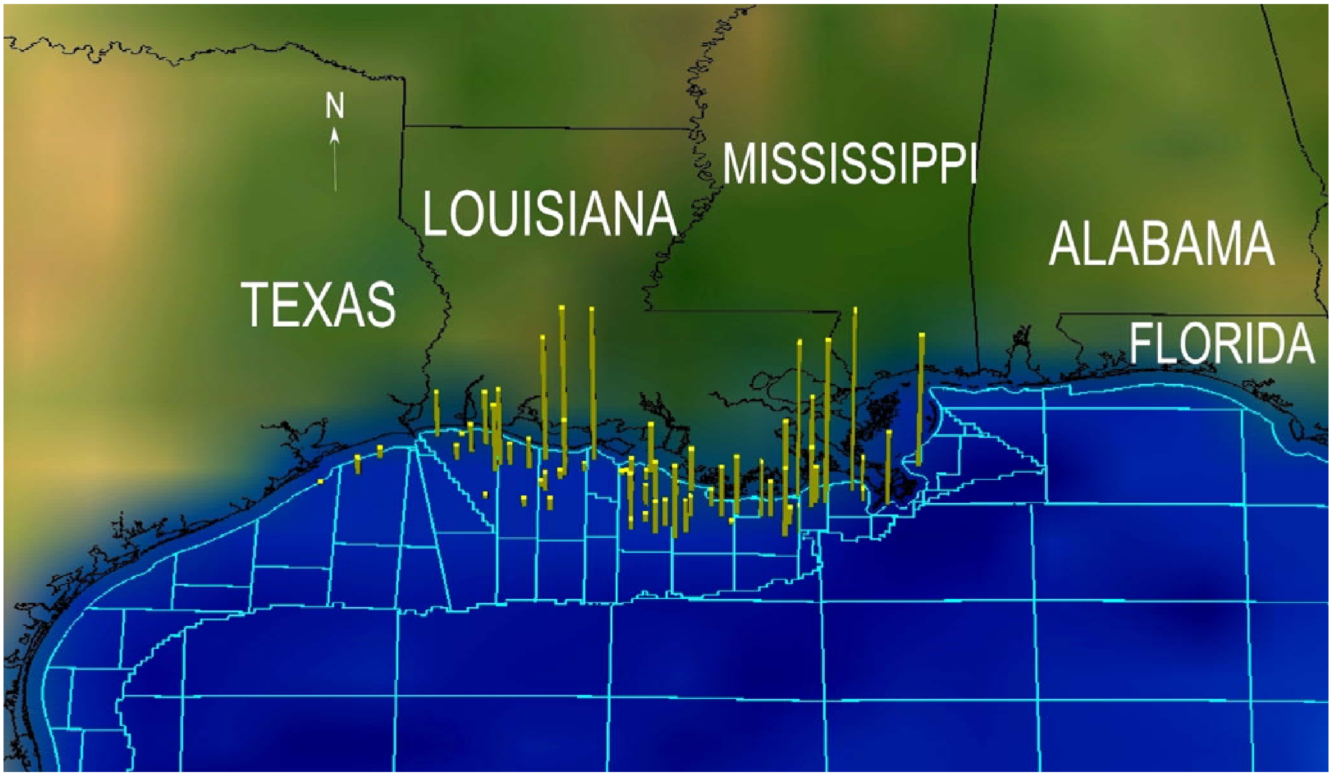


Figure 15. Location of proved fields discovered 1947-1959, Gulf of Mexico OCS.

Figure 16 shows the location of the proved fields discovered in the 1960's. These discoveries were still concentrated offshore central and western Louisiana. Though still confined to the shelf (650 ft or less), field discoveries advanced seaward into deeper waters. During this decade, 2,110 exploratory wells were drilled and 147 proved fields discovered. The twelfth largest proved field in the Gulf of Mexico, Ship Shoal 208, was discovered in the sixties.

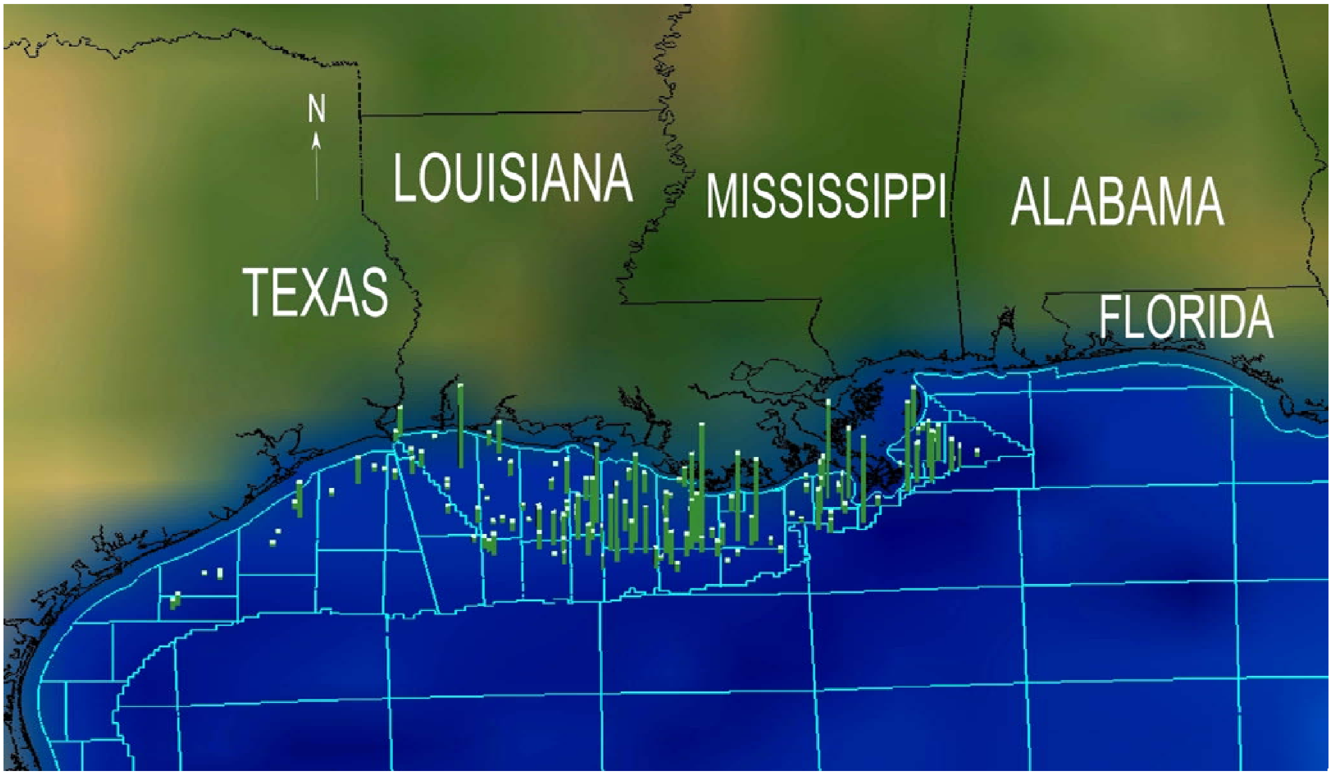


Figure 16. Location of proved fields discovered 1960-1969, Gulf of Mexico OCS.

Figure 17 shows the location of the proved fields discovered in the 1970's. This period reflects continued drilling and development on the shelf, with an increase in field discoveries on the seaward portion of the shelf, predominantly within the Pleistocene age. The introduction of global positioning systems, used on drillships and semi-submersible drilling rigs, further opened up deepwater exploration. Frontier drilling on the shelf-slope margin led to discoveries of new fields in what has been termed the Flexure Trend. During this decade, 2,997 exploratory wells were drilled, resulting in the discovery of 281 proved fields. The second largest field in the Gulf of Mexico, Eugene Island 330, was discovered in 246 ft of water during this decade. Another significant field discovery was Mississippi Canyon 194, the first field in over 1,000 ft of water.

During the 1980's, development activities occurred over practically the entire central and western Gulf of Mexico shelf, as well as on the upper slope, as can be seen in figure 18. In addition, the first Norphlet fields and a Miocene shallow bright spot play were discovered in the eastern Central Gulf of Mexico planning area. Exploratory drilling had now reached water depths beyond 6,000 ft. In this decade, 4,196 exploration wells were drilled, resulting in the discovery of 369 proved fields (30 were discovered in water depths greater than 1,000 ft).

For the 1990's (figure 19), 4,002 exploration wells were drilled, resulting in the discovery of 218 proved fields (50 were discovered in water depths greater than 1,000 ft). The 1990's saw the refinement and reduction in cost of tension leg platform design and a much expanded use of subsea completions. Available production histories have documented high production rates for deepwater fields. The expanding use of horizontal drilling increased productivity of specific reservoirs. Computer workstation technology using three-dimensional seismic data sets allowed for reduced risk and greater geologic assurance in exploration and field development, as well as exploration of new plays, such as the Subsalt Play.

From 2000 to 2004 (figure 20), 1,874 exploration wells were drilled, resulting in the discovery of 89 proved fields. Nearly 32 percent of those fields were in greater than 1,000 ft of water. Reserve estimates for field discoveries during this period may have significant increases because of increased well control, reservoir management, and in-field exploration.

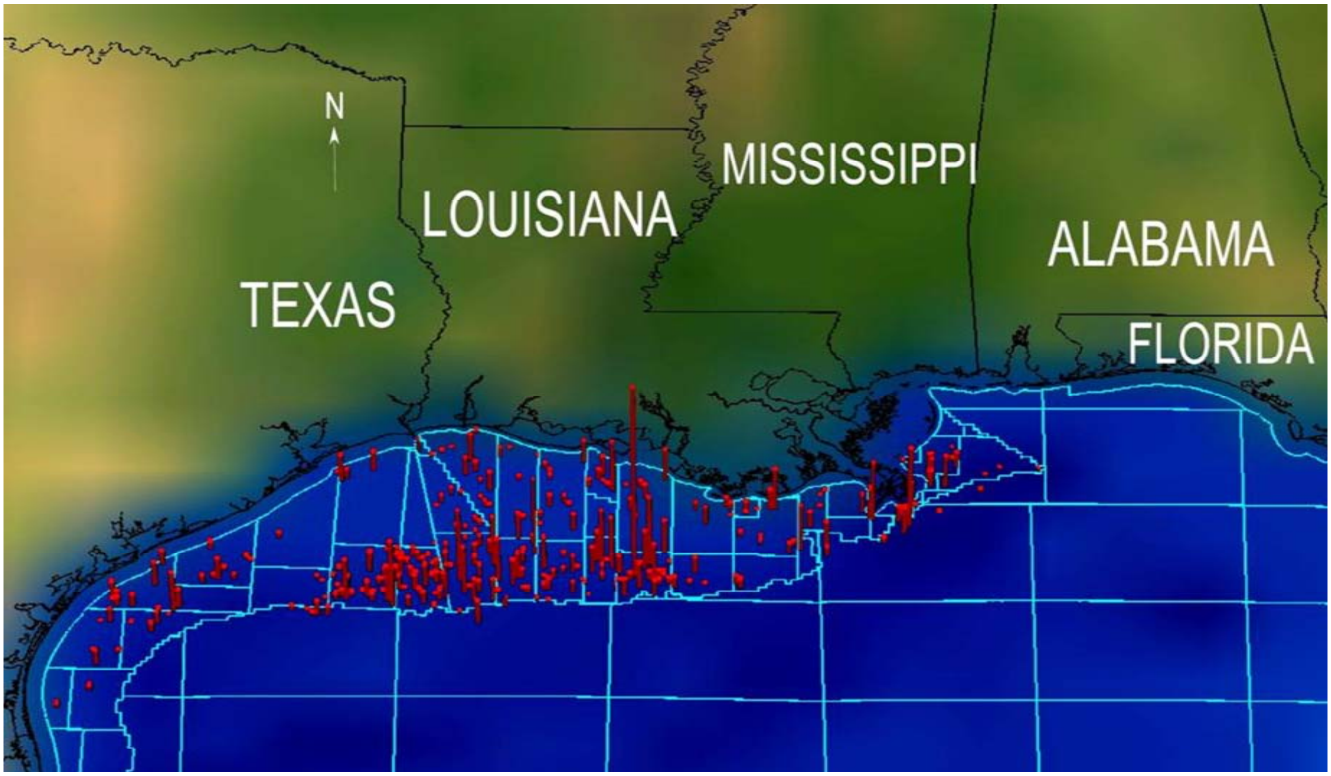


Figure 17. Location of proved fields discovered 1970-1979, Gulf of Mexico OCS.

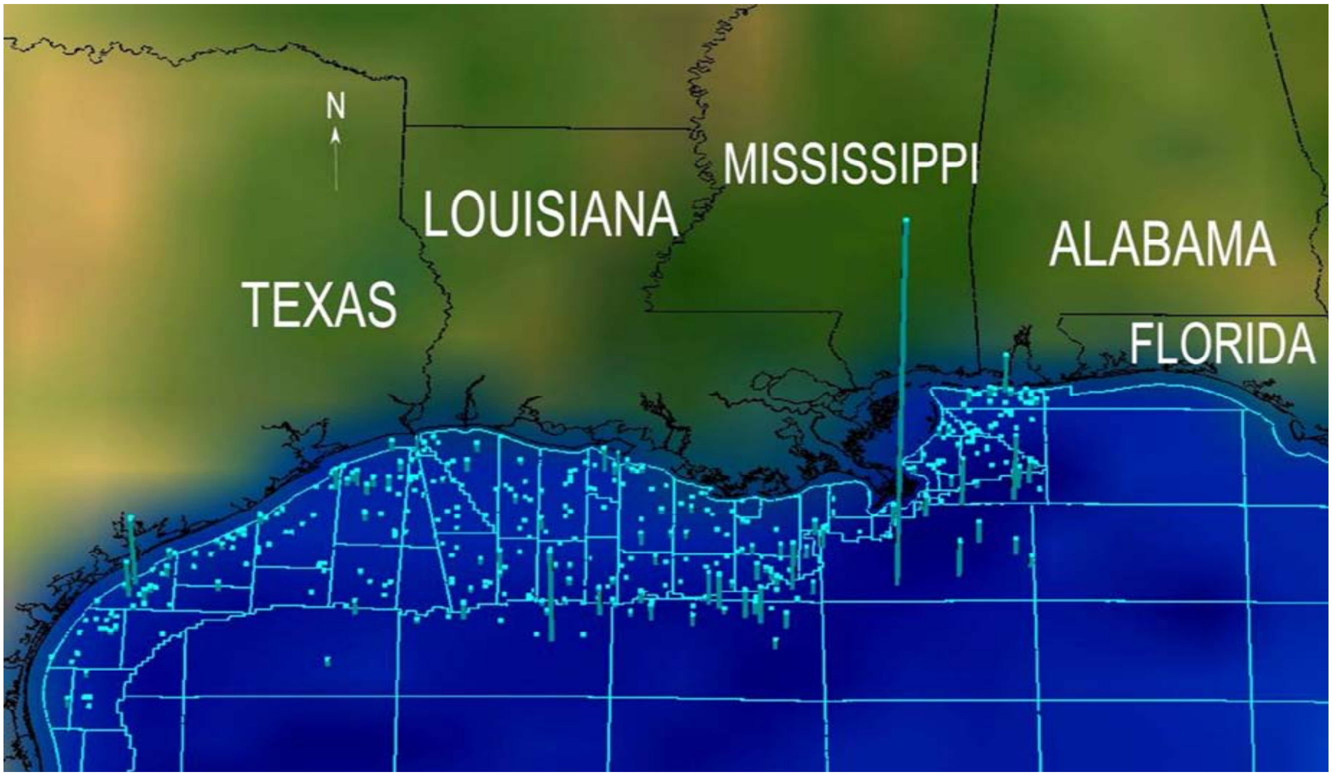


Figure 18. Location of proved fields discovered 1980-1989, Gulf of Mexico OCS.

