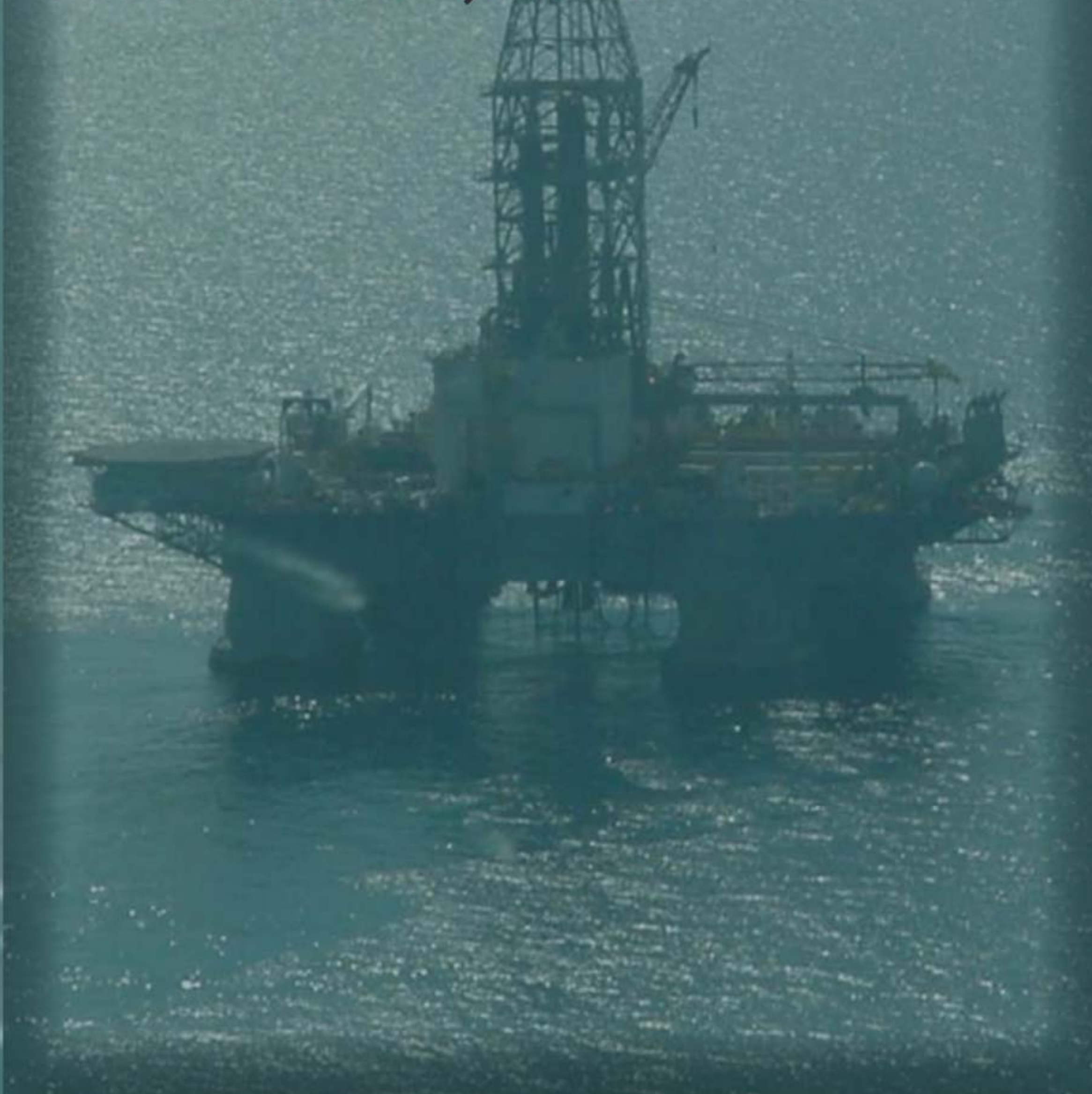
OCS Report
MMS 2006-069

Outer Continental Shelf

Estimated Oil and Gas Reserves Gulf of Mexico December 31, 2003



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

OCS Report
MMS 2006-069

Outer Continental Shelf

Estimated Oil and Gas Reserves, Gulf of Mexico, December 31, 2003

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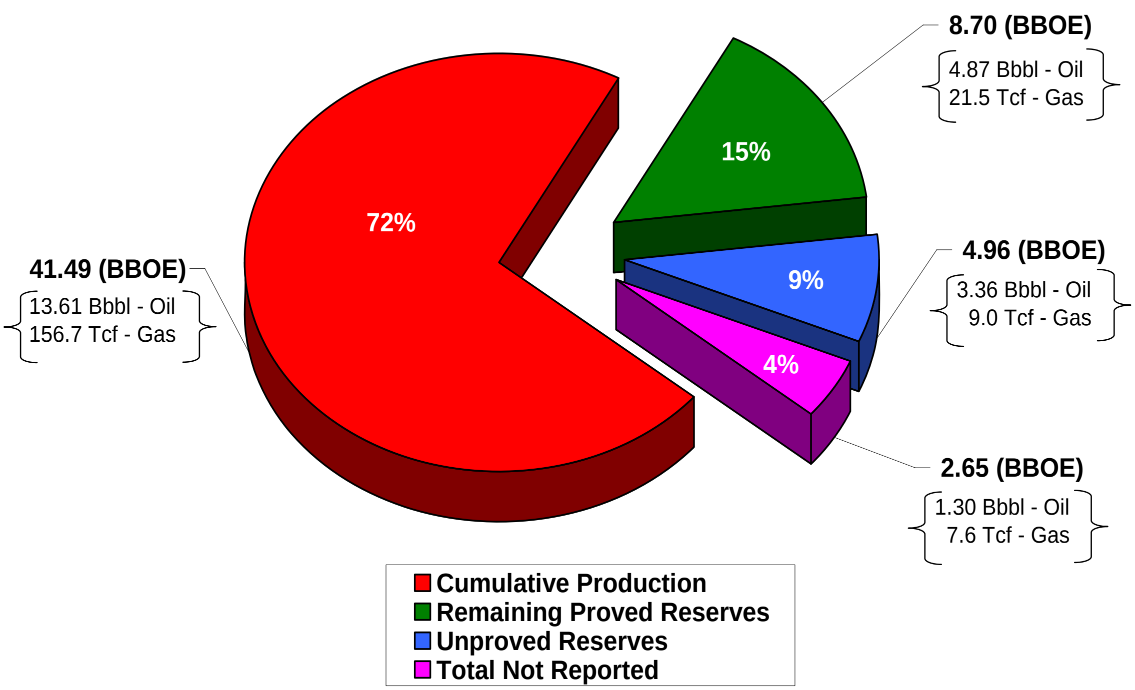
Abstract

As of December 31, 2003, proved reserves in the Gulf of Mexico Outer Continental Shelf (OCS) are estimated to be 18.48 billion barrels of oil and 178.2 trillion cubic feet of gas from 1,141 proved fields. Included in this number are 226 proved expired depleted fields; not included are the 55 unproved active fields. Estimates were derived for individual reservoirs from geologic mapping and reserve evaluation. Cumulative production from the proved fields accounts for 13.61 billion barrels of oil and 156.7 trillion cubic feet of gas. Remaining proved reserves are estimated to be 4.87 billion barrels of oil and 21.5 trillion cubic feet of gas. These reserves are recoverable from 915 proved active fields.

Unproved reserves are estimated to be 3.36 billion barrels of oil and 9.0 trillion cubic feet of gas. These reserves are associated with the 55 unproved active fields studied and the unproved reserves in proved fields. In total, there are 970 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, at a minimum there are 1.3 billion barrels of oil and 7.6 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 2005-052 (Crawford and others, 2005), 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 2003 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.

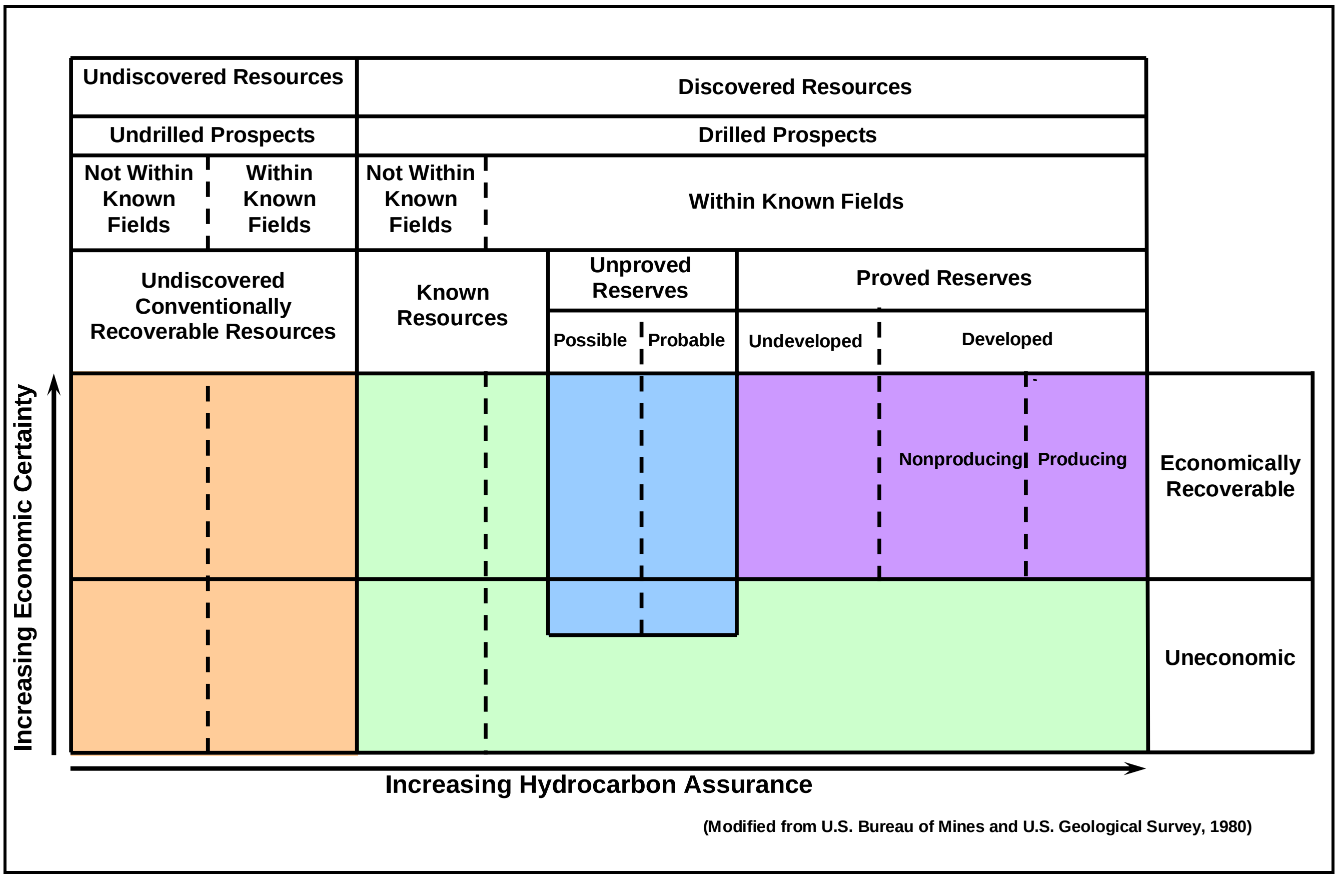


Figure 1. MMS conventionally recoverable petroleum resource classifications.

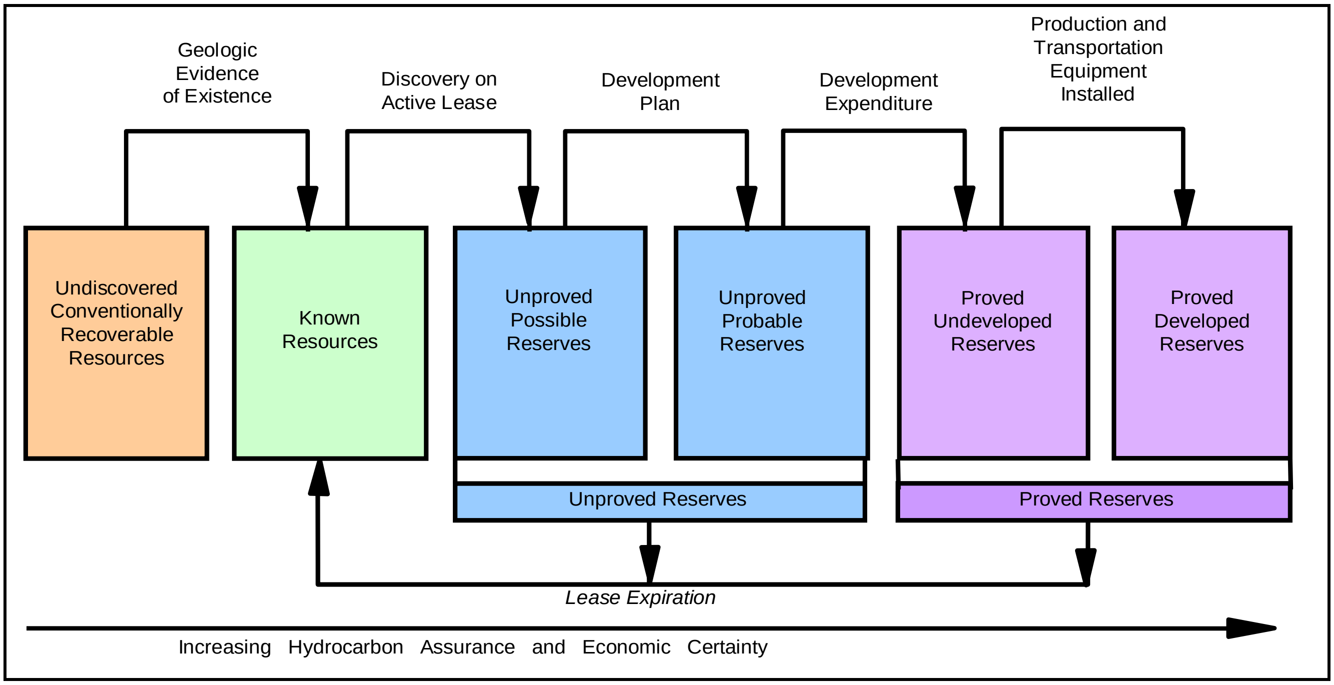


Figure 2. Gulf of Mexico MMS reserve classifications.