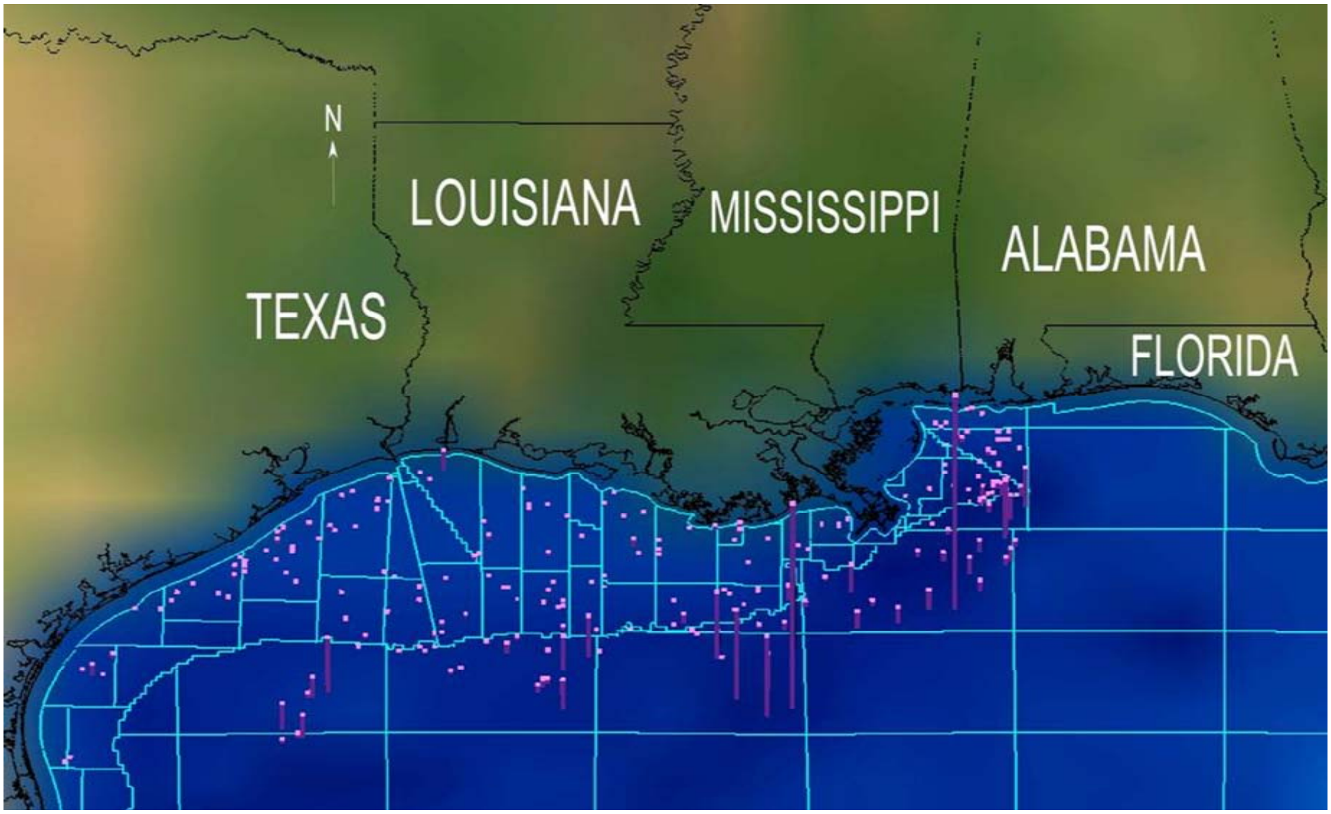


Figure 19. Location of proved fields discovered 1990-1999, Gulf of Mexico OCS.

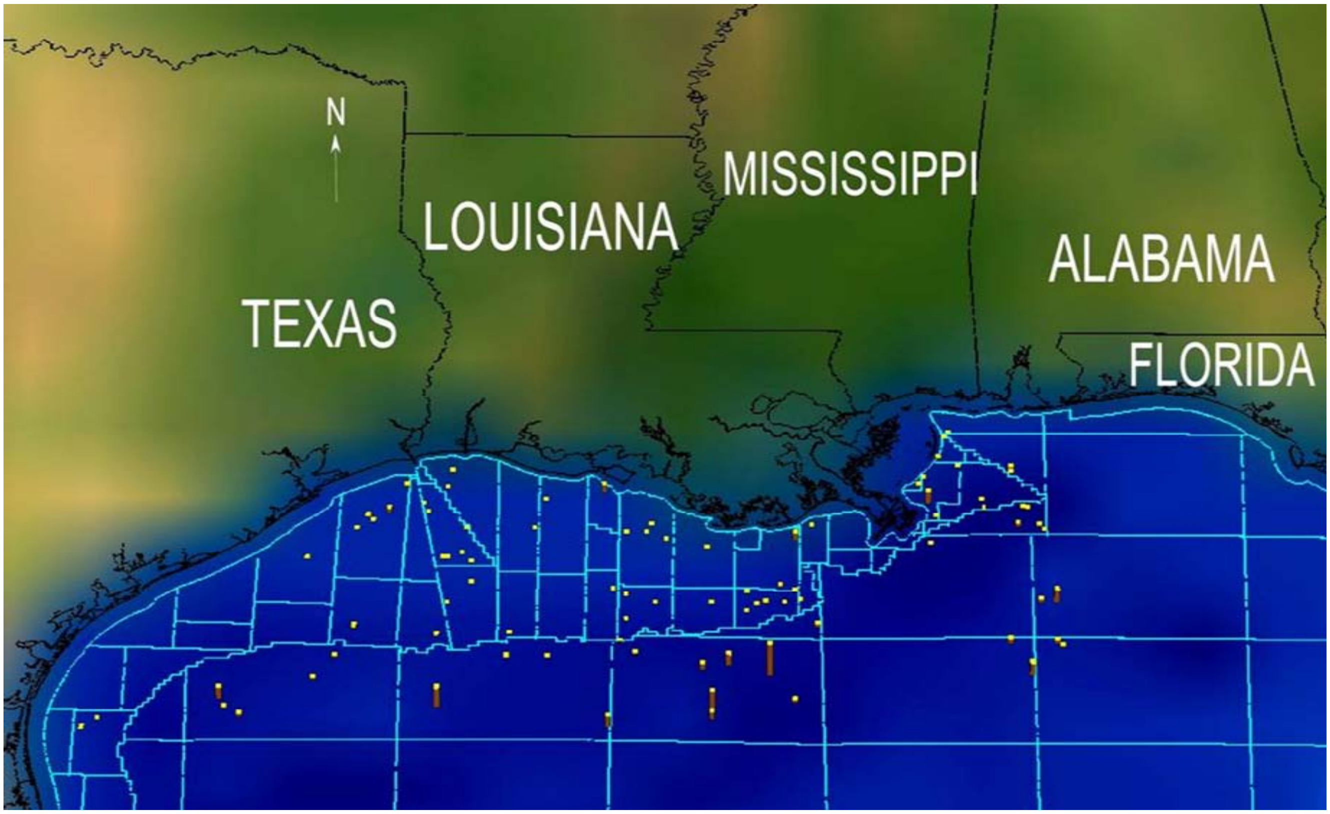


Figure 20. Location of proved fields discovered 2000-2004, Gulf of Mexico OCS.

Figure 21 shows annual field discoveries by geologic age for the 1,172 proved fields. Figure 22 shows annual discoveries of proved reserves by geologic age for the 1,172 proved fields. These two figures show several trends over the last 50 years. From the mid-1940's through the 1960's, the largest number of fields discovered were of Miocene age and these fields contributed the largest reserves additions. This trend reflects a continuation of the nearshore operating environment. The decade of the 1970's saw a large peak in the discovery of Pleistocene and Pliocene fields and proved reserves. Technological advances in seismic data and deeper drilling accounted for the resurgence of Miocene field discoveries and reserve additions in the decade of the 1980's. This decade also saw the first Jurassic Norphlet discoveries. Large Miocene and Pliocene discoveries in the late 1990's will play a major role in future production. The MMS OCS Report MMS 2006-022, ***Deepwater Gulf of Mexico 2006: America's Expanding Frontier***, and MMS OCS 2007-021, ***Deepwater Gulf of Mexico: Interim Report of 2006 Highlights***, available on the GOM Region's Internet homepage, provide detailed information on deepwater activities.

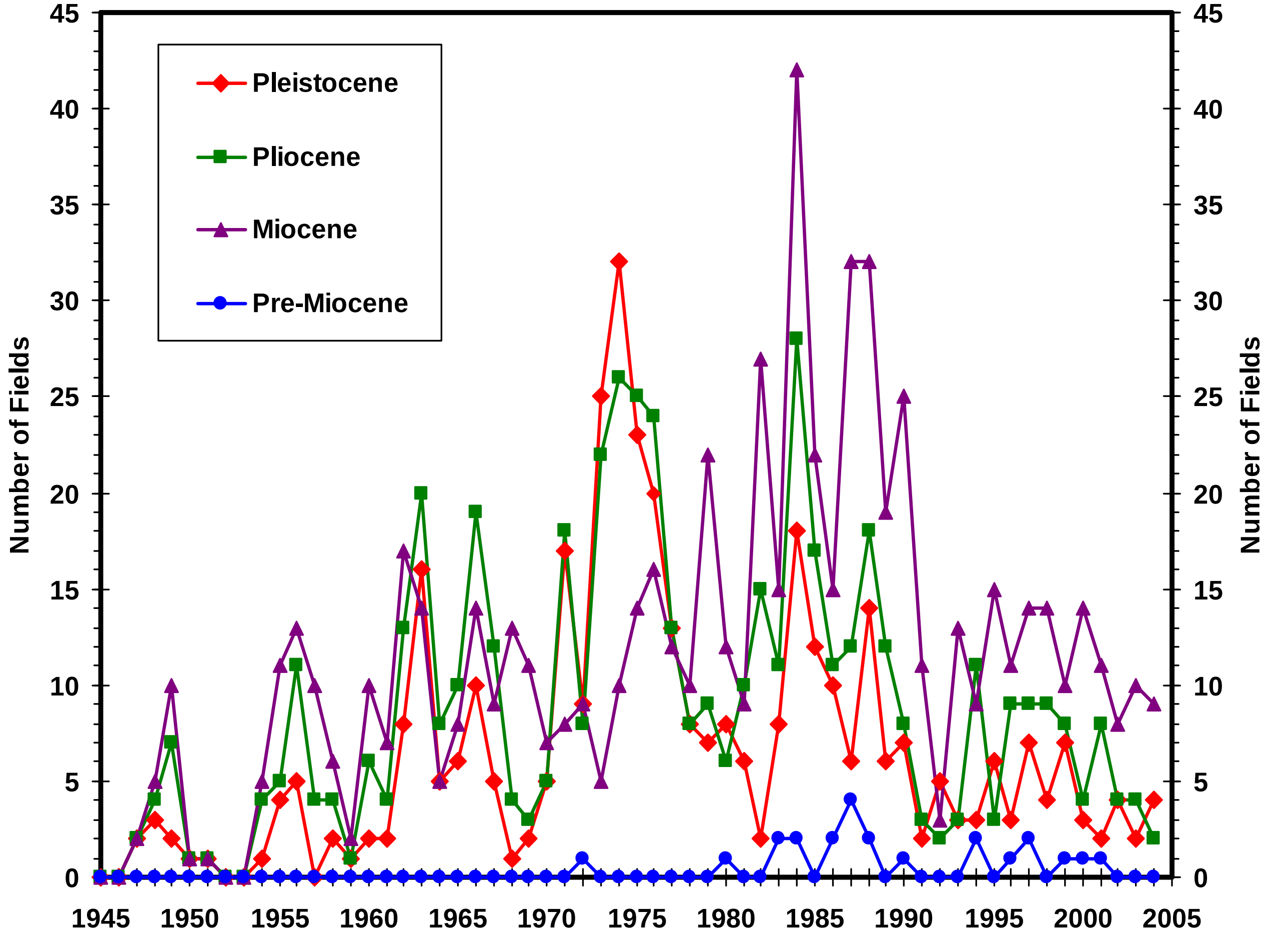


Figure 21. Annual number of field discoveries by geologic age, 1,172 proved fields.

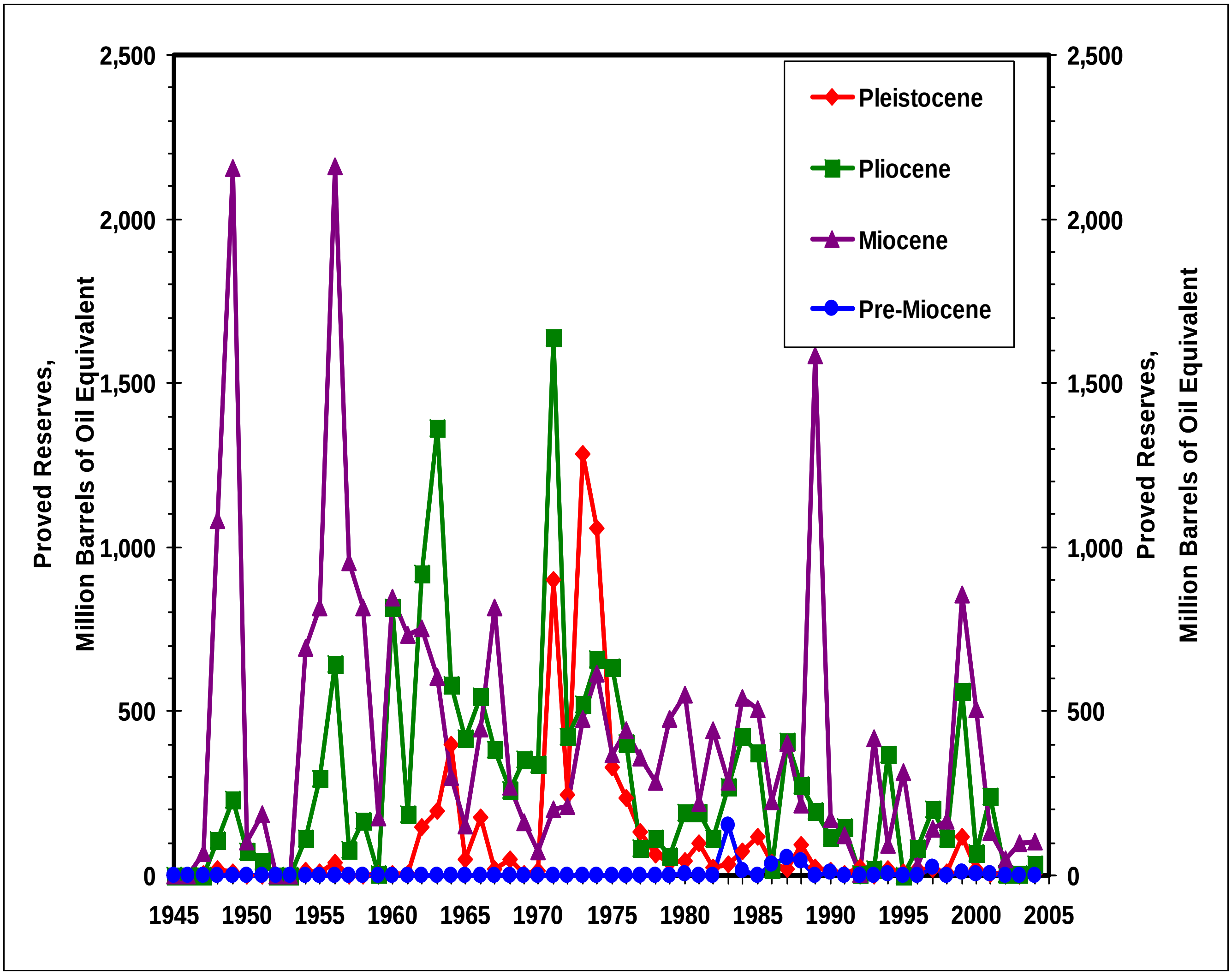


Figure 22. Annual discoveries of proved reserves by geologic age, 1,172 proved fields.

Field-Size Distribution

Reserve sizes are expressed in terms of barrels of oil equivalent (BOE). Gas reserves are converted to BOE and added to the liquid reserves for the convenience of comparison. The conversion factor of 5,620 standard cubic feet of gas equals 1 BOE is based on the average heating values of domestic hydrocarbons. A geometric progression, developed by the USGS (Attanasi, 1998), was selected for field-size distribution ranges (figure 23).

In this report, fields are classified as either oil or gas; some fields do produce both products, making a field type determination difficult. Generally, fields with a gas/oil ratio (GOR) less than 9,700 standard cubic feet per stock tank barrel (SCF/STB) are classified as oil.

Class	Deposit-size range*	Class	Deposit-size range*	Class	Deposit-size range*
1	0.031 - 0.062	10	16 - 32	18	4,096 - 8,192
2	0.062 - 0.125	11	32 -64	19	8,192 - 16,384
3	0.125 - 0.25	12	64 - 128	20	16,384 - 32,768
4	0.25 - 0.50	13	128 - 256	21	32,768 - 65,536
5	0.50 - 1.00	14	256 - 512	22	65,536 - 131,072
6	1 - 2	15	512 - 1,024	23	131,072 - 262,144
7	2 - 4	16	1,024 - 2,048	24	262,144 - 524,288
8	4 - 8	17	2,048 - 4,096	25	524,288 - 1,048,576
9	8 - 16	*Million Barrels of Oil Equivalent (MMBOE)			

Figure 23. Description of deposit-size classes.

The field-size distribution based on proved reserves for 1,172 proved fields is shown in figure 24(a). Of the 1,172 proved oil and gas fields, there are 219 proved oil fields represented in figure 25(a) and 953 gas fields shown in figure 26(a). The Western Gulf of Mexico field-size distributions are displayed on figures 24(b), 25(b), and 26(b). Figures 24(c), 25(c), and 26(c) present the Central Gulf of Mexico field-size distributions of proved reserves including one field in the Eastern Gulf of Mexico. The field-size distribution, derived from unproved reserves for 58 unproved fields, is shown in figure 27(a). There are 31 unproved oil fields in figure 27(b) and 27 unproved gas fields in figure 27(c). All unproved active fields were studied.

Analysis of the 1,172 proved oil and gas fields indicates that the Gulf of Mexico is historically a gas-prone basin. Figure 28 presents the median (exceeded by 50%) and the mean (arithmetic average) reserves from the field-size distributions. This figure also provides information on the largest two field-size ranges from figures 24-27. The GOR of the 219 proved oil fields is 2,638 SCF/STB. The GOR of the 31 unproved oil fields is 826 SCF/STB. The mean yield (condensate divided by gas) for the 953 proved gas fields is 22.5 barrels of condensate per million cubic feet (MMcf) of gas. The mean yield of the 27 unproved gas fields is 18.7 barrels of condensate per MMcf.

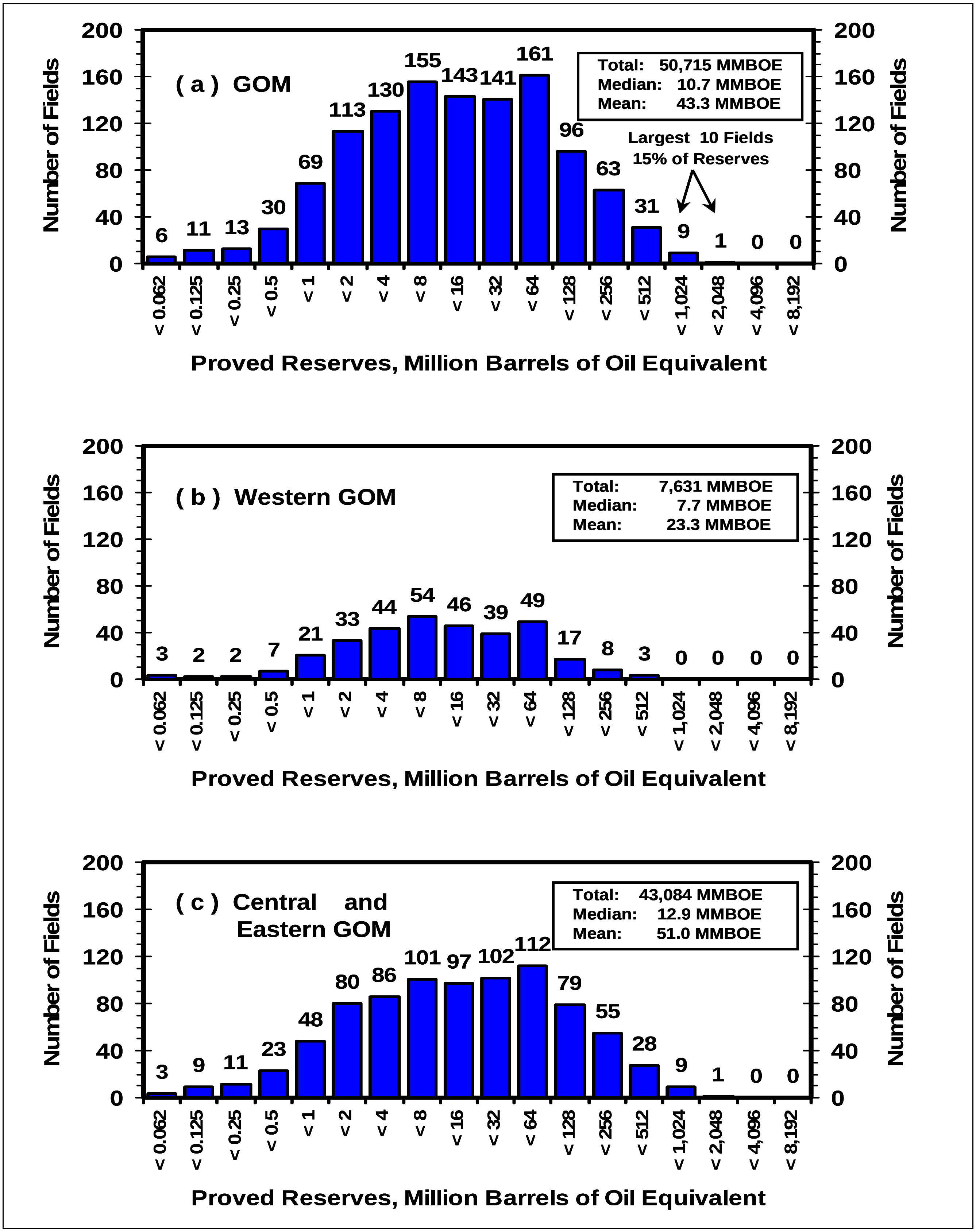


Figure 24. Field-size distribution of proved fields: (a) 1,172 fields, GOM; (b) 328 fields, Western GOM; (c) 844 fields, Central and Eastern GOM.

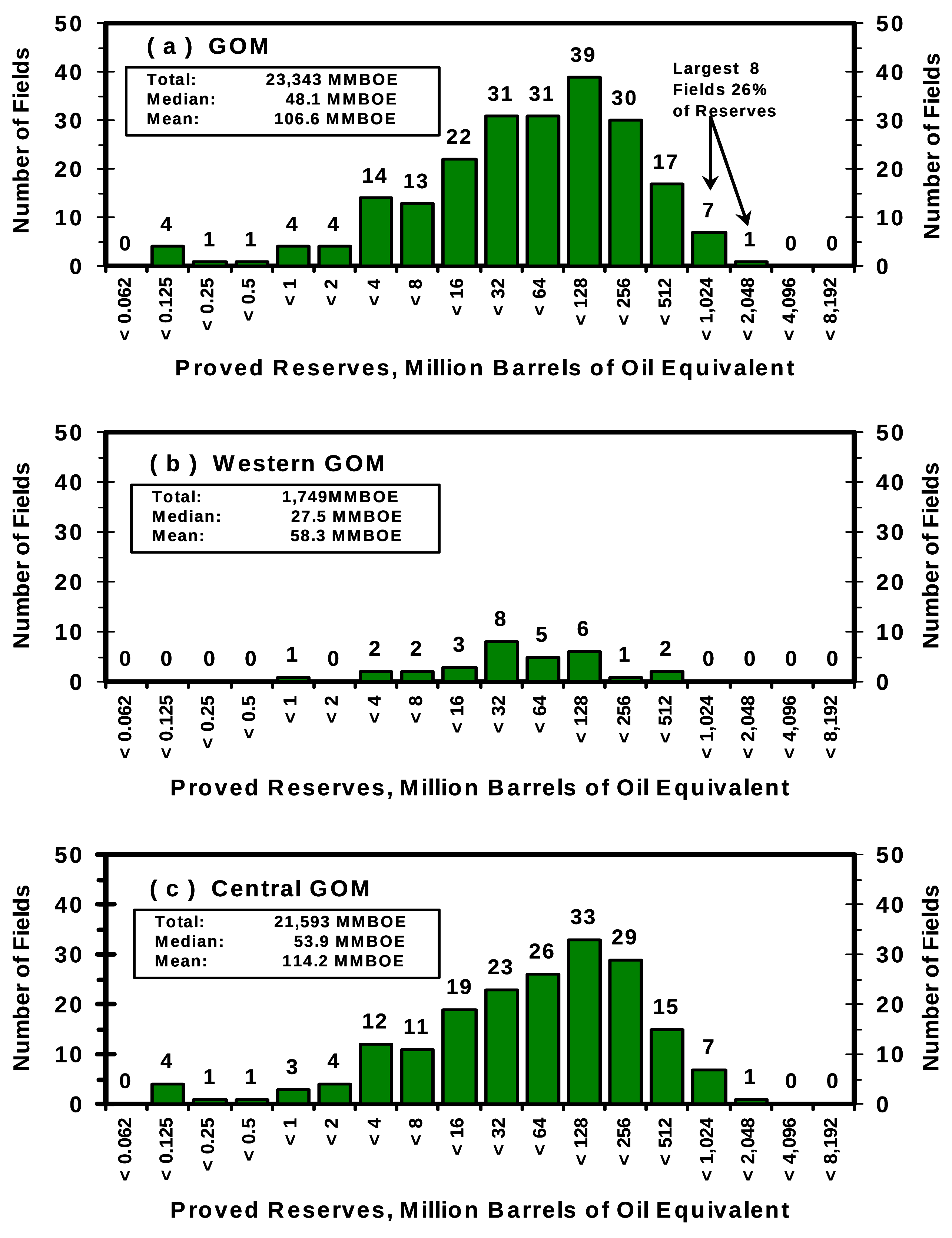


Figure 25. Field-size distribution of proved oil fields: (a) 219 fields GOM; (b) 30 fields, Western GOM; (c) 189 fields, Central and Eastern GOM.

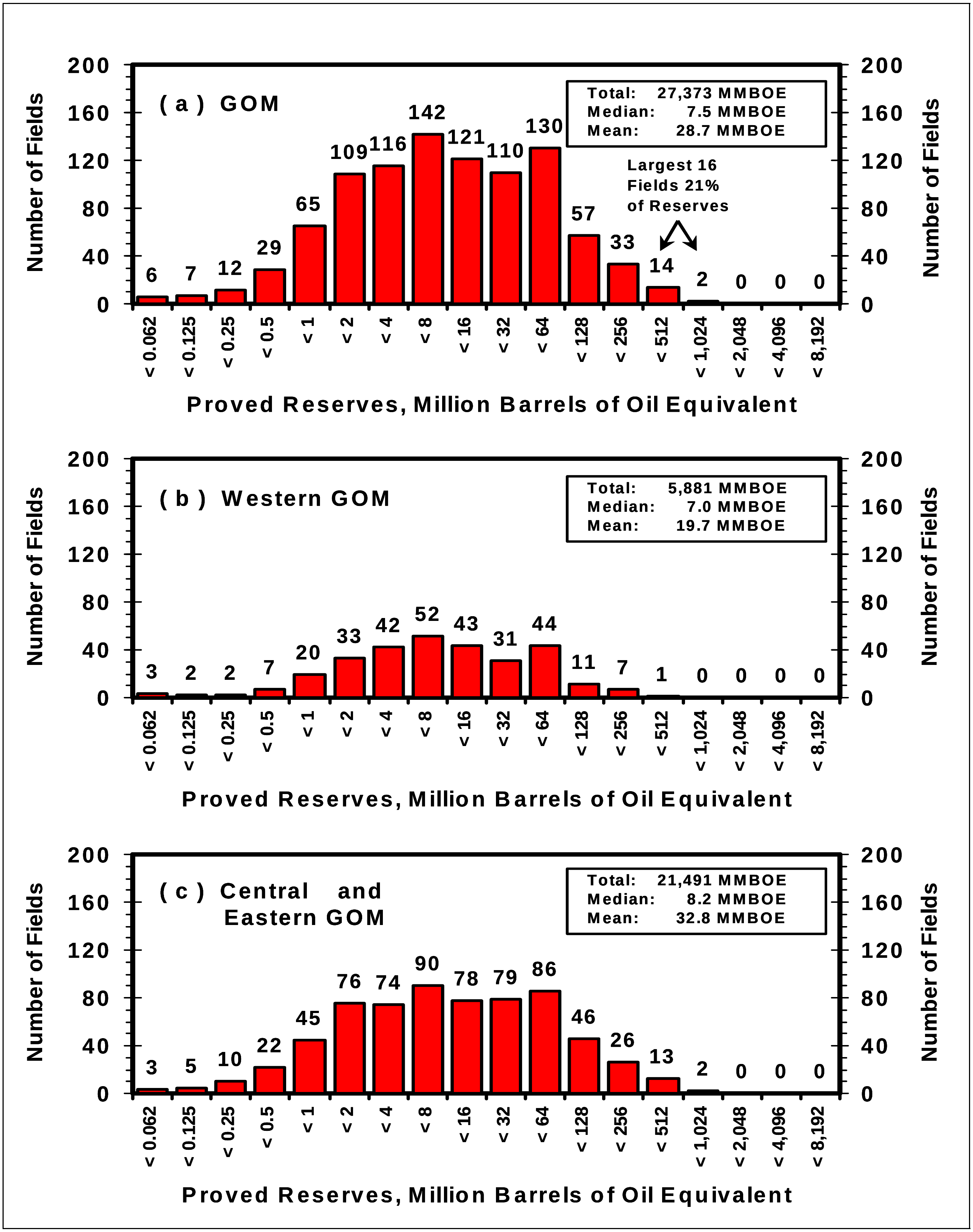


Figure 26. Field-size distribution of proved gas fields: (a) 953 fields, GOM; (b) 298 fields, Western GOM; (c) 655 fields, Central and Eastern GOM.

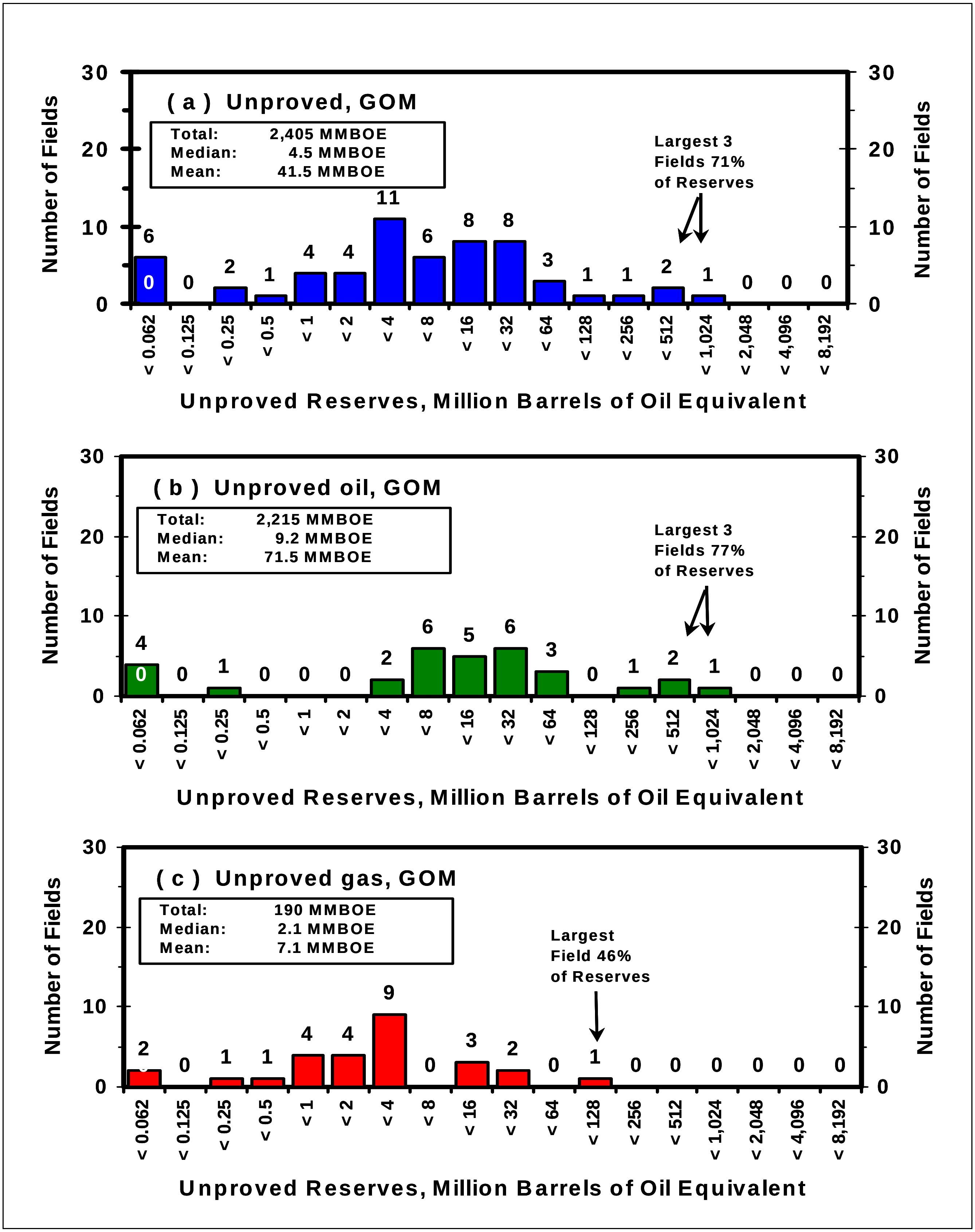


Figure 27. Field-size distribution of unproved fields: (a) 58 fields, GOM; (b) 31 oil fields, GOM; (c) 27 gas fields, GOM.

Description of Fields	Figure Number	Median*	Mean*	Largest Fields	
				Number	Reserves
1,172 Proved	Fig. 24a	10.7	43.3	10	15%
219 Proved Oil	Fig. 25a	48.1	106.6	8	26%
953 Proved Gas	Fig. 26a	7.5	28.7	16	21%
58 Unproved	Fig. 27a	4.5	41.5	3	71%
31 Unproved Oil	Fig. 27b	9.2	71.5	3	77%
27 Unproved Gas	Fig. 27c	2.1	7.1	1	46%

* Million barrels of oil equivalent (MMBOE)

Figure 28. GOM field-size distribution.

Figure 29 shows the cumulative percent distribution of proved reserves in billion barrels of oil equivalent (BBOE), by field rank. All 1,172 proved fields in the Gulf of Mexico OCS are included in this figure. A characteristic often observed in hydrocarbon-producing basins is a rapid drop-off in size from that of largest known field to that of smaller ones. Twenty-five percent of the proved reserves are contained in the 24 largest fields. Fifty percent of the proved reserves are contained in the 82 largest fields. Ninety percent of the proved reserves are contained in the 405 largest fields.