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) 250.116, 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 support 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 250.116 are initially considered unproved reserves. Unproved reserves are less certain to be recovered than proved reserves and may be 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.

Unproved possible reserves 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.

Unproved probable reserves 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.

Proved undeveloped reserves 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.

Proved developed reserves 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.

Remaining proved reserves 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.

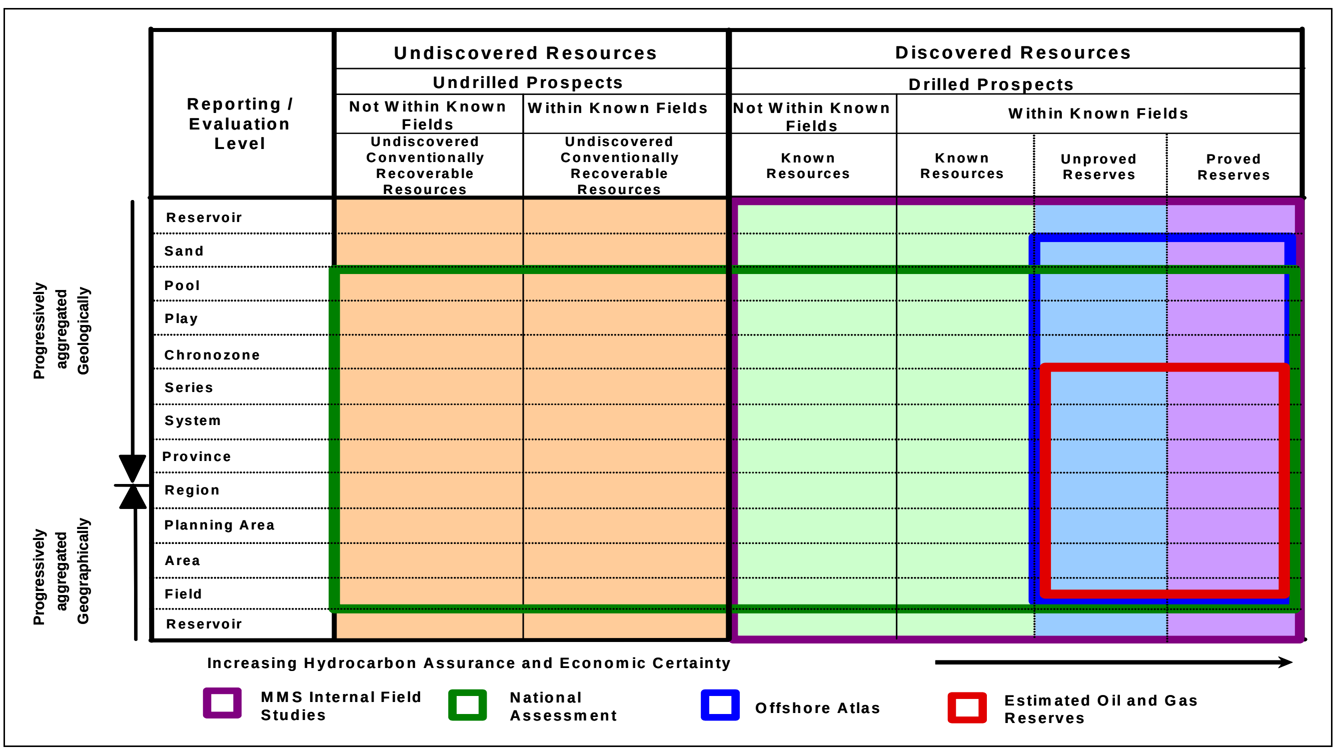


Figure 3. MMS evaluation of reserves and resources.

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 1,141 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 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 226 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. It's called probabilistic when the known geologic, engineering, and economic data are analyzed probabilistically and the estimate determined from continuous probability distributions (SPE/WPC, 1996). 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 (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.

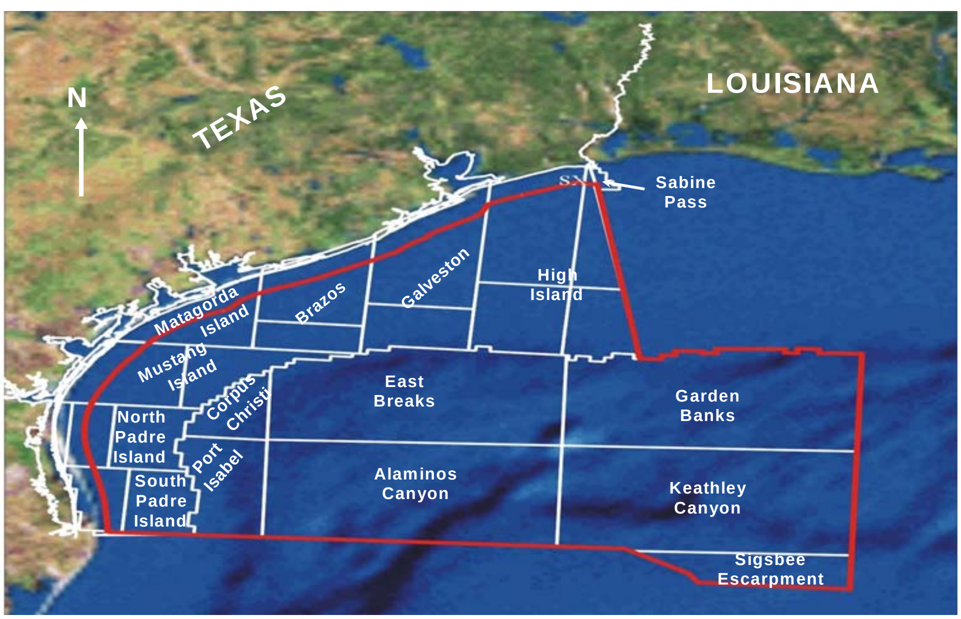


Figure 4. Western Planning Area, Gulf of Mexico, Outer Continental Shelf.

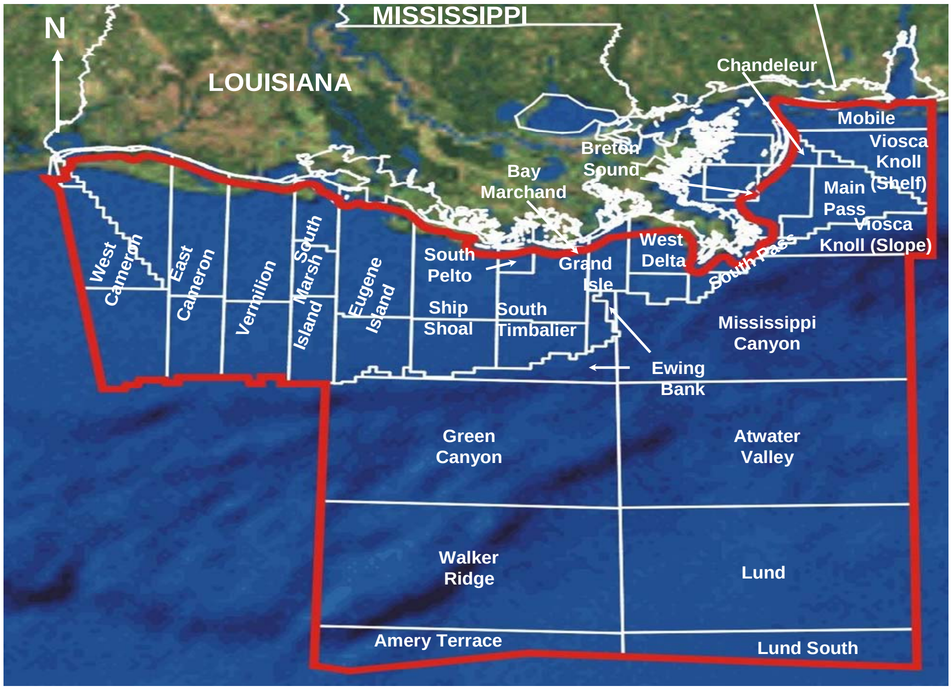


Figure 5. Central Planning Area, Gulf of Mexico, Outer Continental Shelf.

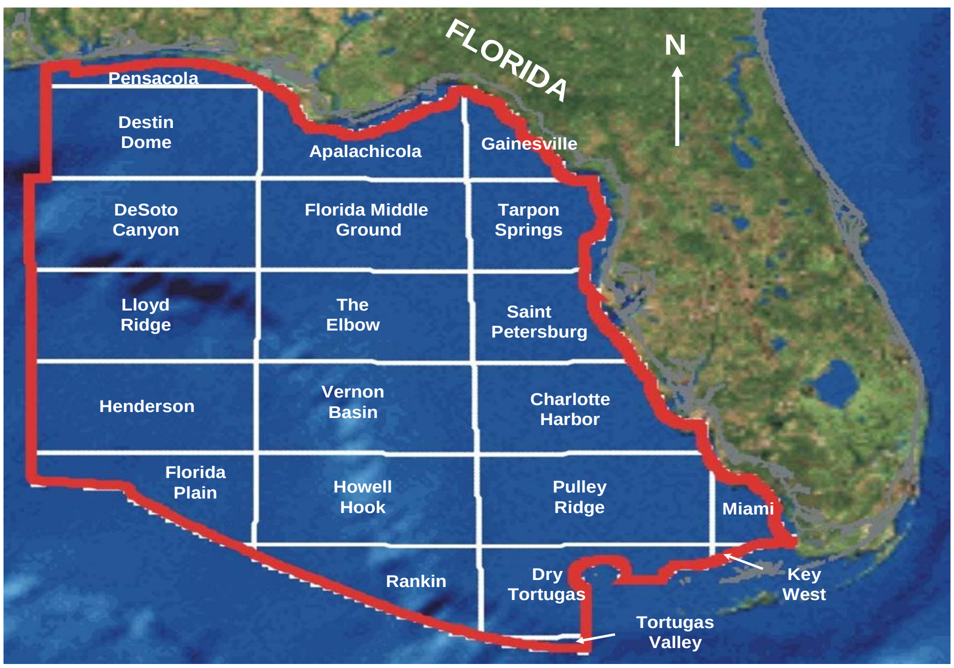


Figure 6. Eastern Planning Area, Gulf of Mexico, Outer Continental Shelf.

As the field is developed, the limits often 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, 2003, there were 970 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 915 proved, active, producing, and non-producing fields and 55 unproved active fields studied. Included are the 226 proved expired, depleted fields, abandoned after producing 2.3 percent barrel oil equivalent of the total cumulative oil and gas production. Not studied were 107 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 2003, 12 proved fields were depleted, and 53 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 1,141 proved fields and 55 unproved fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 2003.

(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 2003		Remaining proved reserves		Unproved reserves	
	Proved active prod	Proved active nonprod	Proved expired depleted	Unproved active	Unproved studied	Expired nonprod	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas
Western Planning Area														
Western Shelf														
Brazos	24	5	9	0	0	2	12	3,732	10	3,202	2	530	1	84
Galveston	20	1	24	0	0	3	64	2,096	49	1,837	15	259	0	33
High Island and Sabine Pass	75	12	38	0	0	14	380	14,943	355	14,106	25	837	10	393
Matagorda Island	23	1	4	0	0	3	26	5,647	22	4,807	4	840	1	138
Mustang Island	15	0	12	1	1	6	7	2,025	5	1,629	2	396	13	211
N.& S.Padre Island	6	1	4	0	0	1	0	573	0	485	0	88	0	1
Western Slope														
Alaminos Canyon	3	0	0	3	3	1	63	116	40	48	23	68	276	302
East Breaks	16	2	0	3	3	3	194	2,299	106	903	88	1,396	25	152
Garden Banks	22	6	3	4	4	6	632	3,943	364	2,454	268	1,489	263	729
Western Slope (Other)*	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Western Planning Area Subtotal	***204***	***28***	***94***	***11***	***11***	***40***	***1,378***	***35,374***	***951***	***29,471***	***427***	***5,903***	***589***	***2,043***
Central Planning Area														
Central Shelf														
Chandeleur	5	3	3	0	0	0	0	352	0	339	0	13	0	2
East Cameron	49	5	12	0	0	0	330	10,567	312	10,147	18	420	4	110
Eugene Island	64	4	10	2	2	6	1,625	19,264	1,528	18,133	97	1,131	37	257
Grand Isle	16	1	4	0	0	1	974	4,821	934	4,513	40	308	19	115
Main Pass and Breton Sound	59	5	16	1	1	8	1,083	6,542	973	5,833	110	709	6	35
Mobile	18	3	6	0	0	3	0	2,072	0	1,609	0	463	0	127
Ship Shoal	45	4	12	0	0	4	1,366	12,029	1,296	11,312	70	717	20	182
South Marsh Island	38	5	7	1	1	0	915	14,232	830	13,376	85	856	13	357
South Pass	11	1	1	1	1	0	1,078	4,379	1,034	4,124	44	255	2	72
South Pelto	9	0	0	0	0	0	158	1,174	141	982	17	192	4	19
South Timbalier	47	2	7	1	1	3	1,534	10,339	1,415	8,788	119	1,551	33	335
Vermilion	66	3	14	0	0	3	551	16,338	503	15,440	48	898	21	386
Viosca Knoll (Shelf)	13	4	10	1	1	1	12	490	9	345	3	145	0	12
West Cameron and Sabine Pass	79	8	22	0	0	4	207	19,802	191	18,467	16	1,335	6	121
West Delta	20	1	3	0	0	3	1,384	5,542	1,322	5,169	62	373	11	79
Central Slope														
Ewing Bank	12	3	1	1	1	1	296	644	226	459	70	185	37	203
Green Canyon	22	6	2	10	10	15	2,045	3,300	631	1,764	1,414	1,536	1,679	1,145
Mississippi Canyon	28	6	1	12	12	8	3,105	8,048	992	4,505	2,113	3,543	486	1,597
Viosca Knoll (Slope)	16	0	1	3	3	3	435	2,768	318	1,868	117	900	128	363
Central Slope (Other)**	0	0	0	7	7	3	0	0	0	0	0	0	266	663
Central Planning Area Subtotal	***617***	***64***	***132***	***40***	***40***	***66***	***17,098***	***142,703***	***12,655***	***127,173***	***4,443***	***15,530***	***2,772***	***6,180***
Eastern Planning Area Subtotal*	***2***	***0***	***0***	***4***	***4***	***1***	***0***	***131***	***0***	***51***	***0***	***80***	***0***	***740***
GOM Total:	***823***	***92***	***226***	***55***	***55***	***107***	***18,476***	***178,208***	***13,606***	***156,695***	***4,870***	***21,513***	***3,361***	***8,963***
	1,141													

*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 1,141 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 55 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.