Figure 30 shows the distribution of the number of fields and proved reserves by water depth. A field's water depth is determined by averaging the water depth of the wells drilled in the field. The water depth ranges used in this figure, 651-1,300 ft, 1,301-2,600 ft, and greater than 2,600 ft, closely approximate the 200-400 meter, 401-800 meter, and greater than 800 meter water depths used in the OCS Deepwater Royalty Relief Act of 1995 (DWRRA). Proved reserves, reported in MMBOE, are associated with the 1,172 proved fields. The 58 unproved active fields are presented to show recent activity. Fifty-eight percent of the proved reserves in the Gulf of Mexico are located in less than 200 ft of water. The shelf, generally considered as less than 650 ft of water, accounts for 79 percent of the proved reserves. Development beyond the shelf, generally considered greater than 650 ft of water, reflects a sizeable amount of proved reserves associated with a few fields. The mean proved reserves per proved field in the Gulf of Mexico is 43.3 MMBOE. For water depths less than 651 ft, it is 38.9 MMBOE; for 651-1,300 ft, it is 36.6 MMBOE; for 1,301-2,600 ft, it is 48.8 MMBOE; and greater than 2,600 ft, it is 109.5 MMBOE.

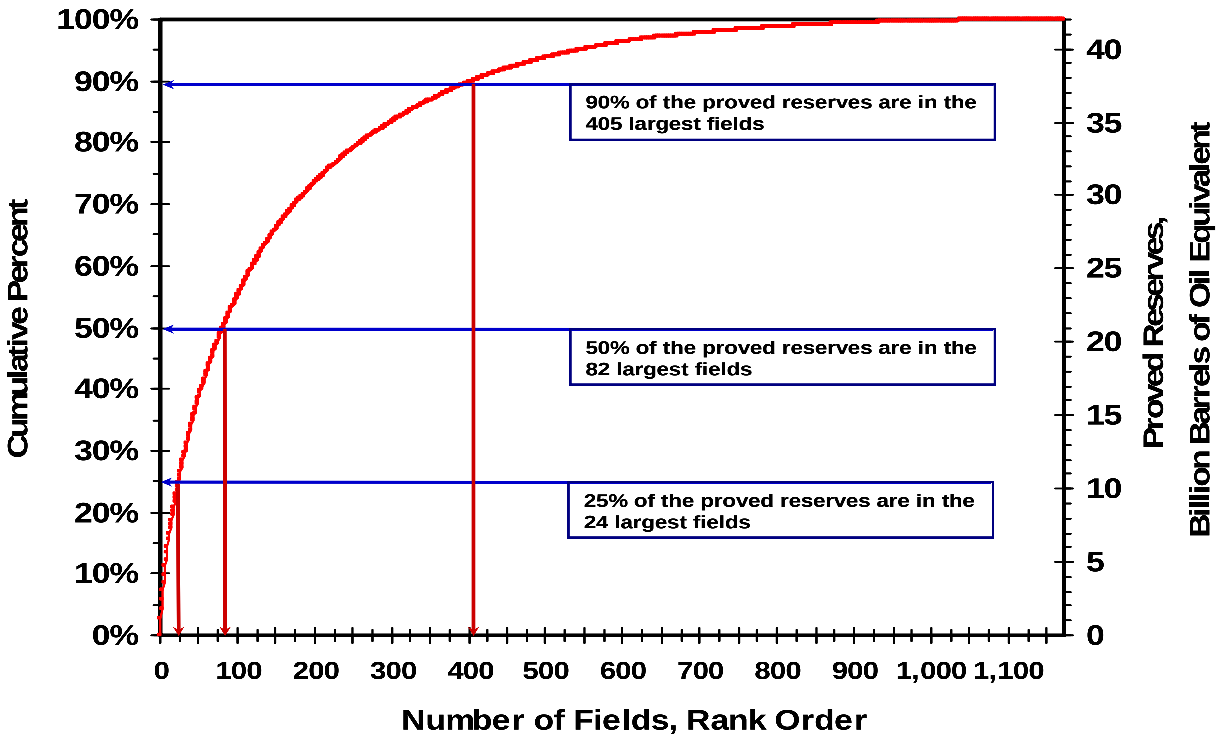


Figure 29. Cumulative percent total reserves versus rank order of field size for 1,172 proved fields.

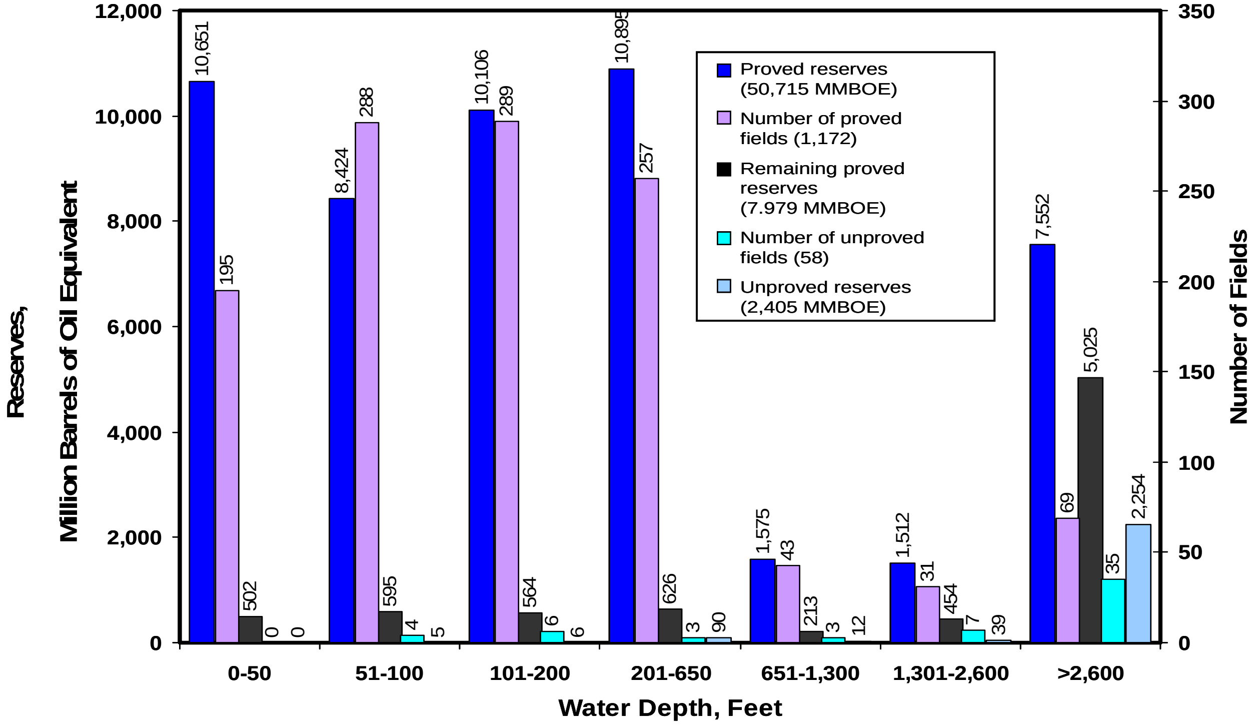


Figure 30. Field and reserves distribution by water depth. (Totals are in parentheses.)

Figure 31 shows the largest 20 fields ranked in order by remaining proved reserves. Nineteen of the twenty top fields lie in water depths of greater than 1,300 ft and account for 54 percent of the remaining proved reserves in the Gulf of Mexico.

Estimates of proved reserves beyond the shelf are increasing. This trend is expected to continue in the future because of additional exploration and development. Of the 143 proved fields in water depths greater than 650 ft, 117 are producing, 8 are depleted, and 18 have yet to produce. There are 45 unproved active fields in water depths greater than 650 ft. These fields contain 2,305 MMBOE, representing 96 percent of the Gulf of Mexico total of estimated unproved reserves.

Exploration and development of the deepwater Gulf of Mexico has accelerated with technological advances, expansion of the infrastructure, and the enactment of the DWRRA. This has given industry the incentive to explore and produce deepwater resources as these activities continue to increase in importance to the Nation's energy supply.

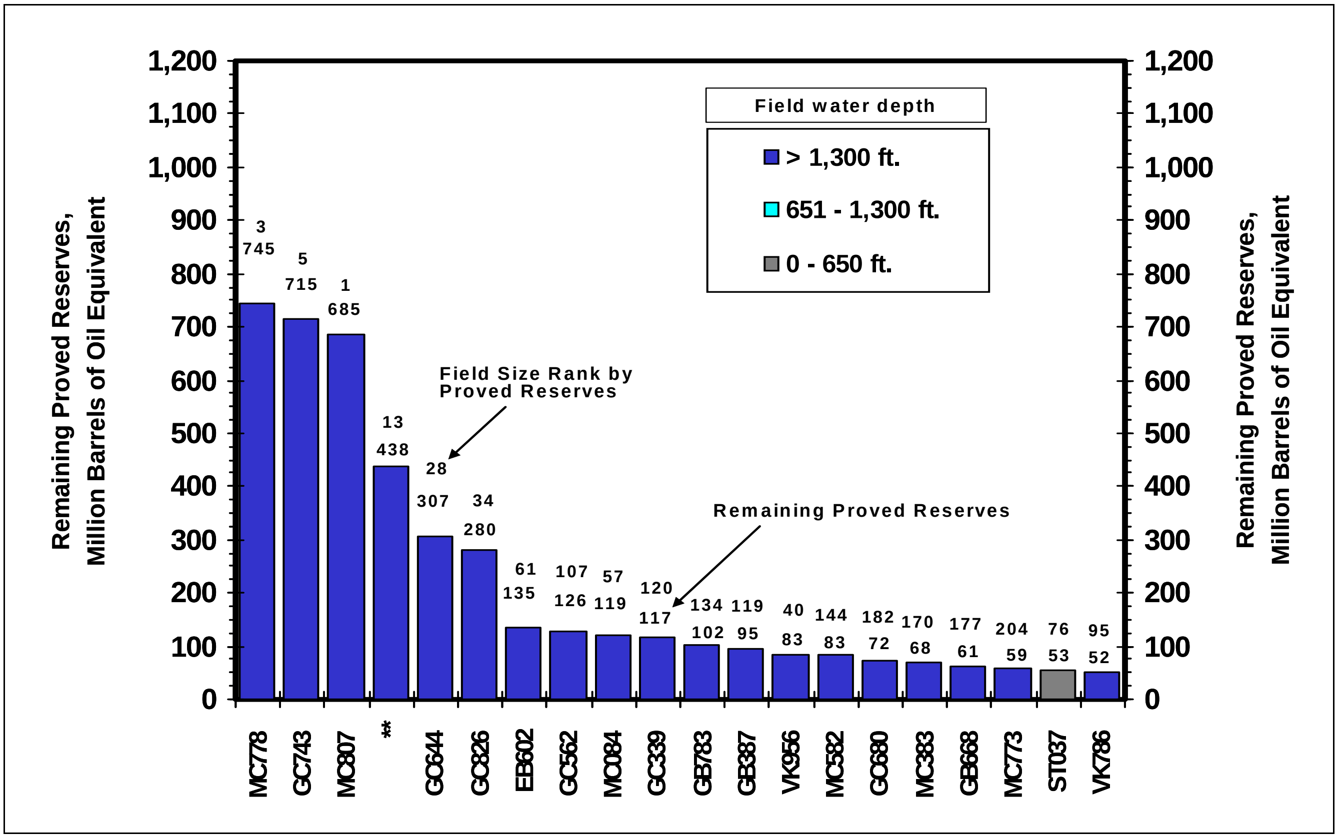


Figure 31. Largest 20 fields ranked by remaining proved reserves. (Note: **indicates the field is proprietary.)

Table 4 lists the 50 largest proved fields ranked by proved reserves expressed in BOE. Rank, field name, new fields, discovery year, water depth, field classification, field type, field GOR, proved reserves, cumulative production through 2004, and remaining proved reserves are presented. A complete listing of all 1,172 proved fields, ranked by proved reserves, is available on the Gulf of Mexico Region's Internet homepage or by contacting the MMS at 1-800-200-GULF. New fields proved in 2004 are identified with an asterisk in the column labeled "New field." Unproved fields reserve data will not be listed. For proved fields not yet qualified, the field names are replaced with two asterisks to preserve the proprietary nature of the data.

Table 4. Gulf of Mexico proved fields by rank order, based on proved BOE reserves, top 50 fields.

(For proved fields not qualified in 2004, the names are replaced with asterisks to preserve the proprietary nature of the data.)
(Field class: PDP - Proved Developed Producing; PDN - Proved Developed Non-Producing; PU - Proved Undeveloped)
(Field type: O - Oil; G - Gas)

Rank	Field name	New field	Disc year	Water depth (feet)	Field class	Field type	Field GOR (SCF/STB)	Proved reserves			Cumulative production through 2004			Remaining proved reserves		
								Oil (MMbbl)	Gas (Bcf)	BOE (MMbbl)	Oil (MMbbl)	Gas (Bcf)	BOE (MMbbl)	Oil (MMbbl)	Gas (Bcf)	BOE (MMbbl)
1	MC807		1989	3,376	PDP	O	1,465	1,139.9	1,669.8	1,437.0	610.9	790.3	751.6	528.9	879.5	685.4
2	EI330		1971	246	PDP	O	4,259	431.0	1,835.9	757.7	415.3	1,790.0	733.8	15.7	45.9	23.9
3	MC778		1999	6,074	PU	O	794	653.1	518.3	745.3	0.0	0.0	0.0	653.1	518.3	745.3
4	WD030		1949	48	PDP	O	1,501	567.1	851.4	718.6	555.5	822.8	701.9	11.6	28.6	16.6
5	GC743	*	1998	6,600	PU	O	647	641.3	414.9	715.2	0.0	0.0	0.0	641.3	414.9	715.2
6	GI043		1956	139	PDP	O	4,312	372.7	1,607.3	658.7	358.7	1,526.3	630.3	14.1	81.0	28.5
7	BM002		1949	50	PDP	O	1,041	525.2	546.5	622.4	518.7	532.4	613.5	6.5	14.1	9.0
8	TS000		1958	13	PDP	G	84,898	37.3	3,165.2	600.5	36.6	3,131.5	593.8	0.6	33.7	6.6
9	VR014		1956	26	PDP	G	63,953	48.2	3,083.1	596.8	47.8	3,044.2	589.4	0.4	38.8	7.4
10	MP041		1956	42	PDP	O	5,760	259.1	1,492.7	524.8	247.7	1,428.3	501.8	11.5	64.4	22.9
11	VR039		1948	38	PDP	G	81,664	31.6	2,583.4	491.3	31.0	2,535.0	482.0	0.7	48.4	9.3
12	SS208		1960	102	PDP	O	6,302	221.2	1,394.2	469.3	214.0	1,327.1	450.1	7.3	67.1	19.2
13	**		2000	5,672	PU	O	1,129	364.5	411.4	437.7	0.0	0.0	0.0	364.5	411.4	437.7
14	WD073		1962	177	PDP	O	2,444	264.2	645.8	379.1	257.4	627.1	368.9	6.9	18.6	10.2
15	GI016		1948	54	PDP	O	1,273	300.3	382.5	368.4	296.7	373.2	363.1	3.6	9.2	5.3
16	GB426		1987	2,863	PDP	O	3,730	218.1	813.5	362.9	201.9	726.6	331.2	16.2	86.9	31.7
17	SP061		1967	220	PDP	O	1,932	262.9	508.0	353.3	257.2	501.5	346.5	5.6	6.5	6.8
18	EI238		1964	146	PDP	G	16,461	89.1	1,467.4	350.2	82.5	1,380.6	328.1	6.7	86.8	22.1
19	ST172		1962	98	PDP	G	151,387	12.5	1,897.2	350.1	11.0	1,801.6	331.6	1.5	95.6	18.5
20	SP089		1969	423	PDP	O	4,395	191.1	839.9	340.5	186.8	799.1	329.0	4.3	40.8	11.5
21	WC180		1961	49	PDP	G	140,580	12.8	1,793.3	331.9	12.6	1,763.0	326.4	0.1	30.3	5.5
22	ST176		1963	127	PDP	G	14,633	90.0	1,317.6	324.5	79.4	1,132.6	280.9	10.7	185.0	43.6
23	ST021		1957	46	PDP	O	1,625	247.6	402.2	319.2	242.0	389.6	311.3	5.6	12.6	7.8
24	MC194		1975	1,018	PDP	O	4,169	179.9	749.9	313.3	175.4	732.9	305.8	4.5	17.1	7.5
25	SM048		1961	100	PDP	G	55,294	28.9	1,596.7	313.0	27.6	1,503.4	295.1	1.3	93.3	17.9
26	EI292		1964	223	PDP	G	85,967	19.0	1,631.8	309.3	18.1	1,603.1	303.3	0.9	28.7	6.0
27	SS169		1960	63	PDP	O	5,343	157.6	841.8	307.4	149.8	799.2	292.0	7.8	42.7	15.4
28	GC644		1999	4,339	PDP	O	1,200	253.1	303.7	307.2	0.2	0.3	0.3	252.9	303.4	306.9
29	EC271		1971	171	PDP	G	19,147	68.8	1,317.5	303.2	67.2	1,306.1	299.6	1.6	11.4	3.6
30	EC064		1957	49	PDP	G	57,062	27.1	1,548.3	302.6	26.4	1,531.4	298.9	0.7	16.9	3.7
31	SS176		1956	100	PDP	G	20,228	63.6	1,285.7	292.3	61.5	1,244.6	283.0	2.0	41.1	9.3
32	SP027		1954	64	PDP	O	5,230	151.1	790.0	291.6	149.2	758.7	284.2	1.8	31.4	7.4
33	WC587		1971	211	PDP	G	120,184	12.8	1,534.1	285.7	12.6	1,518.1	282.8	0.1	15.9	3.0
34	GC826		1998	4,799	PDN	O	554	254.5	141.1	279.6	0.0	0.0	0.0	254.5	141.1	279.6
35	ST135		1956	130	PDP	O	3,505	169.4	593.9	275.1	164.1	567.1	265.0	5.4	26.8	10.1
36	EI296		1971	214	PDP	G	69,920	20.3	1,420.2	273.0	20.3	1,407.0	270.6	0.1	13.2	2.4
37	WD079		1966	124	PDP	O	3,816	162.3	619.4	272.5	160.0	607.5	268.1	2.3	11.9	4.4
38	WC192		1954	57	PDP	G	60,461	22.7	1,372.7	266.9	21.9	1,338.7	260.2	0.8	33.9	6.8
39	MI623		1980	82	PDP	G	98,889	14.3	1,413.9	265.9	13.1	1,294.4	243.4	1.2	119.6	22.5
40	VK956		1985	3,239	PDP	O	6,439	122.0	785.4	261.7	72.5	594.9	178.3	49.5	190.5	83.4
41	HI573A		1973	342	PDP	O	7,823	109.1	853.8	261.1	105.3	844.6	255.5	3.9	9.2	5.5
42	GI047		1955	89	PDP	O	3,516	147.8	519.7	240.3	141.0	500.0	229.9	6.9	19.6	10.4
43	SM023		1960	82	PDP	G	38,910	29.8	1,159.6	236.1	29.4	1,136.0	231.5	0.4	23.7	4.6
44	SP078		1972	203	PDP	G	11,938	75.0	895.2	234.3	70.6	871.8	225.7	4.4	23.5	8.5
45	SM130		1973	214	PDP	O	1,399	186.0	260.2	232.3	180.9	241.1	223.8	5.1	19.1	8.4
46	GC244		1994	2,678	PDP	O	2,033	169.5	344.6	230.8	152.6	305.3	206.9	16.9	39.3	23.9
47	PL020		1951	33	PDP	O	5,904	111.5	658.6	228.7	105.5	590.1	210.5	6.0	68.4	18.2
48	SM066		1963	124	PDP	G	254,457	4.8	1,233.3	224.3	4.8	1,213.0	220.6	0.1	20.3	3.7
49	ST052		1948	58	PDP	O	6,136	106.1	651.1	222.0	92.7	550.0	190.6	13.4	101.1	31.4
50	VR076		1949	31	PDP	G	144,399	8.2	1,185.5	219.2	6.6	1,142.2	209.8	1.6	43.4	9.3

Reservoir-Size Distribution

The size distributions of the proved reservoirs are shown in figures 32, 33, and 34. The size ranges are based on proved reserves and are presented on a geometrically progressing, horizontal scale. These sizes correspond with the USGS deposit-size ranges shown in figure 23 with a modification to reflect small reservoirs in a finer distribution. For figures 33 and 34, the proved reserves are presented in MMbbl and Bcf, respectively. The number of reservoirs in each size grouping, shown as percentages of the total, is presented on a linear vertical scale. For the combination reservoirs (saturated oil rims with associated gas caps), shown in figure 32, gas is converted to BOE and added to the liquid reserves. Proved uneconomic reservoirs are excluded from these distributions, but are included in the table 3 series.

Figure 32 shows the reservoir-size distribution, on the basis of proved BOE, for 2,206 proved combination reservoirs. The median is 0.9 MMBOE and the mean is 2.9 MMBOE. The GOR for the oil portion of the reservoirs is 1,166 SCF/STB, and the yield for the gas cap is 21.4 barrels of condensate per MMcf of gas.

Figure 33 shows the reservoir-size distribution, on the basis of proved oil, for 7,787 proved undersaturated oil reservoirs. The median is 0.3 MMbbl, the mean is 1.7 MMbbl, and the GOR is 1,241 SCF/STB.

Figure 34 shows the reservoir-size distribution, on the basis of proved gas, for 16,567 gas reservoirs. The median is 2.3 billion cubic feet (Bcf) of gas, the mean is 8.8 Bcf, and the yield is 11.9 barrels of condensate per MMcf of gas.

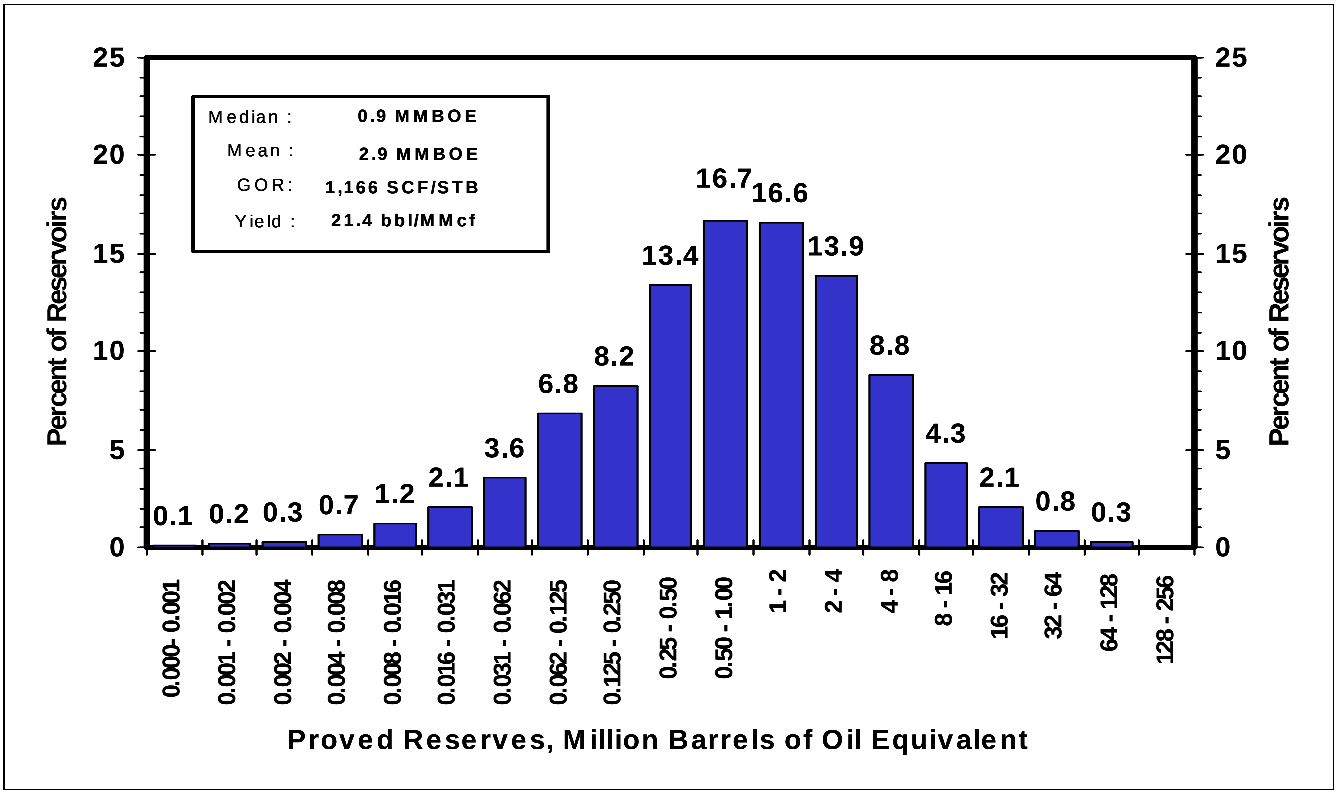


Figure 32. Reservoir-size distribution, 2,206 proved combination reservoirs.

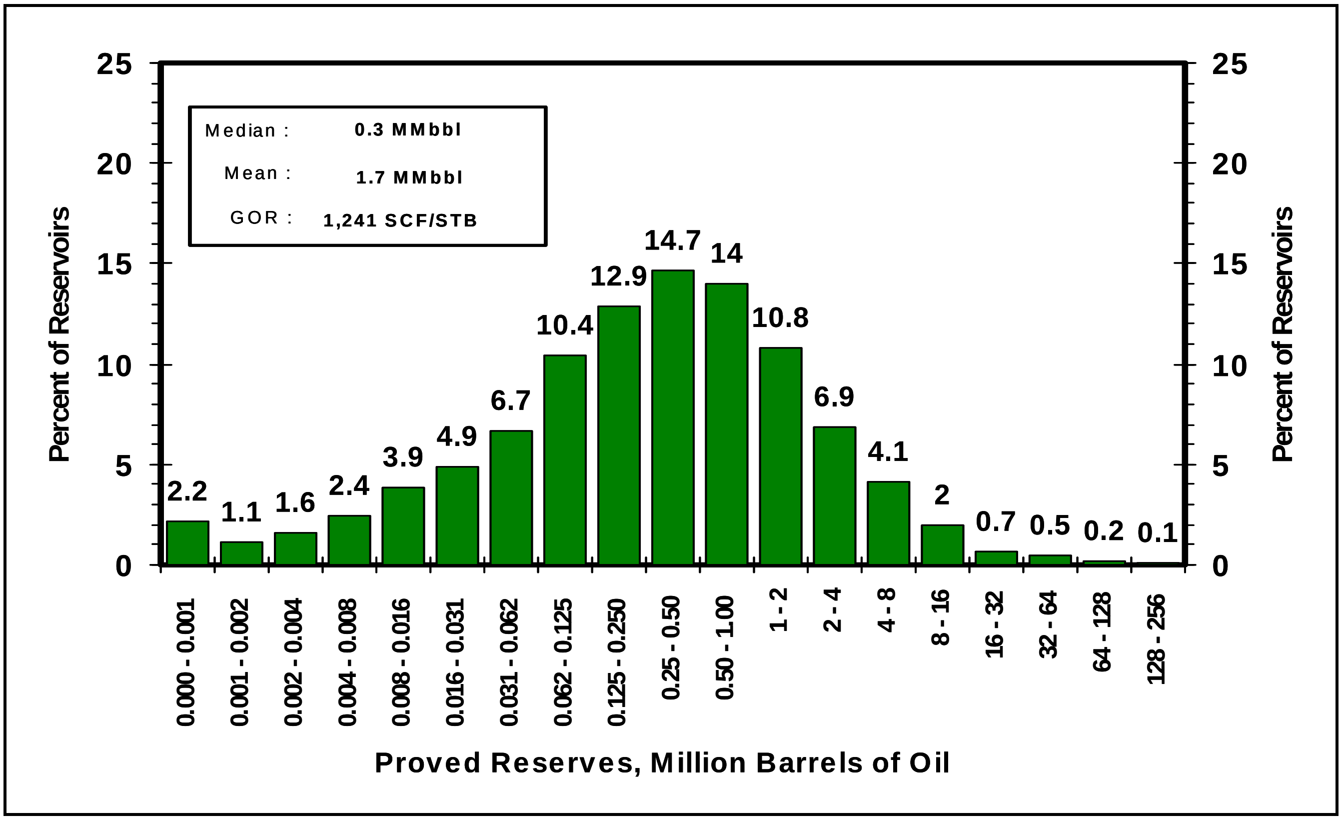


Figure 33. Reservoir-size distribution, 7,787 proved oil reservoirs.

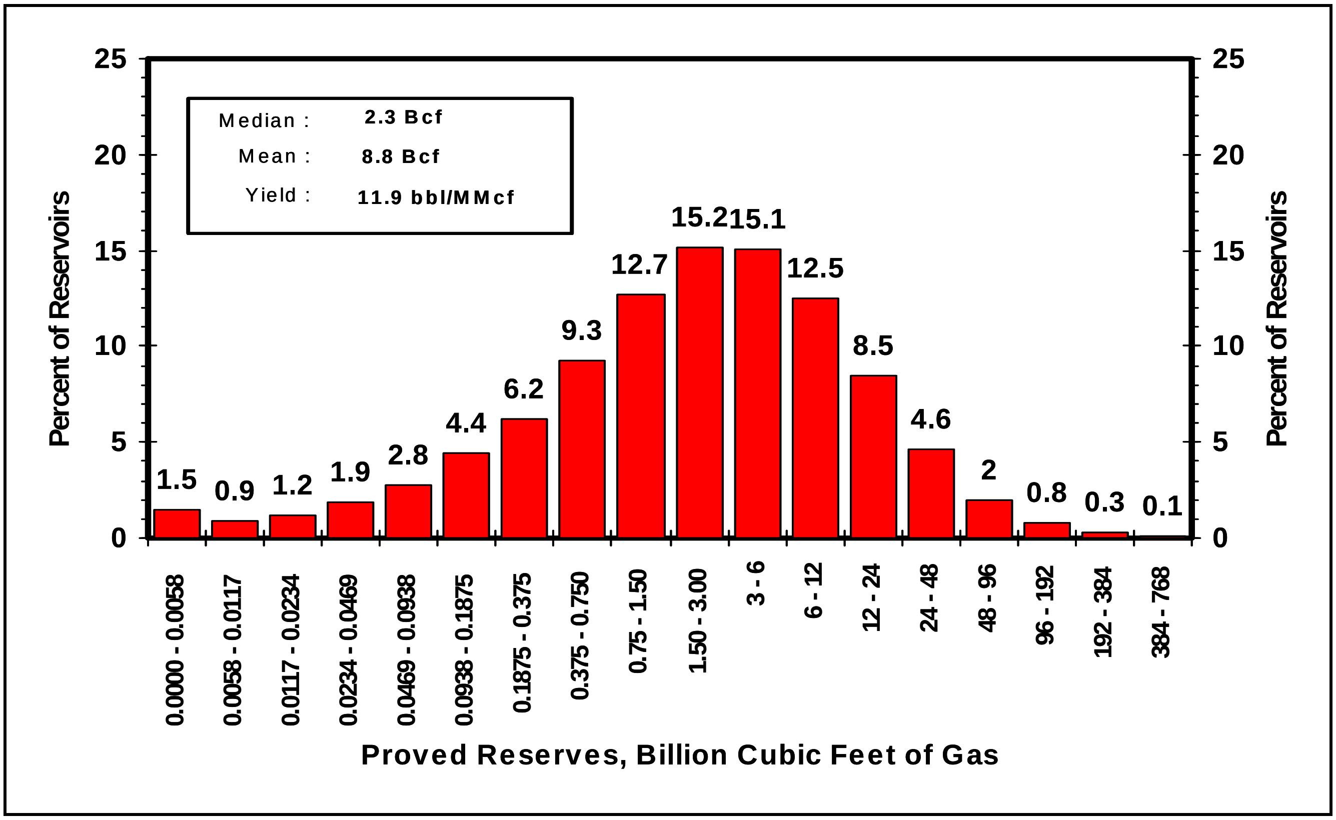


Figure 34. Reservoir-size distribution, 16,567 proved gas reservoirs.

Production Rates and Discovery Trends

The mean daily production in the Gulf of Mexico OCS during 2004 was 1.19 MMbbl of crude oil, 0.27 MMbbl of gas condensate, 2.10 Bcf of casinghead gas, and 8.86 Bcf of gas-well gas. The mean GOR of oil wells was 1,757 SCF/STB, and the mean yield from gas wells was 30.84 barrels of condensate per MMcf of gas. Monthly production plots and data by field are also available on the Gulf of Mexico Region's Internet homepage or can be obtained on CD-ROM by contacting the MMS at 1-800-200-GULF.

Figures 35 and 36 show the frequency distribution of monthly production for completions active during 2004. Since the number of completions within a given range changes from month to month, the completion numbers presented are means of the 2004 monthly completion totals for each production range. The numbers shown in parentheses are also means of monthly counts for completions considered to be on continuous production. Completions off production for more than two days a month are not counted as continuously producing completions.