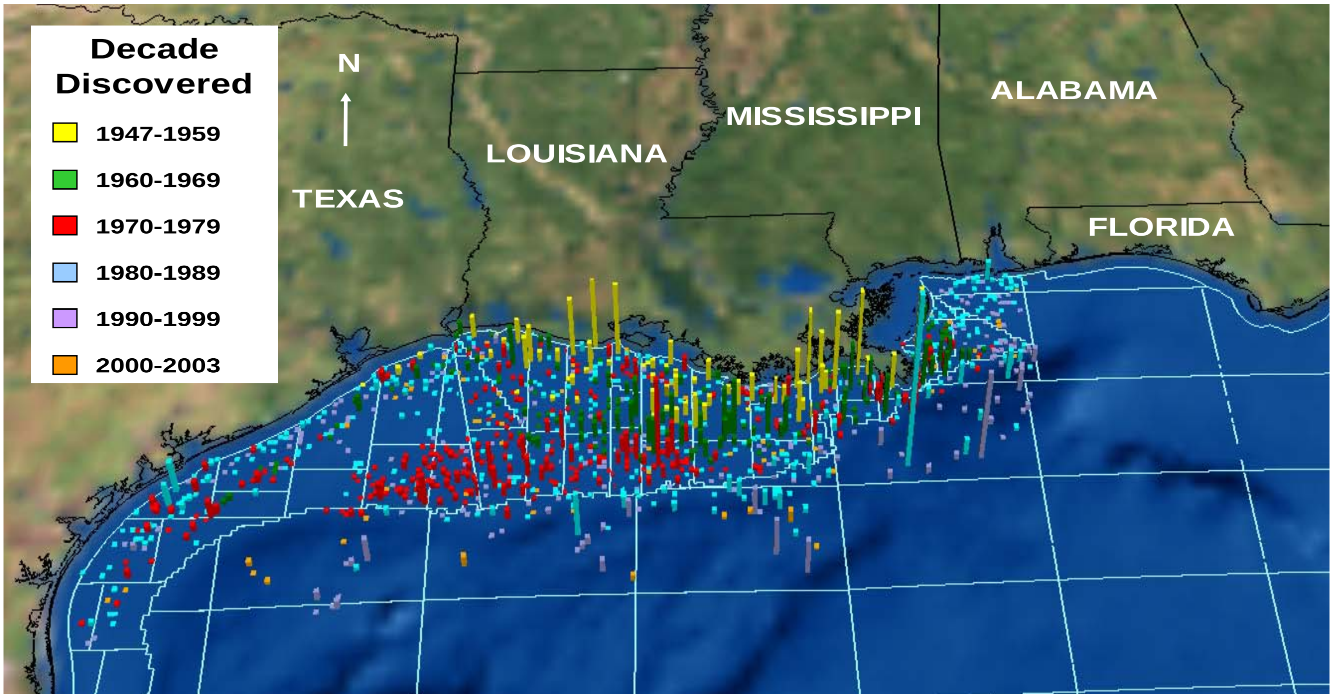


Figure 7. Gulf of Mexico, 1,141 proved fields (915 active and 226 depleted.)

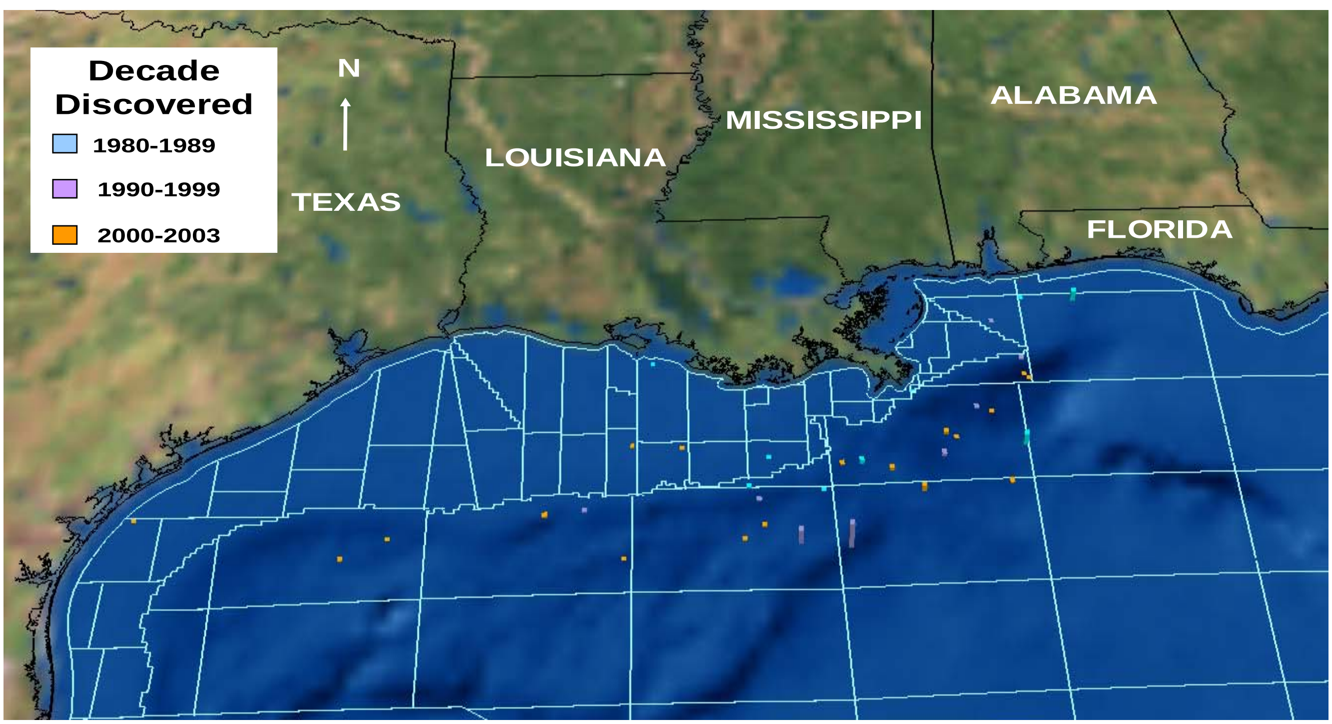


Figure 8. Gulf of Mexico, 55 unproved active fields.

Table 2. Status of oil and gas leases, boreholes, and completions by area, Gulf of Mexico, Outer Continental Shelf, December 31, 2003.

(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	42	57	0	68	316	564	412	195
Galveston	32	83	0	139	551	671	587	137
High Island and Sabine Pass	184	204	0	180	917	3,256	2,247	1,224
Matagorda Island	44	46	0	35	137	591	360	301
Mustang Island	28	42	0	63	372	415	308	155
N.& S.Padre Island	10	23	0	62	290	156	127	44
Western Slope								
Alaminos Canyon	5	0	5	550	106	39	23	9
East Breaks	41	8	3	244	371	335	211	138
Garden Banks	54	27	4	491	750	535	354	180
Western Slope (Other)*	0	0	0	560	226	16	15	0
Western Planning Area Subtotal	***440***	***490***	***12***	***2,392***	***4,036***	***6,578***	***4,644***	***2,383***
Central Planning Area								
Central Shelf								
Chandeleur	9	13	0	13	29	75	49	28
East Cameron	130	169	0	109	535	2,159	1,472	928
Eugene Island	220	147	3	107	430	4,864	3,127	2,162
Grand Isle	53	43	0	29	127	1,869	1,472	613
Main Pass and Breton Sound	148	131	2	98	343	2,976	1,682	1,555
Mobile	40	12	0	25	73	160	96	63
Ship Shoal	163	124	0	119	425	3,476	2,156	1,598
South Marsh Island	137	98	2	73	269	2,747	1,650	1,319
South Pass	42	28	2	22	90	2,247	1,356	1,150
South Pelto	20	10	0	5	27	398	281	230
South Timbalier	129	92	5	110	418	3,089	1,923	1,501
Vermilion	154	195	0	141	496	2,964	1,989	1,274
Viosca Knoll (Shelf)	30	20	0	68	196	229	148	47
West Cameron and Sabine Pass	224	297	0	246	823	3,500	2,447	1,443
West Delta	88	53	0	33	166	2,847	1,869	1,049
Central Slope								
Ewing Bank	32	24	2	52	204	296	197	130
Green Canyon	64	23	16	657	601	802	561	230
Mississippi Canyon	108	30	17	535	588	1,295	834	449
Viosca Knoll (Slope)	38	12	3	39	111	303	166	151
Central Slope (Other)**	0	0	7	931	313	86	71	0
Central Planning Area Subtotal	***1,829***	***1,521***	***59***	***3,412***	***6,264***	***36,382***	***23,546***	***15,920***
Eastern Planning Area Subtotal*	***3***	***0***	***7***	***222***	***347***	***61***	***54***	***5***
GOM Total:	***2,272***	***2,011***	***78***	***6,026***	***10,647***	***43,021***	***28,244***	***18,308***

*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, 2003, is presented in table 2. There are 8,376 active leases (2,272 proved active, 78 unproved qualified, and 6,026 unqualified active) and 12,658 relinquished leases (2,011 proved depleted and 10,647 expired).

Definitions for the lease subgroups of table 2 are:

Proved Active — Leases within the designated 915 proved active fields presented in table 1.

Proved Depleted — Leases relinquished after oil and gas production. The leases associated with the 226 depleted fields are represented here along with other produced, relinquished leases that are part of currently active fields.

Unproved Qualified — Leases associated with the 55 unproved active fields. The leases have qualified as producible under 30 CFR 250.116, but the operators have not established a commitment to produce. These fields may be classified as unproved possible or unproved probable.

Province	System	Series	Biozone: Foraminifer & Ostracod (O)	Biozone: Nannoplanktin	Chronozone: Revised	Chronozone: Outdated
Cenozoic	Quaternary	Pleistocene	Globorotalia flexuosa Sangamon fauna	Emiliania huxleyi (base of acme) Gephyrocapsa oceanica (flood) Gephyrocapsa caribbeanica (flood)	PLU	UPL
			Trimosina "A"	Helicosphaera inversa Gephyrocapsa parallela Pseudoemiliania ovata	PLM	
			Stilostomella antillea Trimosina "A" (acme) Hyalinea "B" / Trimosina "B" Angulogerina "B" Uvigerina hispida	Pseudoemiliania lacunosa "C" (acme) Calcidiscus macintyrei	PLL	MPL
	Tertiary	Pliocene	Globorotalia crassula (acme) Lenticulina 1 Globoquadrina altispira Textularia 1	Discoaster brouweri	PU	LPL
			Buccella hannai (acme) Buliminella 1 Globorotalia plesiotumida (acme)	Sphenolithus abies Sphenolithus abies "B" Discoaster quintatus	PL	UP
		Miocene	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	LP UM3
			Discorbis 12 Bigenerina 2 Uvigerina 3	Helicosphaera walbersdorfensis Coccolithus miopelagicus	MLU	UM1 MM9
			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	MM7
			Cristellaria / Robulus / Lenticulina 53 Amphistegina "B" Robulus 43 Cibicides 38	Helicosphaera ampliaperta Discoaster deflandrei (acme) Discoaster calculosus	MLM	MM4
			Cristellaria 54 / Eponides 14 Gyroidina "K" Catapsydrax stainforthi	Reticulofenestra gartneri Sphenolithus disbelemnos	MUL	
			Discorbis "B" Marginulina "A"	Orthorhabdus serratus Triquetrorhabdulus carinatus	MML	LM4
			Siphonina davisi Lenticulina hanseni	Discoaster saundersi Helicosphaera recta	MLL	LM2 LM1
		Oligocene	Robulus "A" Heterostegina texana Camerina "A" Bolivina mexicana	Dictyococcites bisectus Sphenolithus delphix	OU	UO MO
			Nonion struma Textularia warreni	Sphenolithus pseudoradians Ismolithus recurvus	OL	LO
		Eocene	Hantkenina alabamensis Camerina moodybranchensis	Discoaster saipanensis Cribrocentrum reticulatum Sphenolithus obtusus	EU	UE
			Nonionella cockfieldensis Discorbis yeguaensis	Micrantholithus procerus Pemma basquensis Discoaster lodoensis	EM	ME
			Globorotalia wilcoxensis	Chiasmolithus californicus Toweius crassus Discoaster multiradiatus	EL	LE
		Paleocene	Morozovella velascoensis Vaginulina longiforma Vaginulina midwayana	Fasciculithus tympaniformis	LU	UL
			Globorotalia trinidadensis Globigerina eugubina	Chiasmolithus danicus	LL	LL
Mesozoic	Cretaceous	Upper	Abathomphalus mayaroensis Rosita fornicata Dicarinella concavata Hedbergella amabilis	Micula decussata Micula prinsii FAD Lithastrinus moratus Stoverius achylosus	KUU	UK5
			Dicarinella hagni Planulina eaglefordensis Rotalipora cushmani Favusella washitaensis Rotalipora gandolfii	Lithraphidites acutus	KLU	UK2
		Lower	Cythereis fredericksburgensis (O) Ammobaculites goodlandensis	Hayesites albiensis Braarudosphaera hockwoldensis	KUL	LK8
			Dictyoconus walnutensis Eocytheropteron trinitiensis (O) Orbitolina texana Rehacythereis? aff. R. glabrella (O)	Rucinolithus irregularis	KML	LK6
			Ticinella bejaouaensis Choffatella decipiens Schuleridea acuminata (O)	Diadorhombus rectus Polycostella beckmanni	KLL	LK3
	Jurassic	Upper	Gallaecytheridea postrotunda (O) Epistomina uhligi Epistomina mosquensis Alveosepta jaccardi Paalzowella feifeli	Stephanolithion bigotii bigotii Stephanolithion bigotii maximum Stephanolithion speciosum	JU	UJ4
		Middle	Reinholdella crebra	Watznaueria crucicentralis	JM	MJ
		Lower			JL	LJ
	Triassic	Upper			TRU	UTR
		Middle			TRM	MTR
		Lower			TRL	LTR

Abbreviated MMS Gulf of Mexico biostratigraphic chart illustrating revised chronostratigraphy. Note major shifts in the Series reporting levels, except at the Miocene/pre-Miocene boundary. 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 250.116. There are 107 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 893 boreholes spudded during 2003, compared with 941 during 2002, and 1,262 during 2001. 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 2005. These numbers may change as data are received, processed, and edited.

Reserves Reported by Geologic Age

In this report, the 1,141 proved and 55 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 industrial paleontologists for the Mesozoic and Cenozoic geologic sections. This biostratigraphic update eliminates 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 1,141 proved and 55 unproved fields by geologic age, Gulf of Mexico, Outer Continental Shelf, December 31, 2003.

(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 2003		Remaining proved reserves		Number of unproved reservoirs	Unproved reserves	
		Oil	Gas	Oil	Gas	Oil	Gas		Oil	Gas
Western Planning Area										
Pleistocene	1,042	289	7,894	177	6,952	112	942	142	72	311
Pliocene	815	885	7,941	622	5,924	263	2,017	146	208	707
Miocene	2,337	204	19,510	152	16,579	52	2,931	223	40	733
Pre-Miocene	8	0	29	0	16	0	13	0	0	0
Span Ages	0	0	0	0	0	0	0	10	269	292
Western Planning Area Subtotal	***4,202***	***1,378***	***35,374***	***951***	***29,471***	***427***	***5,903***	***521***	***589***	***2,043***
Central Planning Area										
Pleistocene	3,247	1,060	19,751	961	18,422	99	1,329	283	69	526
Pliocene	9,189	5,851	48,102	4,948	44,230	903	3,872	747	257	1,296
Miocene	10,776	9,291	72,257	6,746	63,025	2,545	9,232	785	644	3,086
Pre-Miocene	37	0	2,037	0	1,496	0	541	8	0	138
Span Ages	17	896	556	0	0	896	556	29	1,802	1,134
Central Planning Area Subtotal	***23,266***	***17,098***	***142,703***	***12,655***	***127,173***	***4,443***	***15,530***	***1,852***	***2,772***	***6,180***
Eastern Planning Area										
Miocene	5	0	131	0	51	0	80	7	0	249
Pre-Miocene	0	0	0	0	0	0	0	1	0	491
Eastern Planning Area Subtotal	***5***	***0***	***131***	***0***	***51***	***0***	***80***	***8***	***0***	***740***
GOM Total	***27,473***	***18,476***	***178,208***	***13,606***	***156,695***	***4,870***	***21,513***	***2,381***	***3,361***	***8,963***

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 to the east and west because of a lack of sediment influx at the edge of the depocenter. Downdip 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, 2003, the Pleistocene produced from 368 fields. Proved reserves were 1.35 billion barrels (Bbbl) and 27.6 trillion cubic feet (Tcf). Remaining proved reserves were 0.21 Bbbl and 2.3 Tcf.

Table 3a. Estimated oil and gas reserves for Pleistocene reservoirs in 368 proved and 8 unproved fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 2003.

(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 2003		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	7	179	6	122	1	57	4	1	56
Galveston	2	0	16	0	14	0	2	0	0	0
Garden Banks	112	144	1,614	41	986	103	628	51	69	163
High Island and Sabine Pass	897	138	6,085	130	5,830	8	255	86	2	87
Western Slope (Other)*	0	0	0	0	0	0	0	0	0	0
Western Planning Area Subtotal	***1,042***	***289***	***7,894***	***177***	***6,952***	***112***	***942***	***142***	***72***	***311***
Central Planning Area										
East Cameron	323	189	1,380	180	1,282	9	98	44	1	31
Eugene Island	757	316	5,415	291	5,207	25	208	25	2	19
Ewing Bank	45	31	246	25	146	6	101	17	22	151
Grand Isle	33	0	85	0	73	0	12	5	0	7
Green Canyon	140	84	540	68	436	16	104	47	14	53
Main Pass and Breton Sound	3	0	16	0	16	0	0	0	0	0
Mississippi Canyon	27	7	706	4	525	3	181	10	8	19
Ship Shoal	252	67	1,724	63	1,641	4	83	7	1	3
South Marsh Island	405	239	1,808	221	1,729	18	79	38	2	62
South Pass	20	0	237	0	235	0	1	1	0	0
South Pelto	5	0	6	0	6	0	0	4	0	7
South Timbalier	180	33	939	28	823	5	116	18	3	23
Vermilion	501	75	1,709	66	1,578	9	131	47	12	88
Viosca Knoll (Slope)	1	0	10	0	0	0	10	1	0	18
West Cameron and Sabine Pass	531	19	4,786	15	4,603	4	183	19	4	45
West Delta	24	0	144	0	122	0	22	0	0	0
Central Slope (Other)**	0	0	0	0	0	0	0	0	0	0
Central Planning Area Subtotal	***3,247***	***1,060***	***19,751***	***961***	***18,422***	***99***	***1,329***	***283***	***69***	***526***
Eastern Planning Area Subtotal*	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
GOM Total	***4,289***	***1,349***	***27,645***	***1,138***	***25,374***	***211***	***2,271***	***425***	***141***	***837***

*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 Mobile Bay in the east to Alaminos Canyon in the west. Upper Pliocene productive sands also extend into the deepwater areas of 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, 2003, the Pliocene produced from 518 fields. Proved reserves were 6.74 Bbbl and 56.0 Tcf. Remaining proved reserves were 1.17 Bbbl and 5.9 Tcf.

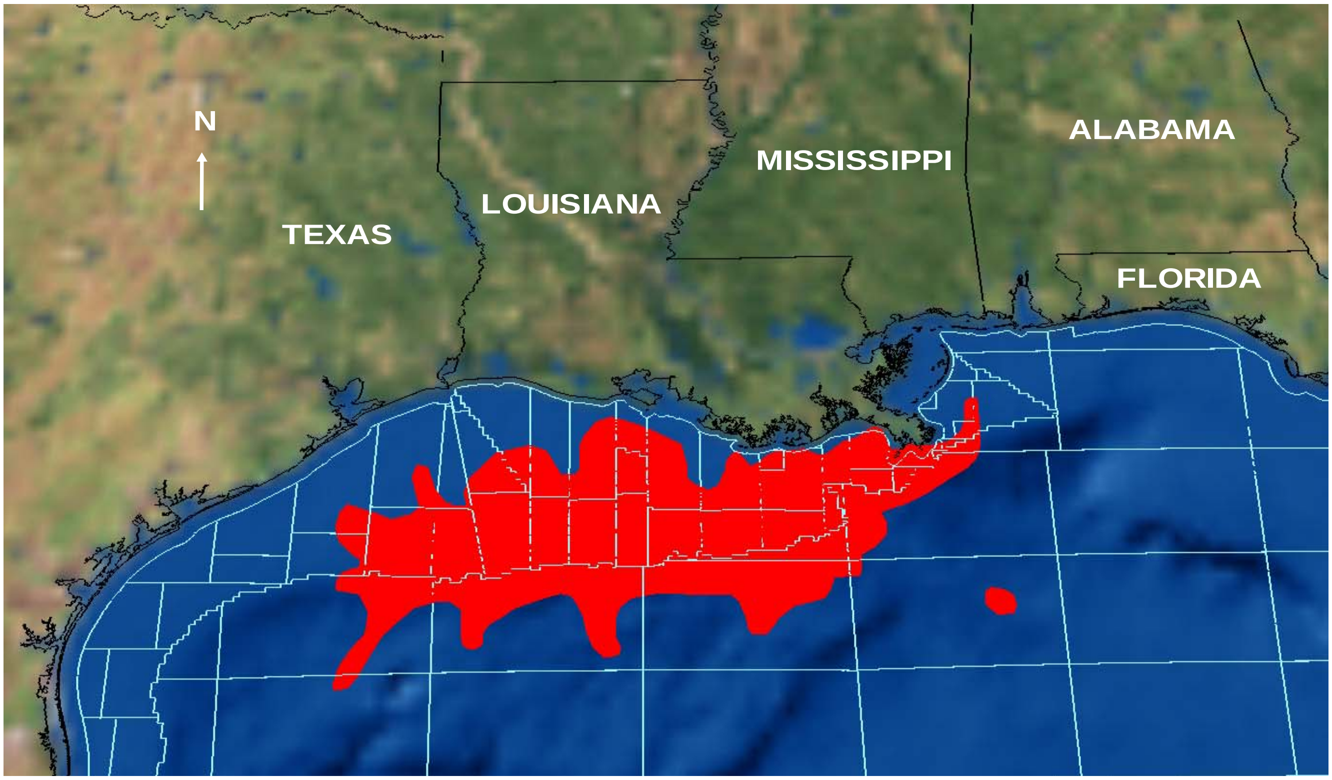


Figure 10. Pleistocene reserves trend.

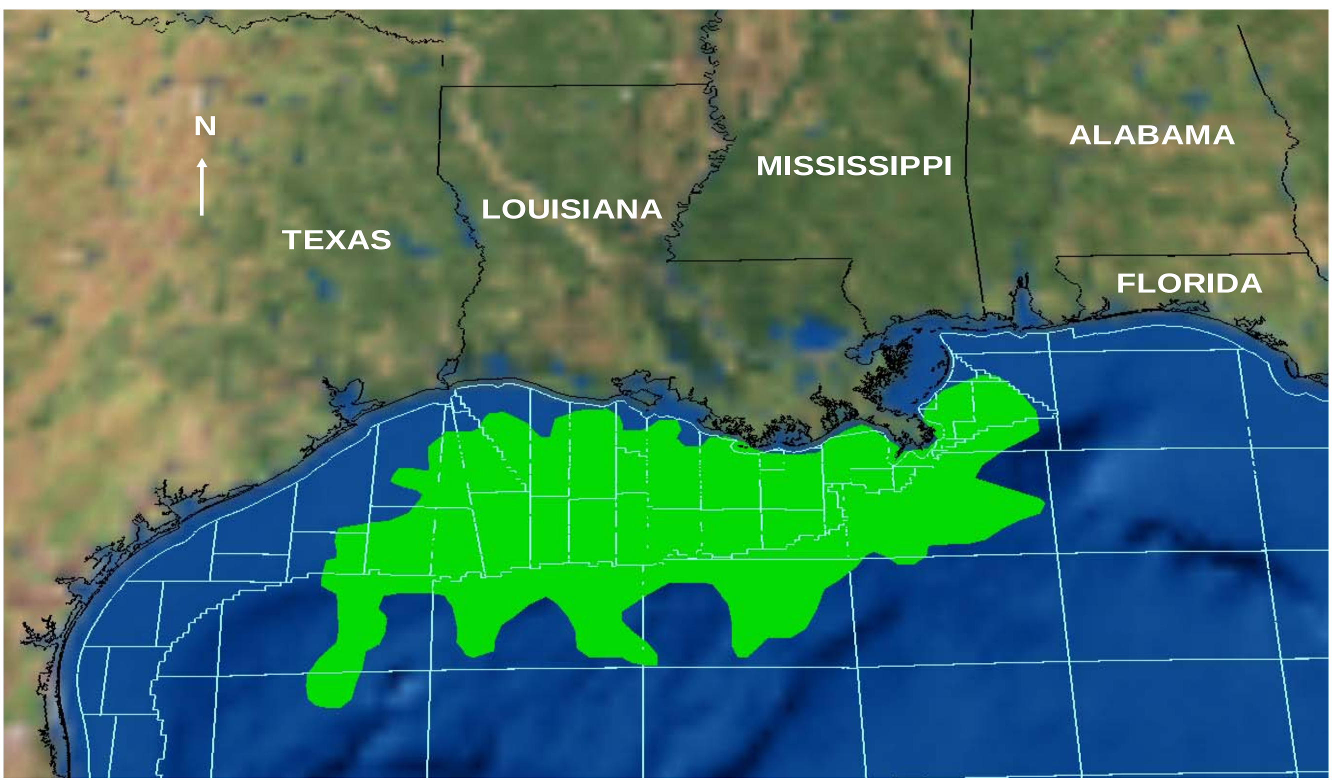


Figure 11. Pliocene reserves trend.

Table 3b. Estimated oil and gas reserves for Pliocene reservoirs in 518 proved and 18 unproved fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 2003.

(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 2003		Remaining proved reserves		Number of unproved reservoirs	Unproved reserves	
		Oil	Gas	Oil	Gas	Oil	Gas		Oil	Gas
Western Planning Area										
Alaminos Canyon	3	63	116	40	48	23	68	1	7	5
East Breaks	140	186	1,759	100	729	86	1,030	30	24	96
Galveston	19	1	70	1	64	0	6	0	0	0
Garden Banks	81	440	2,102	299	1,359	141	743	37	172	497
High Island and Sabine Pass	572	195	3,894	182	3,724	13	170	78	5	109
Western Slope (Other)*	0	0	0	0	0	0	0	0	0	0
Western Planning Area Subtotal	***815***	***885***	***7,941***	***622***	***5,924***	***263***	***2,017***	***146***	***208***	***707***
Central Planning Area										
East Cameron	511	64	4,722	59	4,552	5	170	55	3	49
Eugene Island	1,489	878	8,034	831	7,583	47	451	133	14	64
Ewing Bank	103	243	374	186	298	57	76	15	12	50
Grand Isle	190	42	1,799	40	1,747	2	52	13	1	5
Green Canyon	172	1,006	2,107	554	1,313	452	794	81	118	252
Main Pass and Breton Sound	109	65	719	57	659	8	60	2	0	4
Mississippi Canyon	248	484	2,673	361	2,361	123	312	59	57	308
Ship Shoal	1,752	1,017	7,332	974	6,905	43	427	110	9	101
South Marsh Island	669	349	3,464	316	3,258	33	206	61	7	82
South Pass	804	540	2,343	517	2,191	23	152	22	1	49
South Pelto	145	52	63	48	55	4	8	2	2	7
South Timbalier	1,033	388	4,992	347	4,440	41	552	112	11	175
Vermilion	805	252	4,203	229	3,965	23	238	47	4	96
Viosca Knoll (Slope)	22	53	112	32	79	21	33	4	9	8
West Cameron and Sabine Pass	611	28	3,975	26	3,756	2	219	20	2	32
West Delta	526	390	1,190	371	1,068	19	122	11	7	14
Central Slope (Other)**	0	0	0	0	0	0	0	0	0	0
Central Planning Area Subtotal	***9,189***	***5,851***	***48,102***	***4,948***	***44,230***	***903***	***3,872***	***747***	***257***	***1,296***
Eastern Planning Area Subtotal*	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
GOM Total	***10,004***	***6,736***	***56,043***	***5,570***	***50,154***	***1,166***	***5,889***	***893***	***465***	***2,003***

*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 east of the Mississippi River to as far west as North Padre Island. Miocene productive sands also extend into deep waters in Ewing Bank, Green Canyon, Viosca Knoll, Mississippi Canyon, Atwater Valley, Destin Dome, Desoto Canyon, and Lloyd Ridge. Well control suggests sands continue beyond the Sigsbee Escarpment. Through December 31, 2003, the Miocene produced from 666 fields. Proved reserves were 9.50 Bbbl and 91.9 Tcf. Remaining proved reserves were 2.60 Bbbl and 12.2 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, 2003, these trends produced from 24 fields. Proved reserves were less than 0.01 Bbbl and 2.1 Tcf. Remaining proved reserves were less than 0.01 Bbbl and 0.6 Tcf.