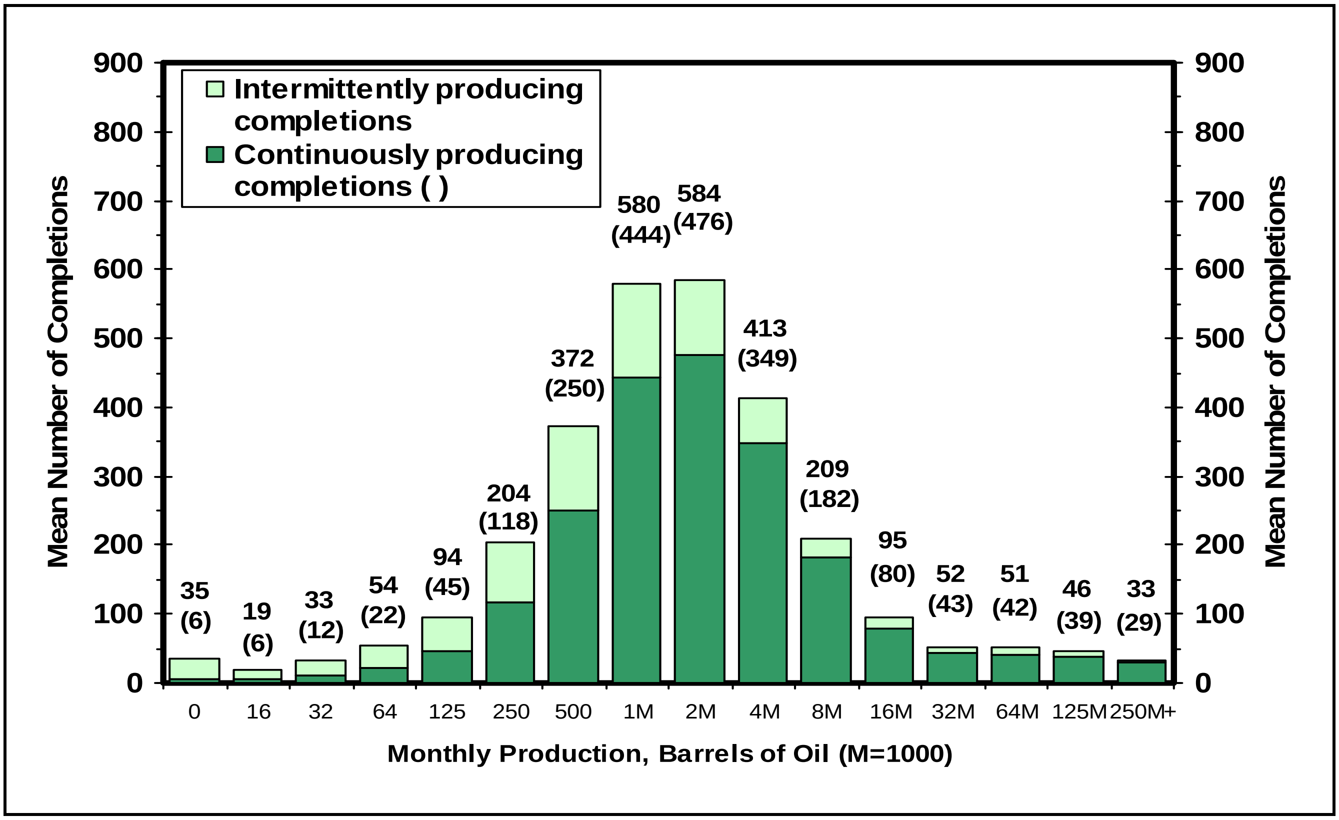


Figure 35. Monthly distribution of oil production, 2,874 completions (2,143 continuously producing completions).

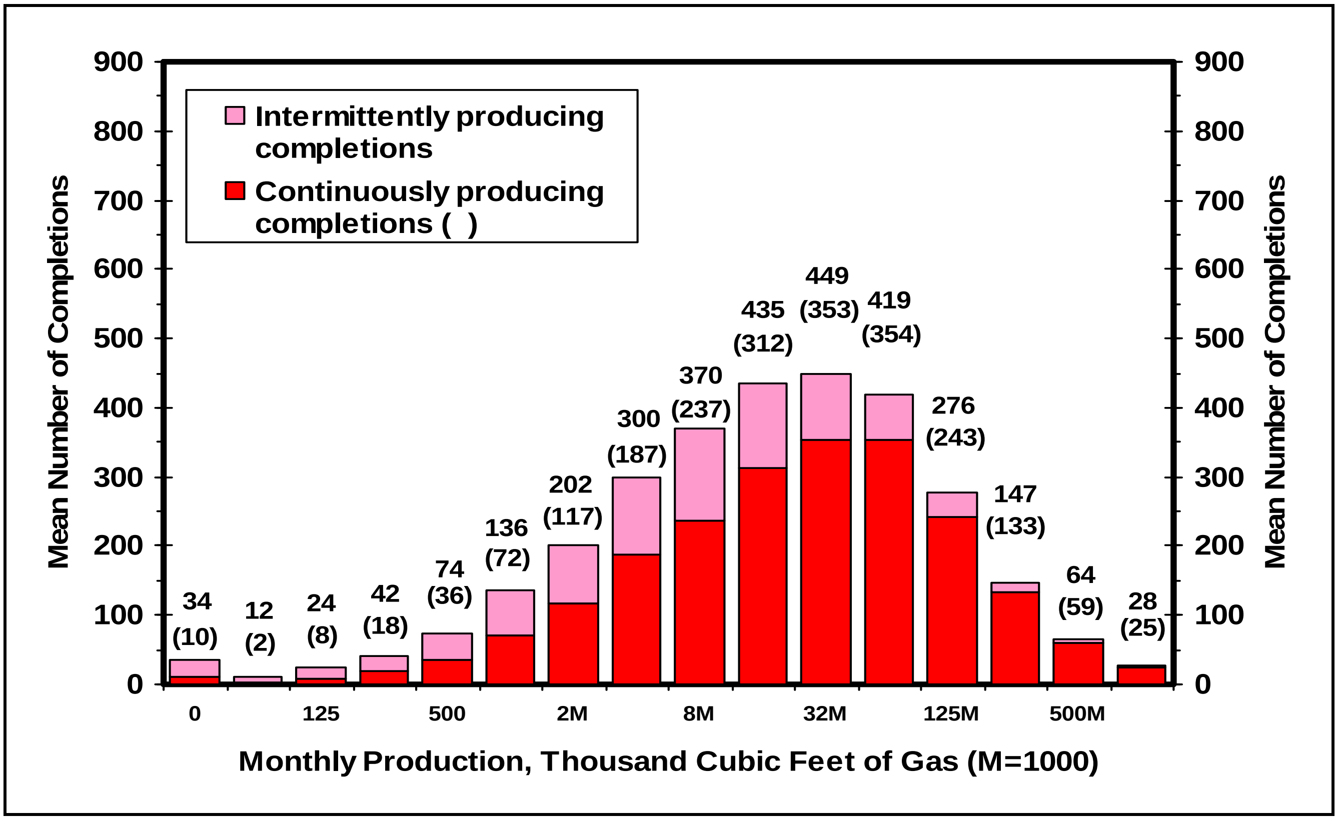


Figure 36. Monthly distribution of gas production, 3,012 completions (2,166 continuously producing completions).

Figure 37 summarizes the data from monthly distributions of oil and gas production rates. The highest reported monthly oil production volume was from a Miocene reservoir with a subsea depth of 12,300 ft, during the month of July. The highest reported monthly gas production volume was from a Miocene reservoir with a subsea depth of 15,395 ft, during the month of March. The mean number of oil completions producing more than 1,000 bbl per day was 184, and the mean number of gas completions producing more than 10 MMcf per day was 171.

2004	Oil	Gas
Mean Number of Producing Completions	2,874 (184 > 1,000 bbls per day)	3,012 (171 > 10MMcf per day)
Mean Number of Continuously Producing Completions	2,143	2,166
Highest Monthly Mean Number of Producing Completions	3,048 (January)	3,108 (March)
Lowest Monthly Mean Number of Producing Completions	2,252 (October)	2,809 (October)
Mean Production Volume **Mean Producing Rate**	12,637 bbl (463 bbl per day)	89.4 MMcf (3.3 MMcf per day)
Median Production Volume **Median Producing Rate**	2,101 bbl (67 bbl per day)	26.6 MMcf (1.0 MMcf per day)
Highest Production Volume **Highest Producing Rate** **Highest Producing Month** **Highest Production Volume Trend** **Highest Production Volume Subsea Depth**	894,118 bbl (28,843 bbl per day) (July) (MIOCENE) (12,300 feet)	4,815 MMcf (155.3 MMcf per day) (March) (MIOCENE) (15,395 feet)

Figure 37. Monthly completion and production data.

Annual production in the Gulf of Mexico OCS is shown in figure 38. The oil plot includes condensate and the gas plot includes casinghead gas. From 1986 through 1990, annual oil production declined 23 percent, which coincides with low world oil prices. From 1990 through 2002, annual oil production increased 106 percent, from 275 MMbbl to 567 MMbbl, because of the addition of deepwater production. From 2002 to 2004 oil production decreased 6 percent to 535 MMbbl.

From 1990 through 1993, gas production declined 5 percent. From 1993 through 2001, annual gas production rose from 4.7 Tcf, peaking at 5.1 Tcf in 1997, a 9-percent increase. Annual gas production reached at least 5.0 Tcf per year from 1996 through 1999 and in 2001. Since 2001, gas production has declined 21 percent to 4.0 Tcf. For further analysis of the gas production decline, see the MMS OCS Report MMS 2007-020, ***Gulf of Mexico Oil and Gas Production Forecast: 2007-2017***, available on the GOM Region's Internet homepage.

Figure 39 presents proved reserves, cumulative production, and remaining proved reserves in BBOE as of December 31, 2004, summed according to field discovery year. Field depletion may be estimated by the relative positions of the cumulative production curve and the remaining proved reserves curve. For example, if the value of the remaining proved reserves is higher than the value of cumulative production for a given year, the aggregate depletion for fields discovered that year is less than 50 percent. The plot demonstrates in general that fields discovered after 1996 are less than 50 percent depleted.

Figure 40 is a plot of the number of proved gas and oil fields by discovery year. The annual number of gas fields discovered steadily increased until 1985, declined until 1992, increased over the next five years, declined until 2000 and generally leveled off for the next 4 years. The number of oil fields discovered has not varied much from year to year, never exceeding 11, and averaging only about 3.6 discoveries per year. Through 1959, 35 percent of all fields discovered were oil. This percentage declined steadily as more gas fields were discovered. Only 15 percent of the fields discovered during the 1980's were oil fields. From 1990 through 2001, the oil fields discovered rose to 20 percent, reflecting recent deepwater discoveries.

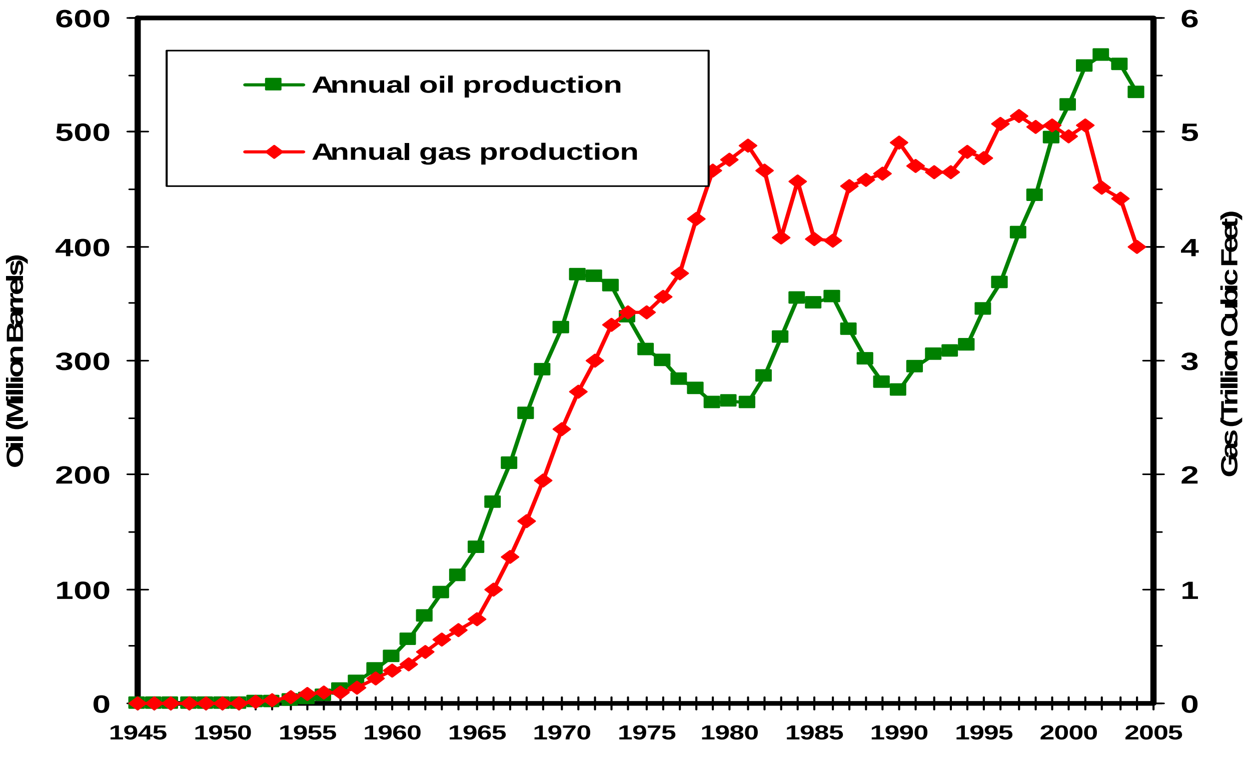


Figure 38. Annual oil and gas production.

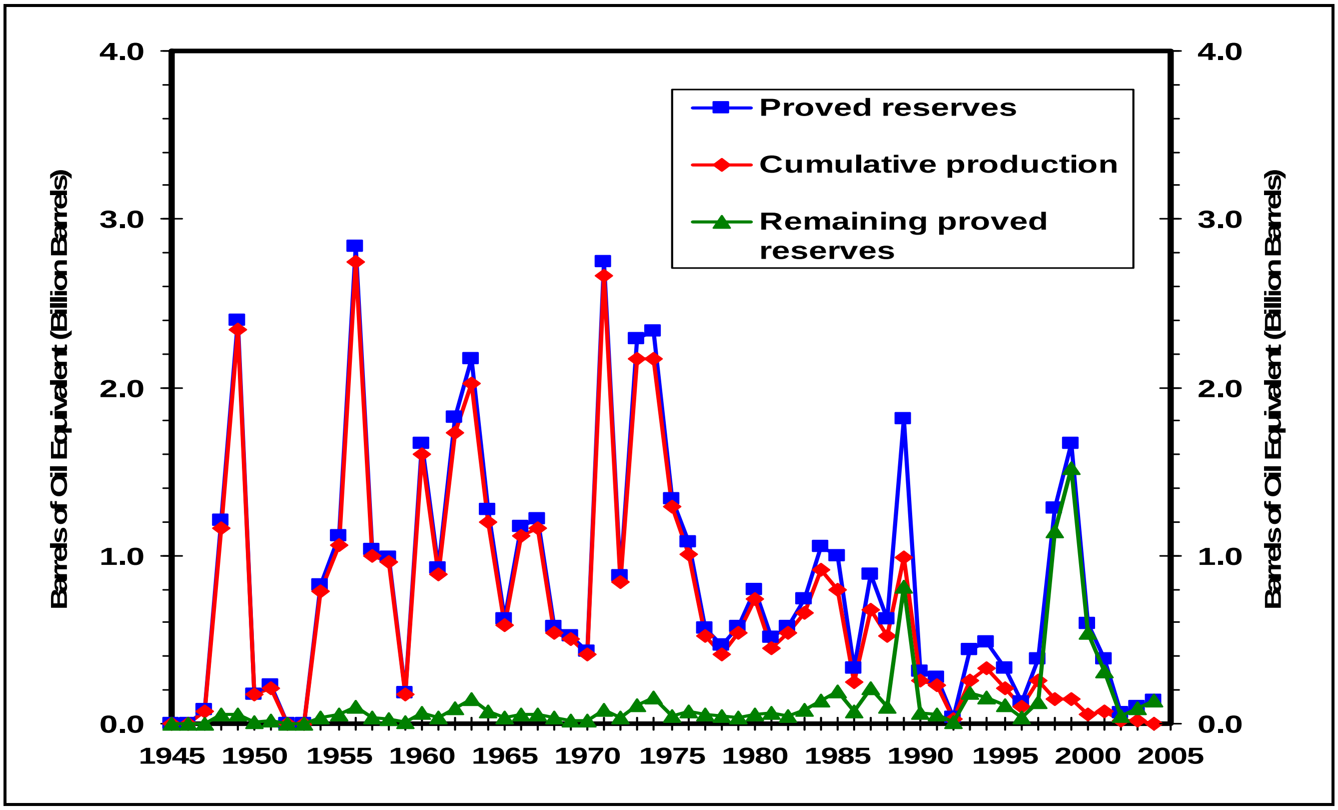


Figure 39. Proved reserves and production by field discovery year.