Table 3c. Estimated oil and gas reserves for Miocene reservoirs in 666 proved and 24 unproved fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 2003.

(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 2003		Remaining proved reserves		Number of unproved reservoirs	Unproved reserves	
		Oil	Gas	Oil	Gas	Oil	Gas		Oil	Gas
Western Planning Area										
Brazos	415	11	3,732	10	3,202	1	530	48	1	84
East Breaks	5	1	362	0	52	1	310	0	0	0
Galveston	390	62	2,010	47	1,759	15	251	28	0	33
Garden Banks	9	49	226	25	110	24	116	7	22	69
High Island and Sabine Pass	614	48	4,964	43	4,552	5	412	66	3	197
Matagorda Island	471	26	5,647	22	4,807	4	840	44	1	138
Mustang Island	329	7	1,997	5	1,613	2	384	28	13	211
N.& S.Padre Island	104	0	572	0	484	0	88	2	0	1
Western Slope (Other)*	0	0	0	0	0	0	0	0	0	0
Western Planning Area Subtotal	***2,337***	***204***	***19,510***	***152***	***16,579***	***52***	***2,931***	***223***	***40***	***733***
Central Planning Area										
Chandeleur	24	0	352	0	339	0	13	3	0	2
East Cameron	390	77	4,465	73	4,313	4	152	16	0	30
Eugene Island	1,244	431	5,815	406	5,343	25	472	156	20	174
Ewing Bank	5	22	24	16	16	6	8	5	3	3
Grand Isle	705	931	2,938	893	2,694	38	244	98	17	103
Green Canyon	16	59	96	9	14	50	82	14	10	28
Main Pass and Breton Sound	1,387	1,017	5,807	916	5,158	101	649	10	6	31
Mississippi Canyon	137	2,613	4,667	626	1,618	1,987	3,049	90	421	1,272
Mobile	30	0	352	0	311	0	41	1	0	1
Ship Shoal	749	282	2,973	260	2,766	22	207	45	11	77
South Marsh Island	877	327	8,960	293	8,389	34	571	79	5	213
South Pass	570	539	1,799	517	1,697	22	102	6	1	22
South Pelto	367	106	1,105	93	921	13	184	8	2	5
South Timbalier	1,121	1,115	4,408	1,041	3,526	74	882	91	19	137
Vermilion	931	223	10,427	207	9,898	16	529	79	4	202
Viosca Knoll (Shelf)	31	12	174	9	147	3	27	2	0	0
Viosca Knoll (Slope)	92	384	2,645	287	1,788	97	857	22	119	337
West Cameron and Sabine Pass	1,195	159	11,042	149	10,108	10	934	18	0	44
West Delta	905	994	4,208	951	3,979	43	229	29	5	65
Central Slope (Other)**	0	0	0	0	0	0	0	13	1	340
Central Planning Area Subtotal	***10,776***	***9,291***	***72,257***	***6,746***	***63,025***	***2,545***	***9,232***	***785***	***644***	***3,086***
Eastern Planning Area Subtotal*	***5***	***0***	***131***	***0***	***51***	***0***	***80***	***7***	***0***	***249***
GOM Total	***13,118***	***9,495***	***91,898***	***6,898***	***79,655***	***2,597***	***12,243***	***1,015***	***684***	***4,068***

*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 24 proved and 2 unproved fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 2003.

(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 2003		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	29	0	16	0	13	0	0	0
Western Slope (Other)*	0	0	0	0	0	0	0	0	0	0
Western Planning Area Subtotal	***8***	***0***	***29***	***0***	***16***	***0***	***13***	***0***	***0***	***0***
Central Planning Area										
Main Pass and Breton Sound	1	0	0	0	0	0	0	0	0	0
Mobile	22	0	1,720	0	1,298	0	422	4	0	126
Viosca Knoll (Shelf)	14	0	317	0	198	0	119	4	0	12
Central Slope (Other)**	0	0	0	0	0	0	0	0	0	0
Central Planning Area Subtotal	***37***	***0***	***2,037***	***0***	***1,496***	***0***	***541***	***8***	***0***	***138***
Eastern Planning Area Subtotal*	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***1***	***0***	***491***
GOM Total	***45***	***0***	***2,066***	***0***	***1,512***	***0***	***554***	***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.

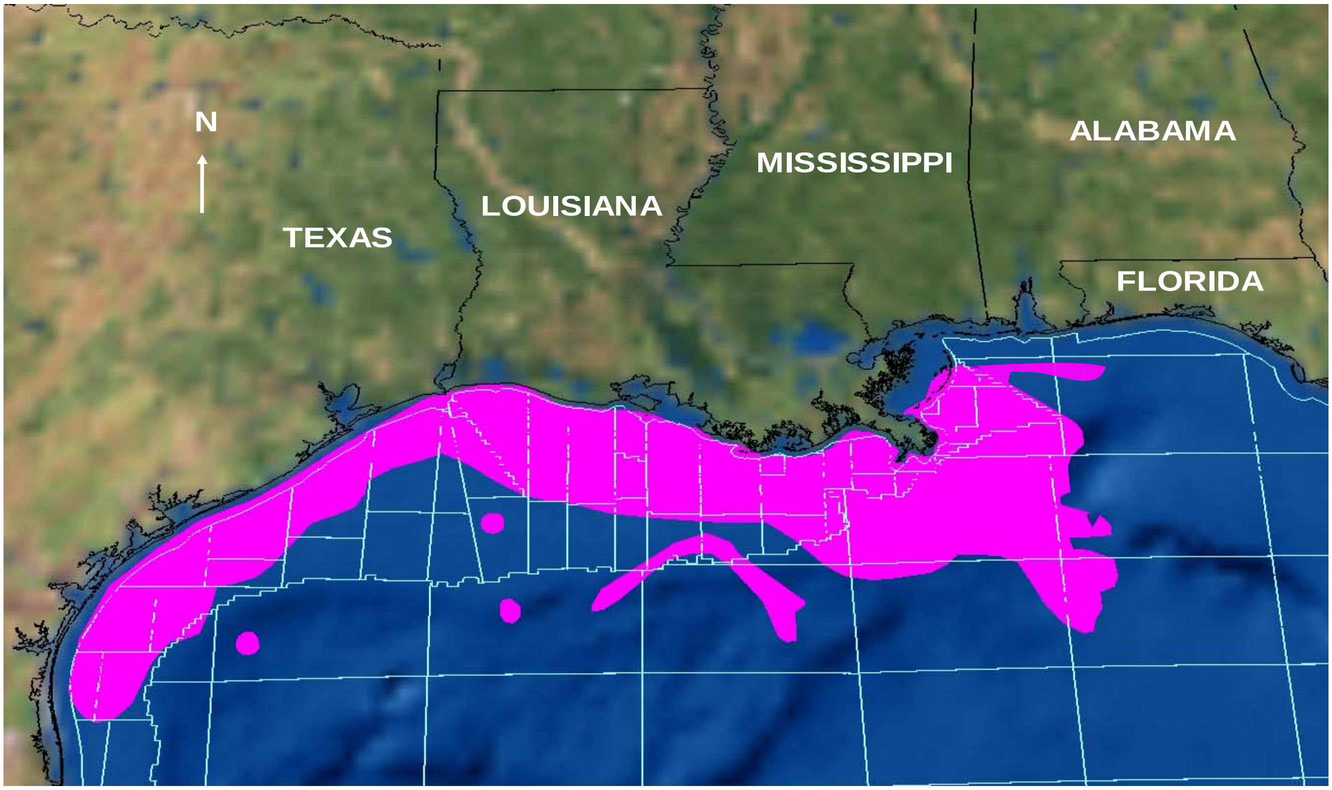


Figure 12. Miocene reserves trend.

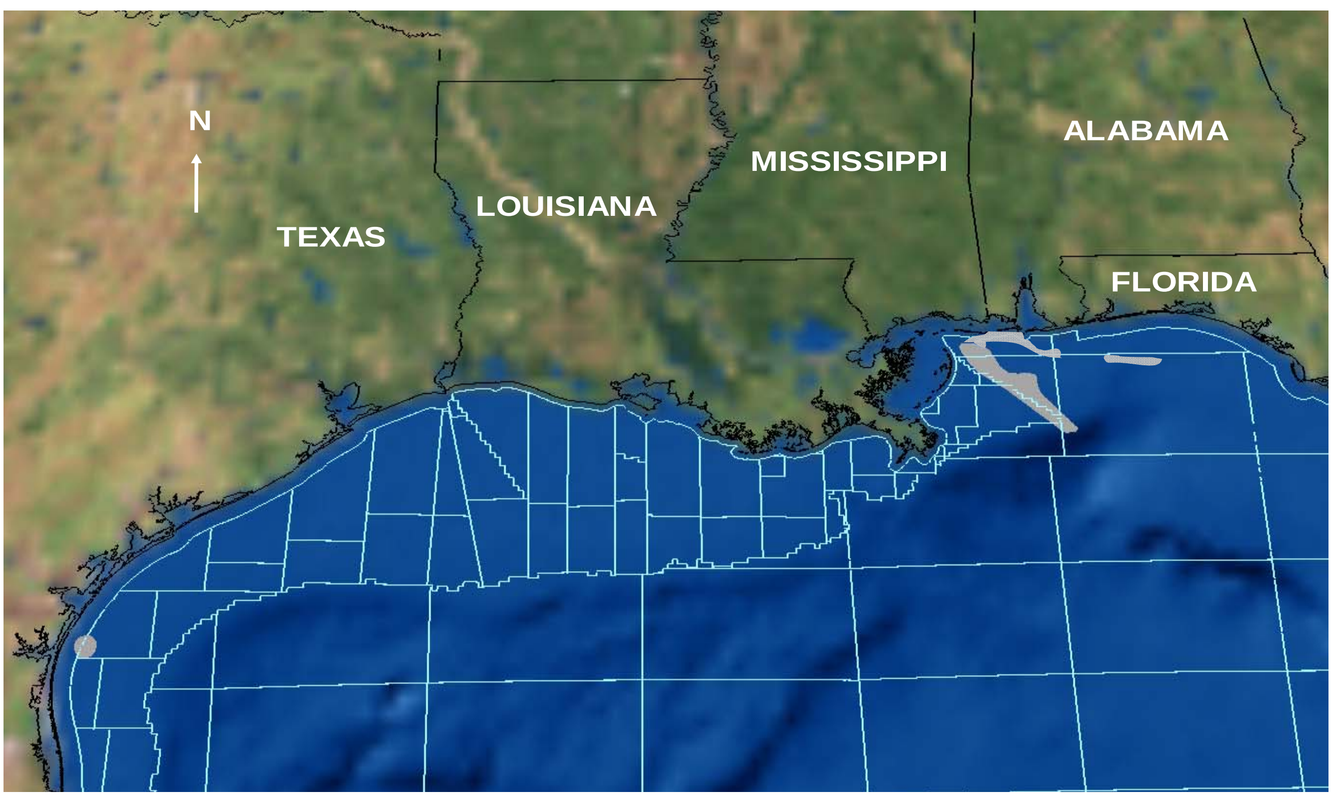


Figure 13. Pre-Miocene reserves trend.

Table 3e. Estimated oil and gas reserves for reservoirs that Span Ages in 2 proved and 10 unproved fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 2003.

(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 2003		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	10	269	292
Western Slope (Other)*	0	0	0	0	0	0	0	0	0	0
Western Planning Area Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***10***	***269***	***292***
Central Planning Area										
Green Canyon	17	896	556	0	0	896	556	17	1,537	812
Central Slope (Other)**	0	0	0	0	0	0	0	12	265	322
Central Planning Area Subtotal	***17***	***896***	***556***	***0***	***0***	***896***	***556***	***29***	***1,802***	***1,134***
Eastern Planning Area Subtotal*	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
GOM Total	***17***	***896***	***556***	***0***	***0***	***896***	***556***	***39***	***2,071***	***1,426***

*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 has changed from the previous distribution by geologic age because of revisions of 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.

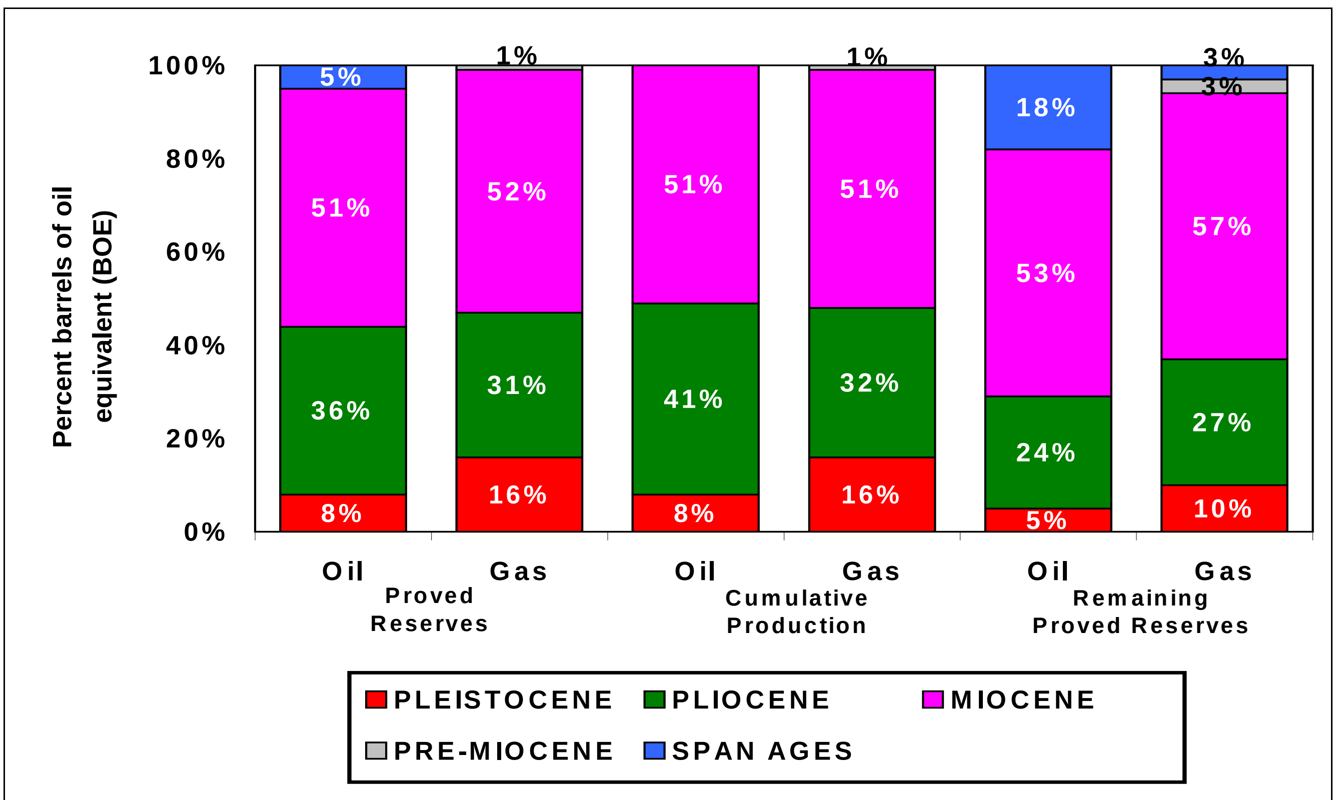


Figure 14. Distribution of reserves and production data by geologic age.

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, 272 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.

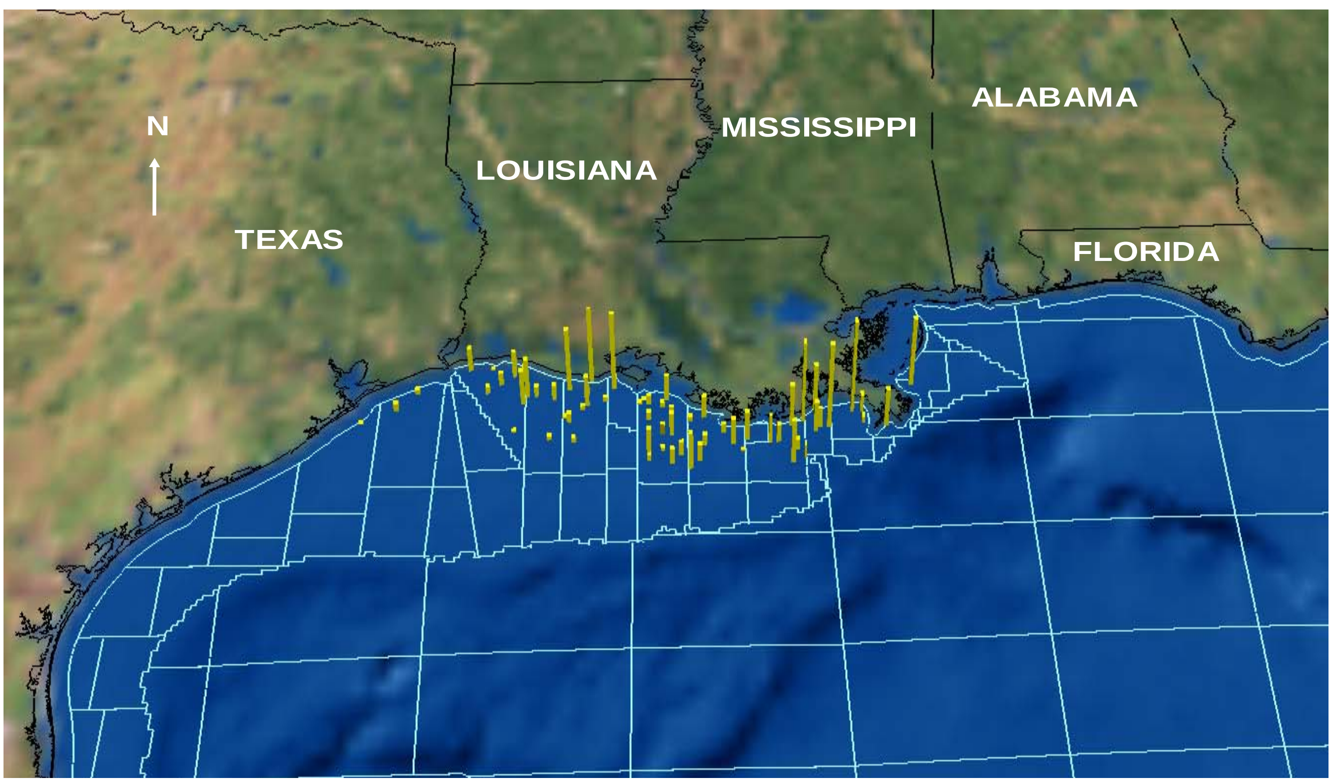


Figure 15. Location of proved fields discovered 1947-1959, Gulf of Mexico OCS.

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, 2,083 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 in the Pleistocene depocenter. The introduction of dynamic 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 that have been termed the Flexure Trend. During this decade, 2,969 exploratory wells were drilled, resulting in the discovery of 282 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, putting the slope within reach. In this decade, 4,136 exploration wells were drilled, resulting in the discovery of 364 proved fields (28 were discovered in water depths greater than 1,000 ft).

For the 1990's (figure 19), 3,978 exploration wells were drilled, resulting in the discovery of 215 proved fields (48 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, and for exploration of new plays, such as the Subsalt Play.

From 2000 to 2003 (figure 20), 1,513 exploration wells were drilled, resulting in the discovery of 65 proved fields. Nearly 25 percent of those fields were in greater than 1,000 ft of water. Reserve estimates for recent field discoveries may have significant increases because of increased well control, reservoir management, and in-field exploration.

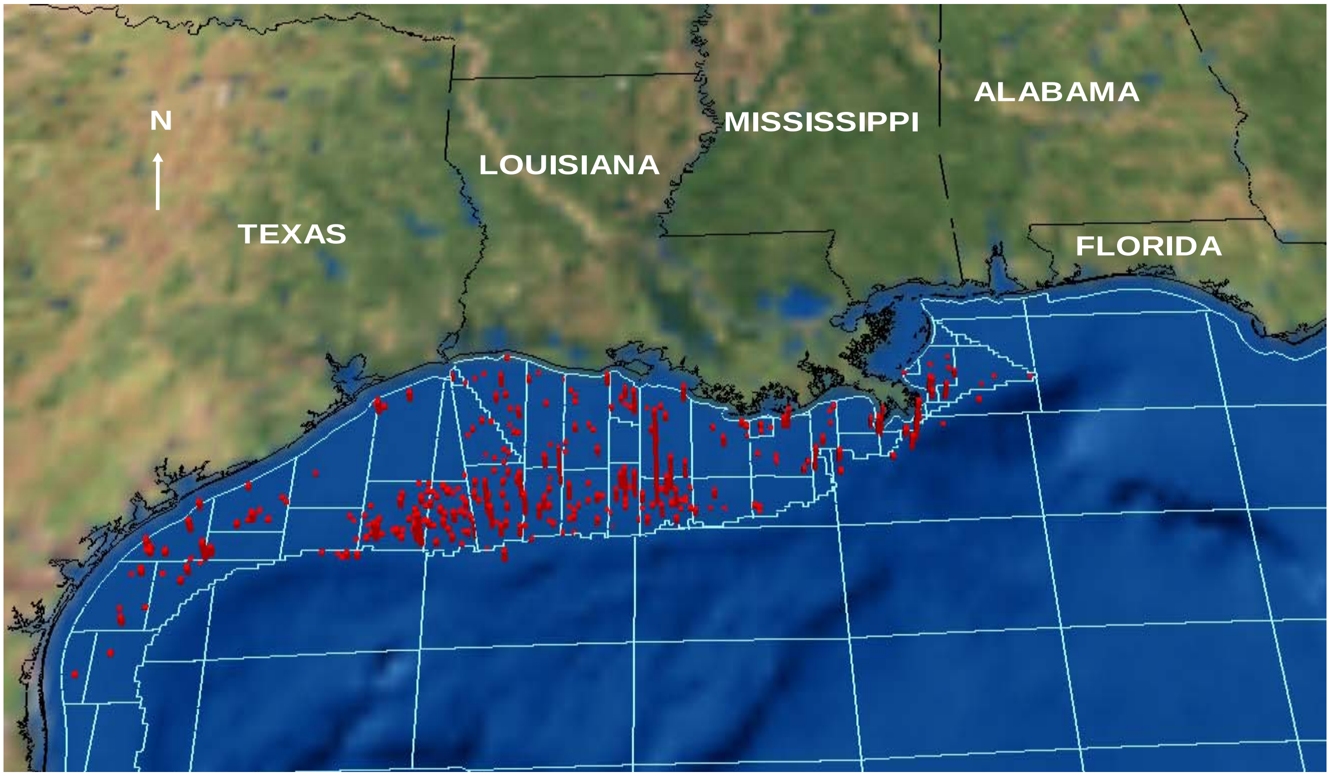


Figure 17. Location of proved fields discovered 1970-1979, Gulf of Mexico OCS.

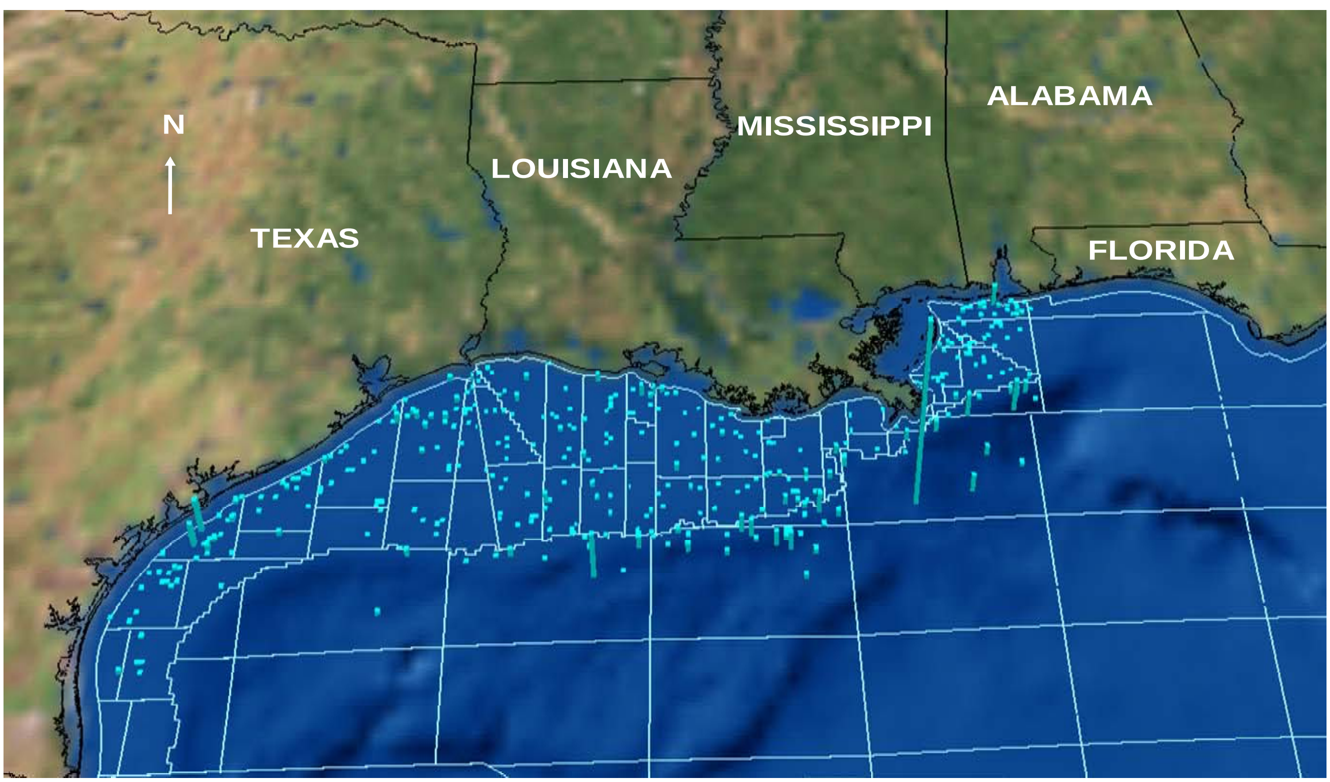


Figure 18. Location of proved fields discovered 1980-1989, Gulf of Mexico OCS.

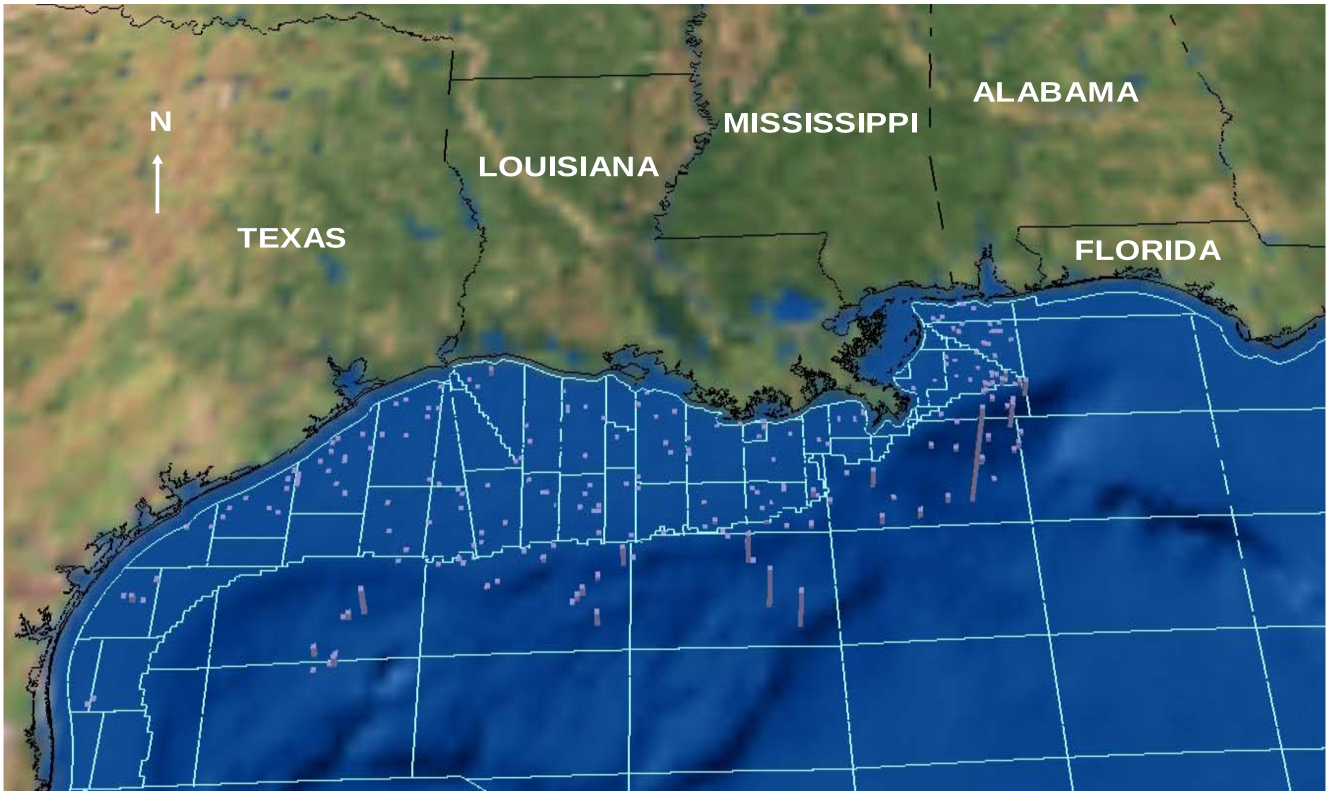


Figure 19. Location of proved fields discovered 1990-1999, Gulf of Mexico OCS.