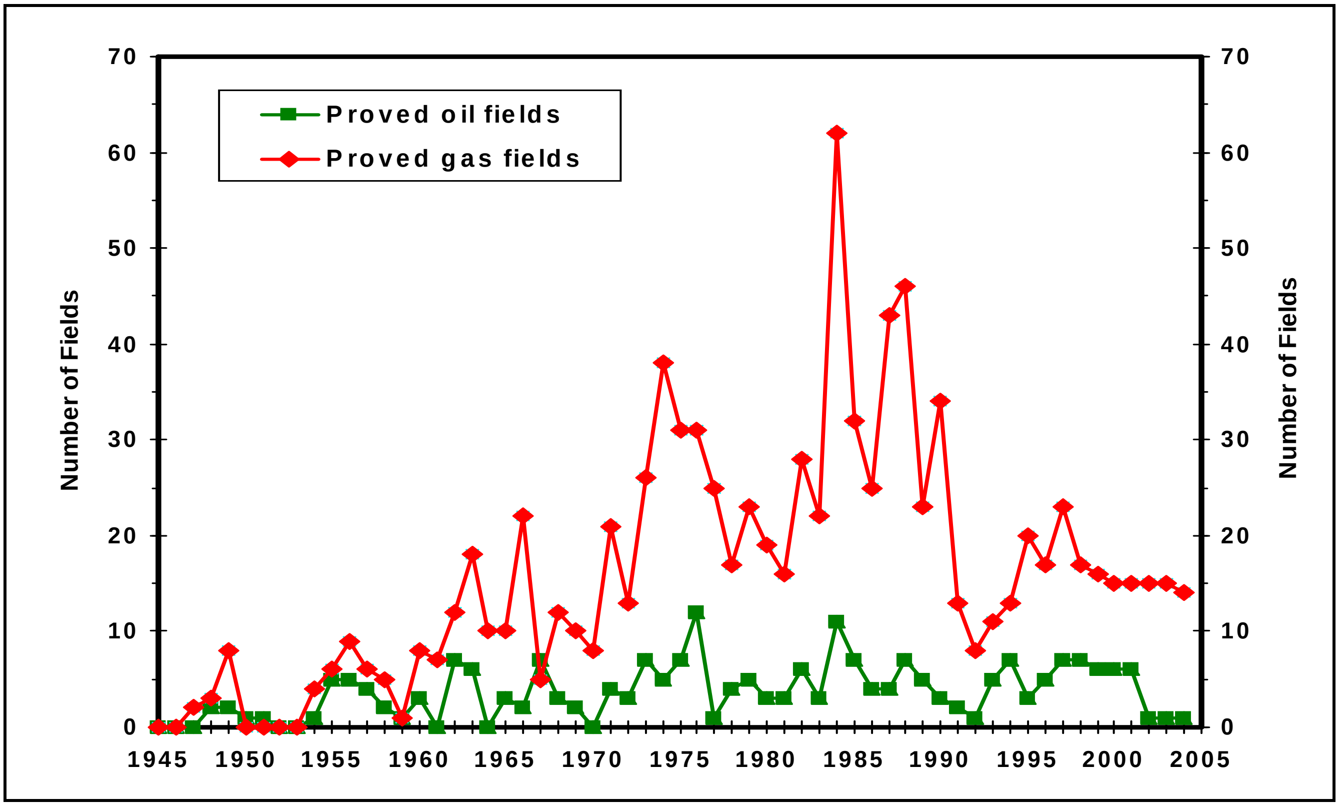


Figure 40. Annual oil and gas field discoveries.

Figure 41 presents the number of proved fields and the mean field size by field discovery year. This plot shows that the number of discovered fields has been decreasing from year to year since 1997, and the mean size of the fields has been getting smaller except for 1989 and 1996 through 1999. The mean field size discovered is expected to increase because of reserves growth and additions in proved fields and reserves from unproved fields that become proved.

Figure 42 presents the number of proved and unproved fields and the average water depth of the fields discovered in each year. For 2001, the mean water depth for the fields discovered peaked at nearly 3,000 ft. Since 1995, the mean water depth has been greater than 1,000 ft, indicating that exploration and resulting production have moved into deeper water.

Figures 43 and 44 show proved oil and gas reserves and annual production by reservoir discovery year. All data presented in figure 43 include crude oil and condensate, and all data presented in figure 44 include associated and nonassociated gas. The year of discovery assigned to a reservoir is the year in which the first well encountering hydrocarbons penetrated the reservoir. For comparison with the rate of discoveries, the annual production of oil and gas is also shown. In four of the last ten years, annual proved reserves additions for oil have exceeded annual oil production, resulting in an increase in remaining proved oil reserves. Since 1984, annual gas production has exceeded annual proved reserve additions for gas. Because of reserves growth, the proved reserves plot in figures 43 and 44 is expected to increase over what is shown.

Figure 45 presents the total footage drilled, the total number of wells drilled, and the number of exploratory and development wells drilled in the Gulf of Mexico OCS each year. All curves show a decline from 1985 to 1986 due to unfavorable oil and gas economics. A second decline occurred from 1990-92. Drilling increased from 1992 to 1997, reflecting stable energy prices and improvements in exploration and production technology. The variation in the number of wells drilled from 1997 to 2000 is caused in part by the instability in energy prices.

Figure 46 presents the number of exploratory wells drilled each year by water depth. The plot shows the move toward drilling in deeper water, but also illustrates continued drilling on the shelf.

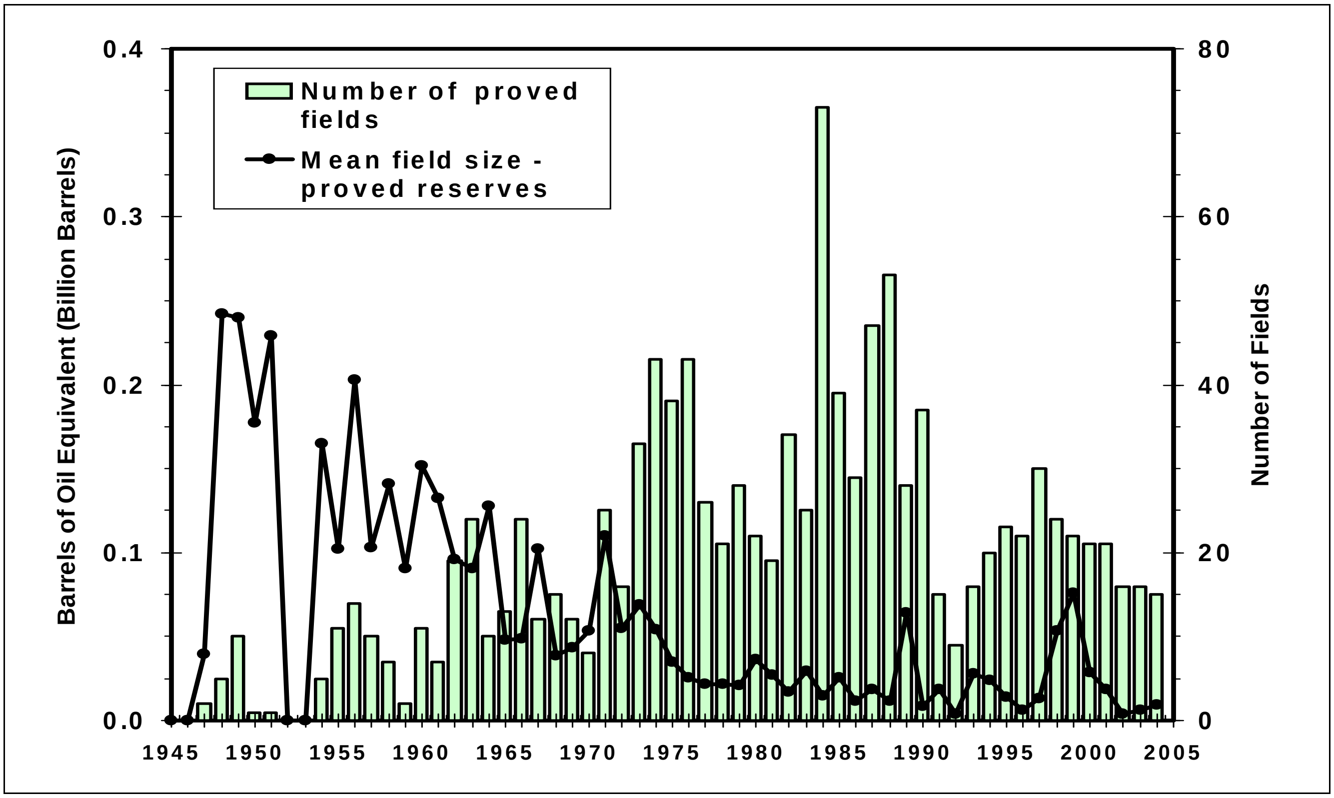


Figure 41. Number of proved fields and mean field size by field discovery year.

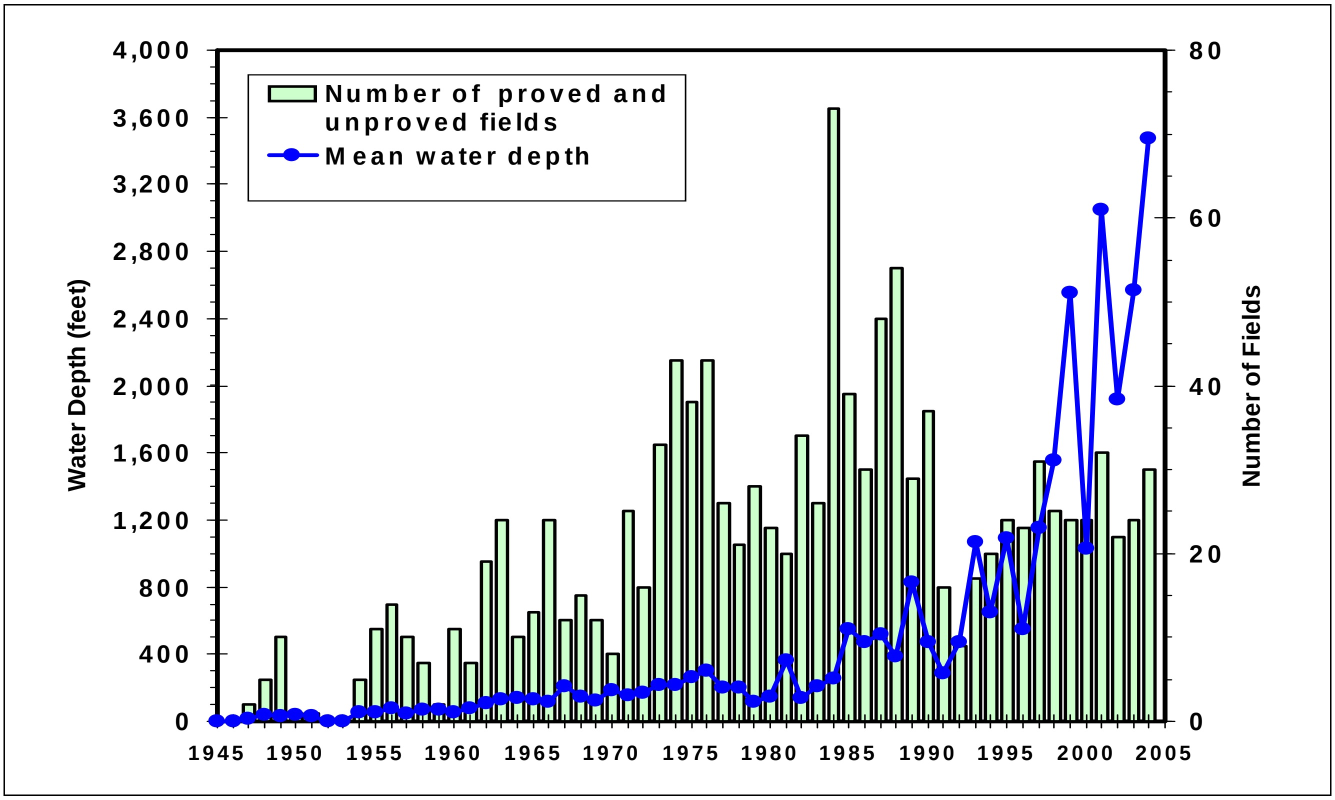


Figure 42. Number of proved and unproved fields and mean water depth by field discovery year.

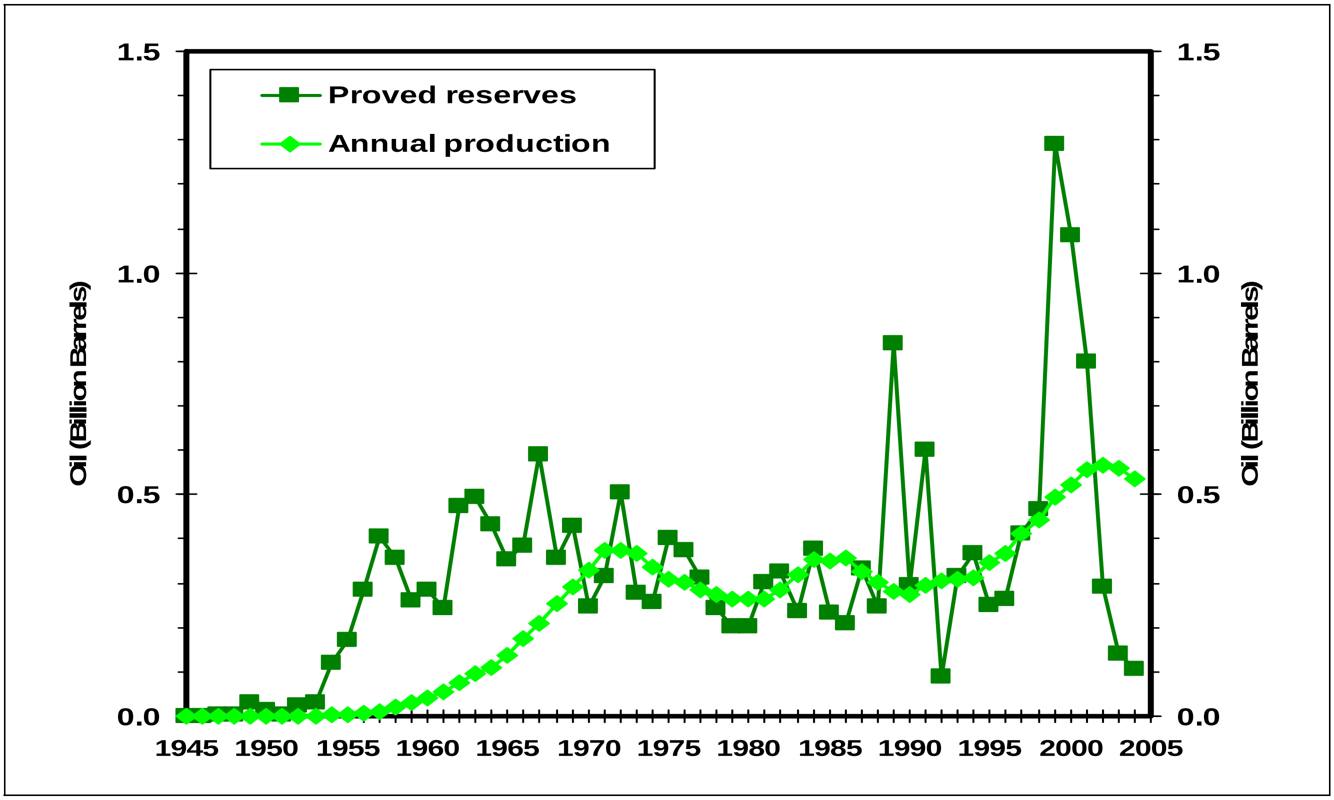


Figure 43. Proved oil reserves by reservoir discovery year and annual oil production.

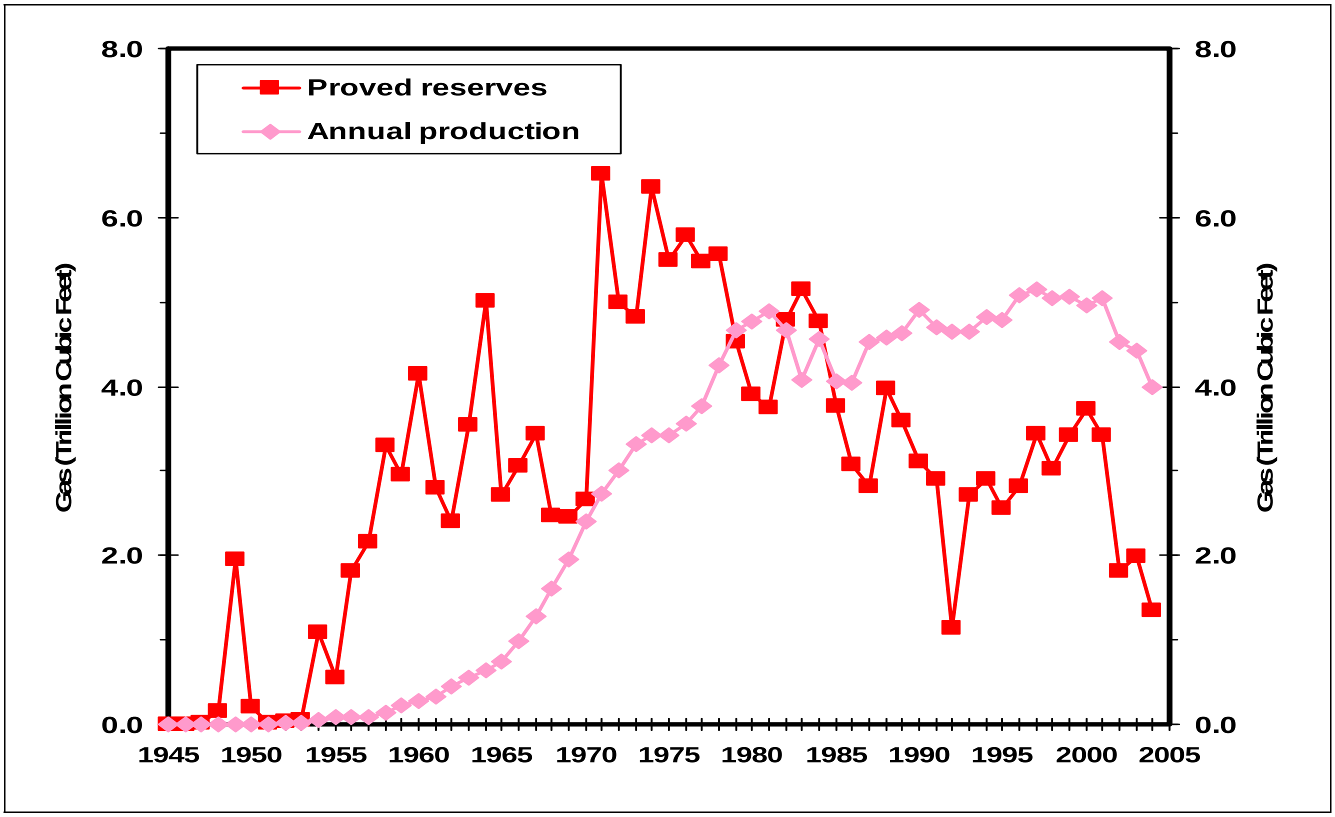


Figure 44. Proved gas reserves by reservoir discovery year and annual gas production.