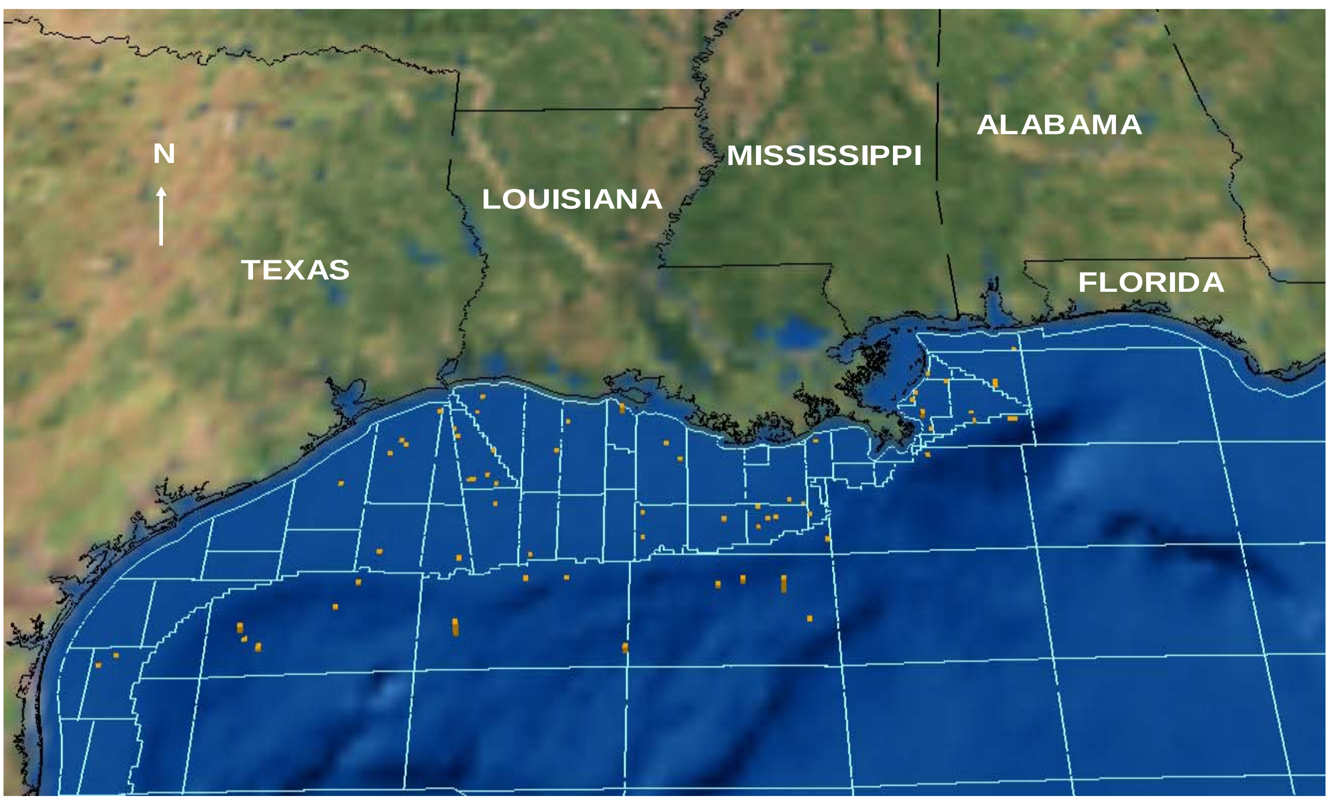


Figure 20. Location of proved fields discovered 2000-2003, Gulf of Mexico OCS.

Figure 21 shows annual field discoveries by geologic age for the 1,141 proved fields. Figure 22 shows annual field discoveries of proved reserves by geologic age for the 1,141 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 reflected 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***, available on the GOM Region's Internet homepage, provides detailed information on deepwater activities.

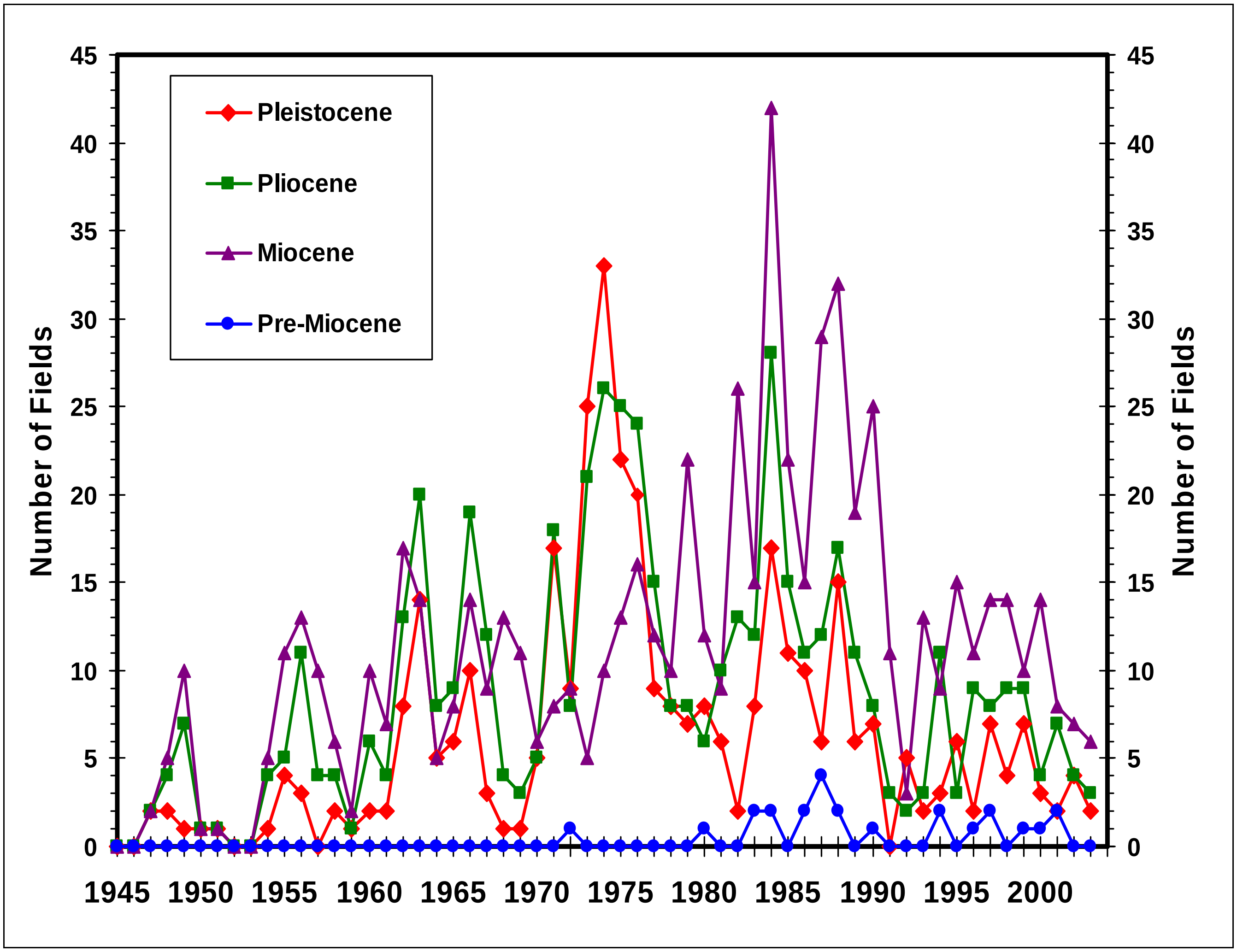


Figure 21. Annual number of field discoveries by geologic age, 1,141 proved fields.

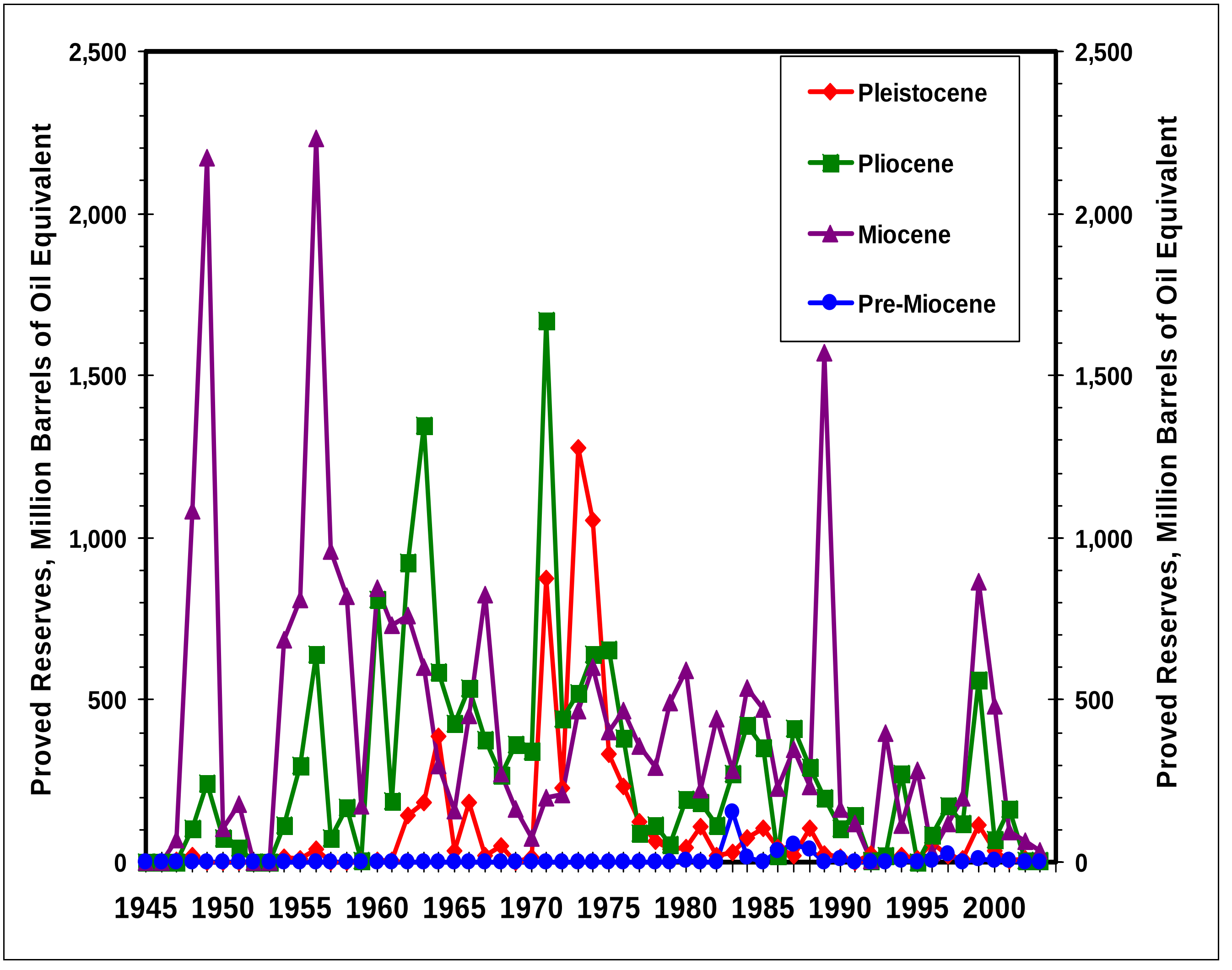


Figure 22. Annual discoveries of proved reserves by geologic age, 1,141 proved fields.

Field-Size Distribution

Reserve sizes are expressed in terms of barrels of oil equivalent and added to the liquid reserves. 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 1,141 proved fields is shown in figure 24(a). Of the 1,141 proved oil and gas fields, there are 216 proved oil fields represented in figure 25(a) and 925 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 55 unproved fields, is shown in figure 27(a). There are 32 unproved oil fields in figure 27(b) and 23 unproved gas fields in figure 27(c). All unproved active fields were studied.

Analysis of the 1,141 proved oil and gas fields indicates that the Gulf of Mexico is historically a gas-prone basin. Figure 28 summarizes the total reserves, the median (exceeded by 50%), and the mean (arithmetic average) 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 216 proved oil fields is 2,720 SCF/STB. The GOR of the 32 unproved oil fields is 956 SCF/STB. The mean yield (condensate divided by gas) for the 925 proved gas fields is 22.7 barrels of condensate per million cubic feet (MMcf) of gas. The mean yield of the 23 unproved gas fields is 14.7 barrels of condensate per MMcf.