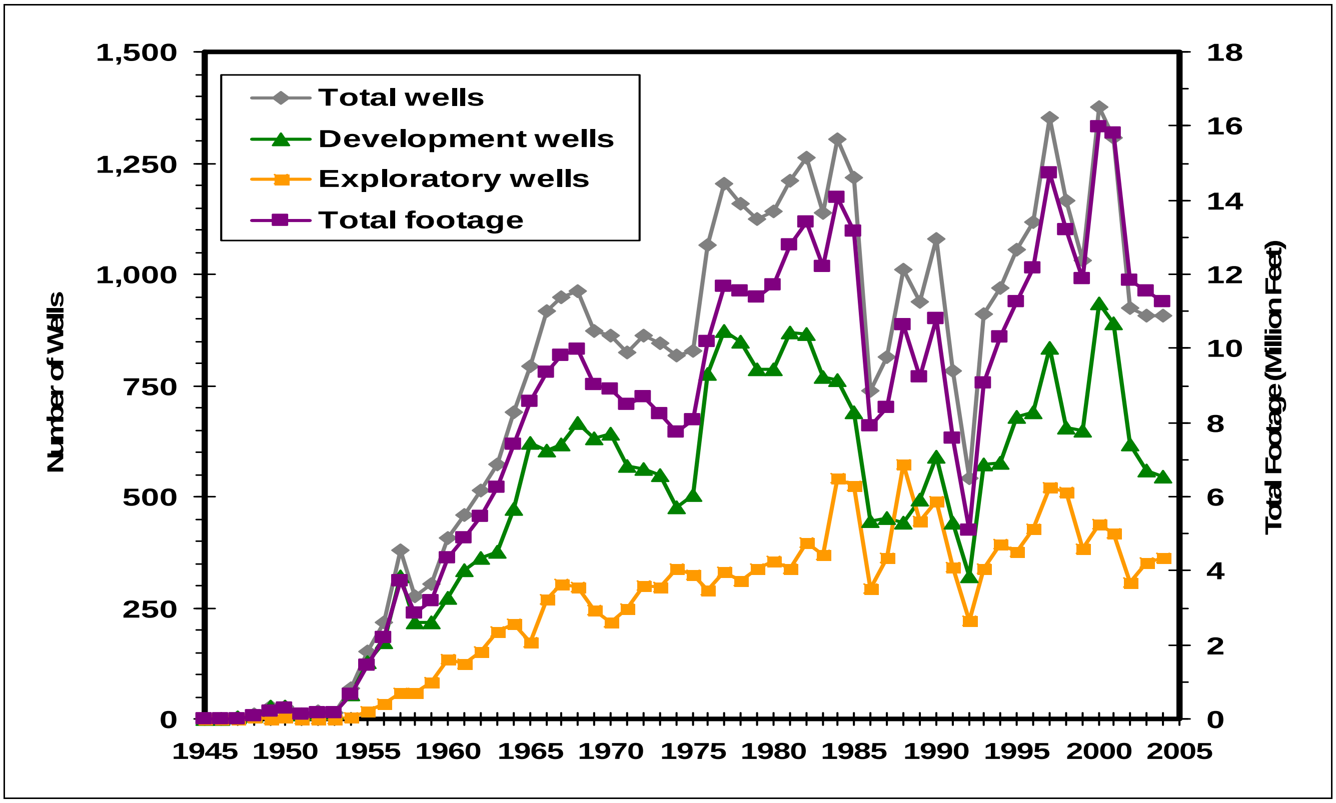


Figure 45. Wells and footage drilled.

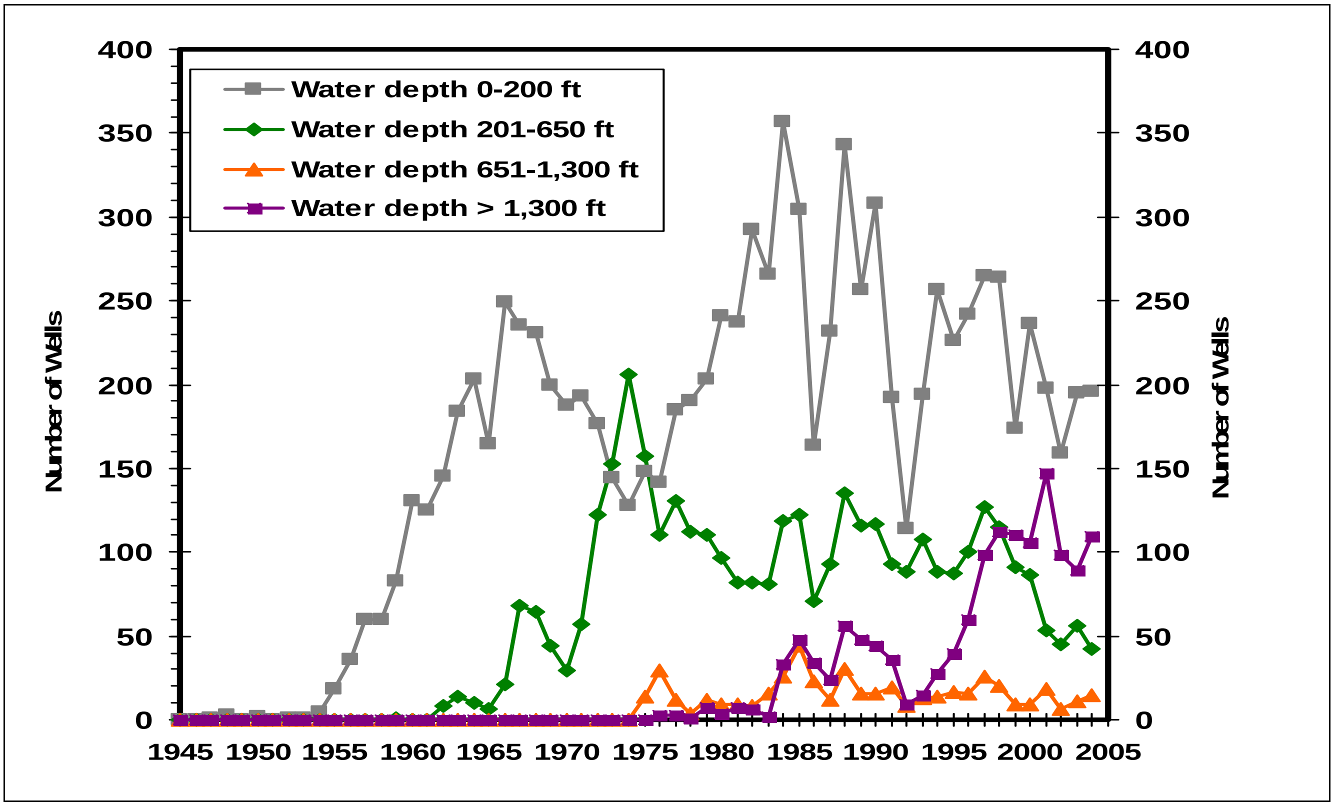


Figure 46. Number of exploratory wells drilled by water depth.

Summary and Comparison of Proved Reserves

A summary of the proved reserve estimates for 2004 and a comparison with estimates from last year's report (December 31, 2003) are shown in table 5. There were 34 proved fields added during 2004 (6 oil fields and 28 gas fields), which are summarized and tabulated as increases to proved reserves. Note that 18 of the proved fields were discovered prior to 2004.

Proved reserve estimates are revised as additional wells are drilled and new leases are added to existing fields, and as reservoirs are depleted and leases relinquished. Complete reevaluations of existing field studies are conducted on the basis of changes in field development and/or production history. Revisions of proved reserves are summarized and presented as changes in Table 5. Based on periodic reviews and revisions of field studies conducted since the 2003 report, the revisions for proved oil and gas reserves have resulted in a net decrease. A net change in the proved oil and gas reserves is a result of combining the discoveries and the revisions.

Table 5 demonstrates that the 2004 proved oil and gas discoveries and field revisions did not exceed oil and gas production. The remaining proved reserves decreased for oil and gas since the 2003 report.

Table 5. Summary and comparison of proved oil and gas reserves as of December 31, 2003, and December 31, 2004.

	Oil (billion bbl)	**Gas (trillion cu ft)**
Proved reserves:		
Previous estimates, as of 12/31/2003*	**18.48**	**178.2**
Discoveries	0.86	2.0
Revisions	-0.38	-1.8
Net Change	**0.48**	**0.2**
Estimate, as of 12/31/2004 (this report)	**18.96**	**178.4**
Cumulative production:		
Previous estimates, as of 12/31/2003*	**13.61**	**156.7**
Discoveries	0.00	0.0
Revisions	0.53	4.0
Net Change	**0.53**	**4.0**
Estimate, as of 12/31/2004 (this report)	**14.14**	**160.7**
Remaining proved reserves:		
Previous estimates, as of 12/31/2003*	**4.87**	**21.5**
Discoveries	0.86	2.0
Revisions	-0.38	-1.8
Production during 2004	-0.53	-4.0
Net Change	**-0.05**	**-3.8**
Estimate, as of 12/31/2004 (this report)	**4.82**	**17.7**

*Crawford and others, 2006

Table 6 presents all previous reserve estimates by year. Because of adjustments and corrections to production data submitted by Gulf of Mexico OCS operators, the difference between historical cumulative production for successive years does not always equal the annual production for the latter year. No comparisons will be made for unproved reserves.

Table 6. Proved oil and gas reserves and cumulative production at end of year, 1975-2004, Gulf of Mexico, Outer Continental Shelf and Slope.

Oil expressed in billions of barrels; gas in trillions of cubic feet. "Oil" includes crude oil and condensate; "gas" includes associated and nonassociated gas. Remaining proved reserves estimated as of December 31 each year.

Year	Number of fields included	Proved reserves		Historical cumulative production		Remaining proved reserves	
		Oil	Gas	Oil	Gas	Oil	Gas
1975	255	6.61	59.9	3.82	27.2	2.79	32.7
1976	306	6.86	65.5	4.12	30.8	2.74	34.7
1977	334	7.18	69.2	4.47	35.0	2.71	34.2
1978	385	7.52	76.2	4.76	39.0	2.76	37.2
1979 *	417	7.71	82.2	4.83	44.2	2.88	38.0
1980	435	8.04	88.9	4.99	48.7	3.05	40.2
1981	461	8.17	93.4	5.27	53.6	2.90	39.8
1982	484	8.56	98.1	5.58	58.3	2.98	39.8
1983	521	9.31	106.2	5.90	62.5	3.41	43.7
1984	551	9.91	111.6	6.24	67.1	3.67	44.5
1985	575	10.63	116.7	6.58	71.1	4.05	45.6
1986	645	10.81	121.0	6.93	75.2	3.88	45.8
1987	704	10.76	122.1	7.26	79.7	3.50	42.4
1988 +	678	10.95	126.7	7.56	84.3	3.39	42.4
1989	739	10.87	129.1	7.84	88.9	3.03	40.2
1990	782	10.64	129.9	8.11	93.8	2.53	36.1
1991	819	10.74	130.5	8.41	98.5	2.33	32.0
1992	835	11.08	132.7	8.71	103.2	2.37	29.5
1993	849	11.15	136.8	9.01	107.7	2.14	29.1
1994	876	11.86	141.9	9.34	112.6	2.52	29.3
1995	899	12.01	144.9	9.68	117.4	2.33	27.5
1996	920	12.79	151.9	10.05	122.5	2.74	29.4
1997	957	13.67	158.4	10.46	127.6	3.21	30.8
1998	984	14.27	162.7	10.91	132.7	3.36	30.0
1999	1,003	14.38	161.3	11.40	137.7	2.98	23.6
2000	1,050	14.93	167.3	11.93	142.7	3.00	24.6
2001	1,086	16.51	172.0	12.48	147.7	4.03	24.3
2002	1,112	18.75	176.8	13.05	152.3	5.71	24.6
2003	1,141	18.48	178.2	13.61	156.7	4.87	21.5
2004	1,172	18.96	178.4	14.14	160.7	4.82	17.7

* Gas plant liquids dropped from system

\+ Basis of reserves changed from demonstrated to SPE proved.

Conclusions

As of December 31, 2004, the 1,172 proved oil and gas fields in the federally regulated part of the Gulf of Mexico OCS contained proved reserves estimated to be 18.96 billion barrels of oil and 178.4 trillion cubic feet of gas. Cumulative production from the proved fields accounts for 14.14 billion barrels of oil and 160.7 trillion cubic feet of gas. Remaining proved reserves are estimated to be 4.82 billion barrels of oil and 17.7 trillion cubic feet of gas for the 910 proved active fields. Remaining proved oil reserves have decreased 1 percent and the remaining proved gas reserves have decreased 18 percent from last year's report.

Unproved reserves in the federally regulated part of the Gulf of Mexico OCS are estimated to be 2.76 billion barrels of oil and 7.8 trillion cubic feet of gas. Included are unproved reserves of 2.51 billion barrels of oil and 3.6 trillion cubic feet of gas from 105 fields in water depths greater than 1,000 feet. Estimated unproved reserves for oil are 5.1 times annual oil production, and for gas are 1.9 times greater than annual gas production.

The oil production remains high primarily because large deepwater oil-prone fields have come on production. The decrease in remaining proved oil reserves is likely temporary as new deepwater discoveries become proved.

In addition to the proved and unproved reserves discussed above, at a minimum there are 1.87 billion barrels of oil and 7.7 trillion cubic feet of gas that are not presented in the tables and figures of this report. This oil and gas occurs on leases that have not yet qualified (and therefore are not placed in a field) or they occur as known resources in proved fields, or as known resources in unproved fields. As further drilling and development occur, these additional hydrocarbon volumes will become reportable, and it is anticipated that future proved and unproved reserves will increase accordingly.

Contributing Personnel

This report includes contributions from the following Gulf of Mexico Region, Office of Resource Evaluation, personnel.

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Notice

This report, *Estimated Oil and Gas Reserves, Gulf of Mexico, December 31, 2004,* has undergone numerous changes over the last few years. We are continually striving to provide meaningful information to the users of this document. Suggested changes, additions, or deletions to our data or statistical presentations are encouraged so we can publish the most useful report possible. Please contact the Reserves Section Chief at (504) 736-2918 at Minerals Management Service, 1201 Elmwood Park Boulevard, MS 5130, New Orleans, Louisiana 70123-2394, to communicate your ideas for consideration in our next report.

For free publication and digital data, visit the Gulf of Mexico Internet web site. The report can be accessed as an Acrobat .pdf (portable document format) file, which allows you to view, print, navigate, and search the document with the free downloadable Acrobat Reader 7.0.8. Digital data used to create the tables and figures presented in the document are also accessible as either tab-delimited ASCII text files (.txt; viewable using NotePad or WordPad) or as Excel 97 spreadsheet files (.xls; using Microsoft's Excel spreadsheet viewer, a free file viewer for users without access to Excel). These files are made available in a zipped format, which can be unzipped with the downloadable WinZip program. Soon to be available (for a nominal fee) is a CD-ROM that will include this report, digital data, and field production plots.

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The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

The Minerals Management Service Mission

As a bureau of the Department of the Interior, the Minerals Management Service's (MMS) primary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore Federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the **Offshore Minerals Management Program** administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The MMS **Minerals Revenue Management** meets its responsibilities by ensuring the efficient, timely and accurate collection and disbursement of revenue from mineral leasing and production due to Indian tribes and allottees, States and the U.S. Treasury.

The MMS strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialogue with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending MMS assistance and expertise to economic development and environmental protection.

MMS *Securing Ocean Energy &*
Economic Value for America