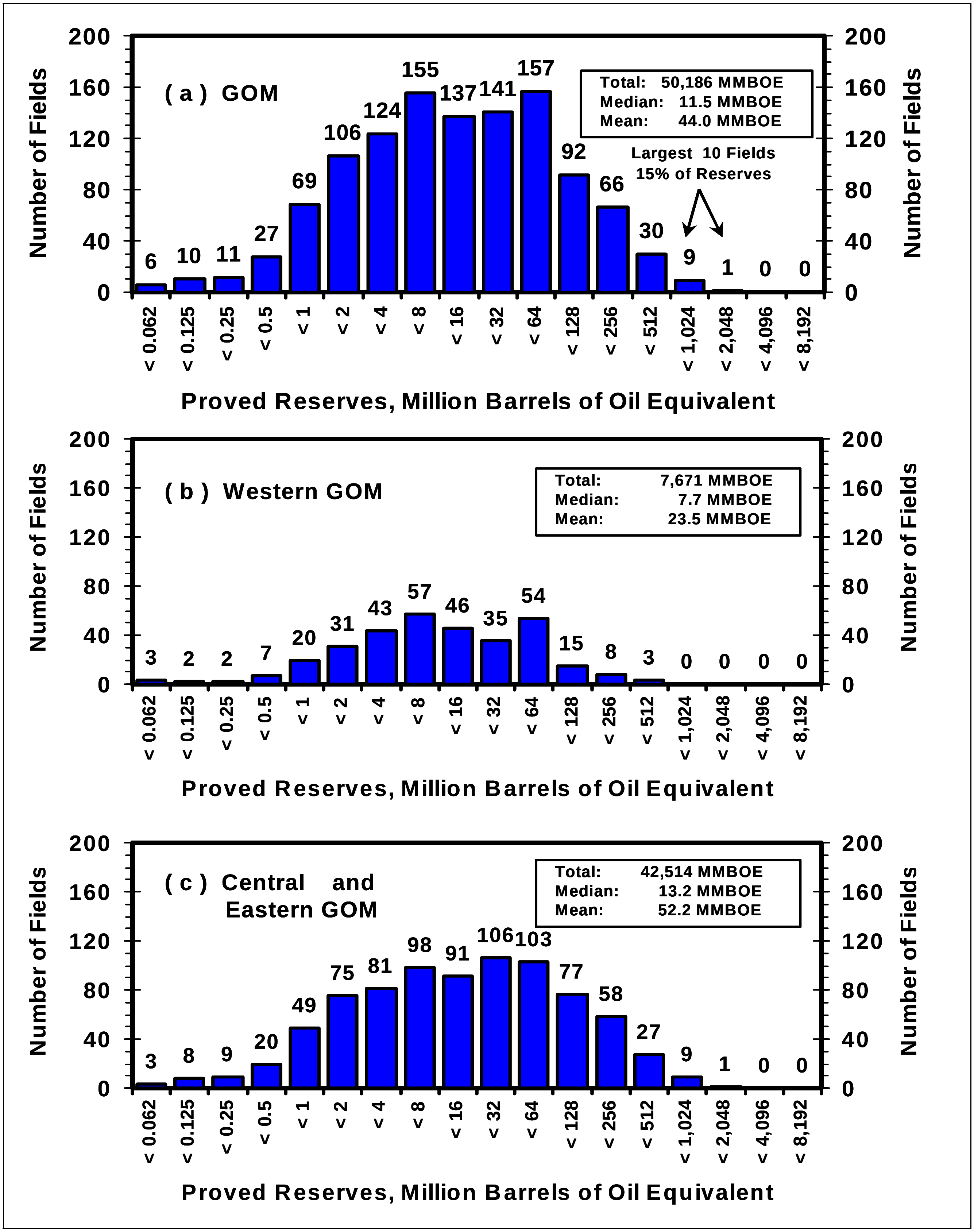


Figure 24. Field-size distribution of proved fields: (a) 1,141 fields, GOM; (b) 326 fields, Western GOM; (c) 815 fields, Central and Eastern GOM.

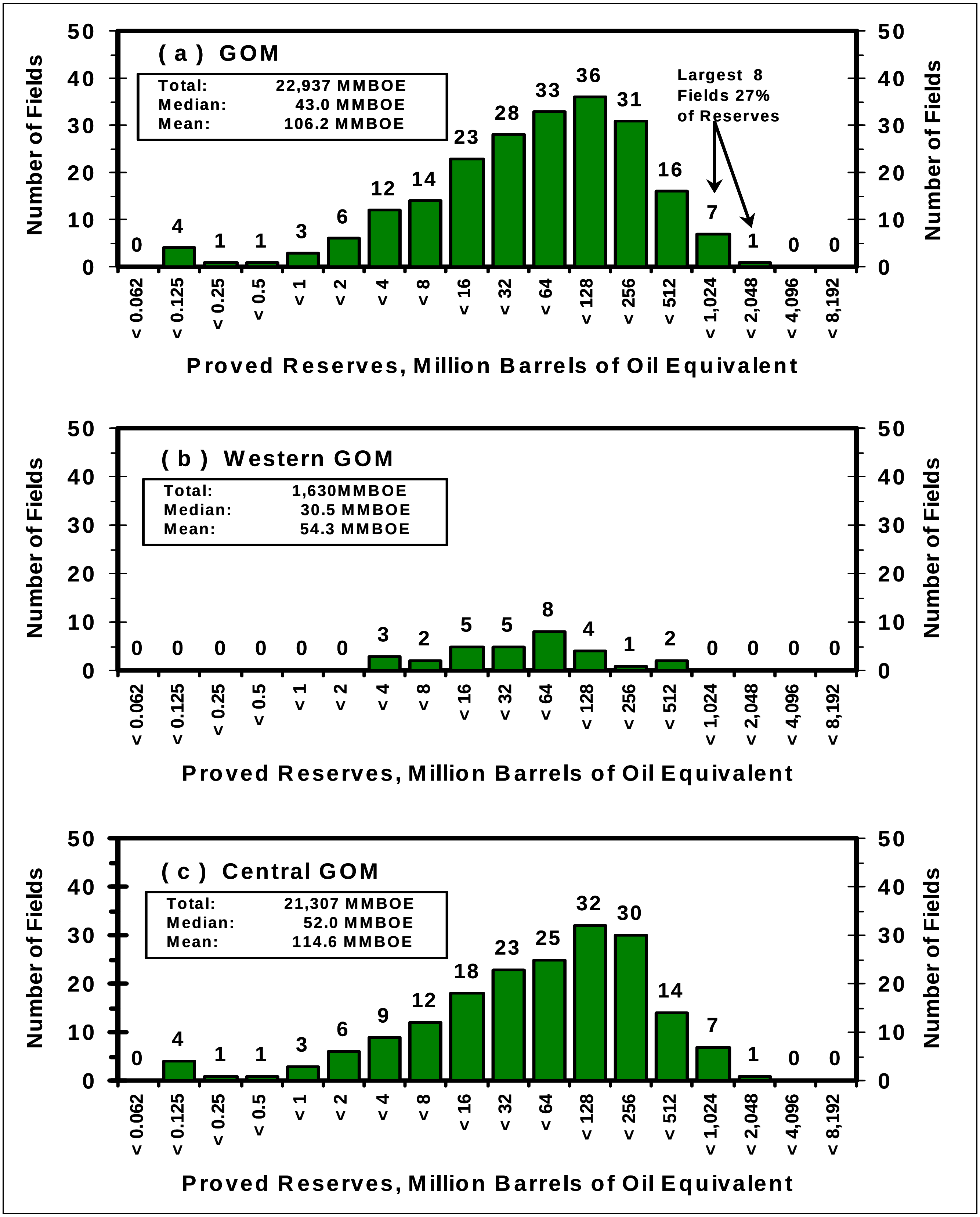


Figure 25. Field-size distribution of proved oil fields: (a) 216 fields GOM; (b) 30 fields, Western GOM; (c) 186 fields, Central and Eastern GOM.

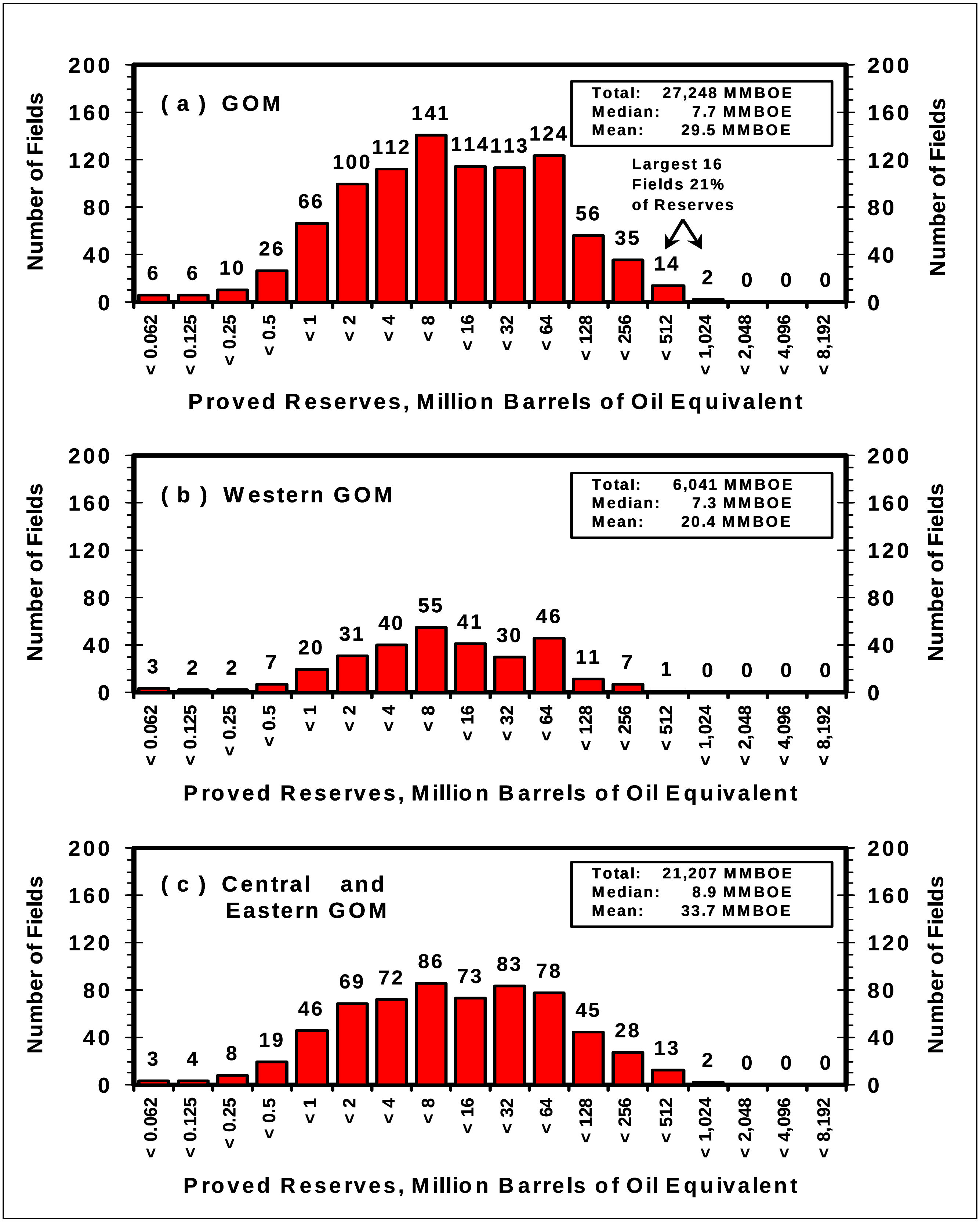


Figure 26. Field-size distribution of proved gas fields: (a) 925 fields, GOM; (b) 296 fields, Western GOM; (c) 629 fields, Central and Eastern GOM.

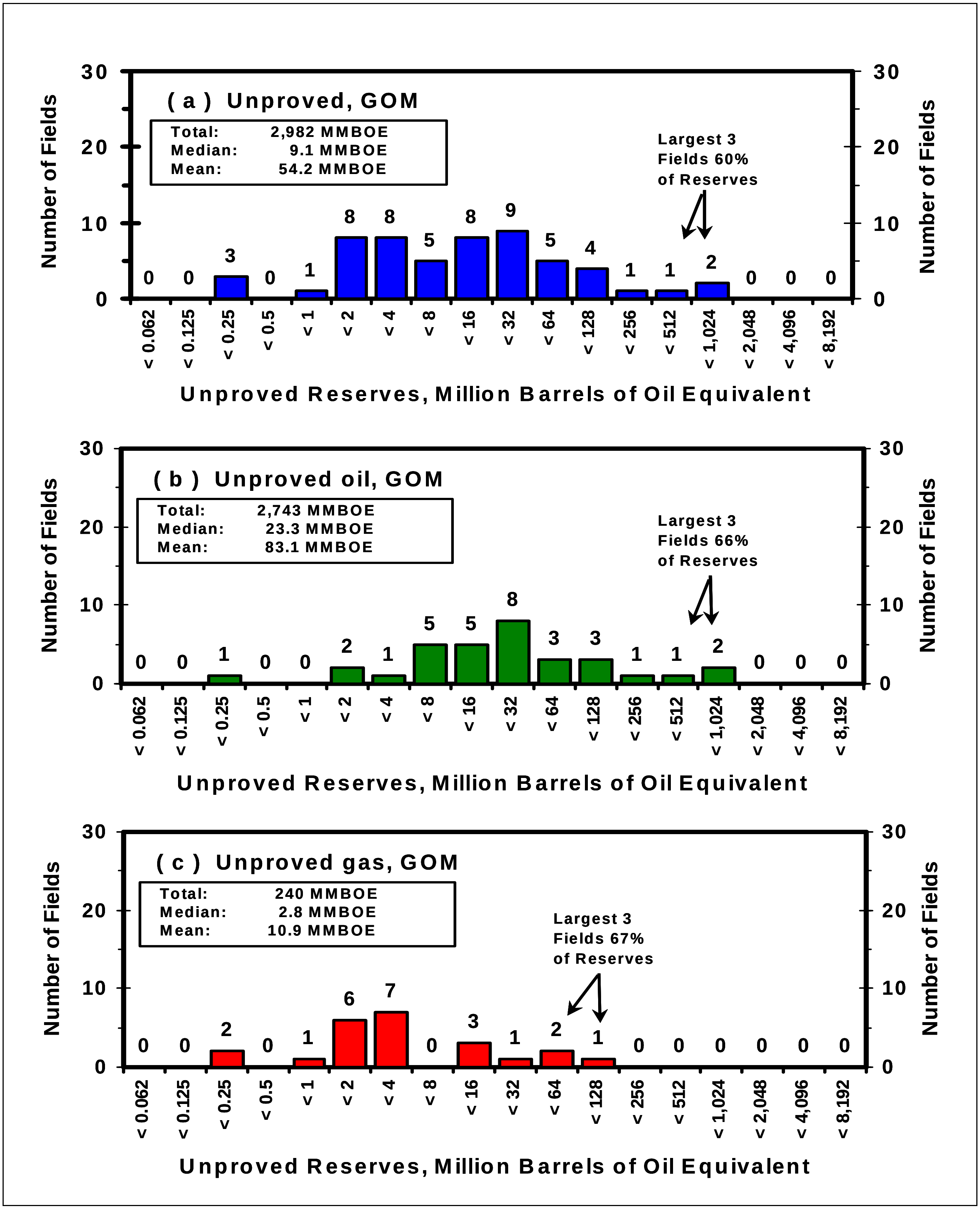


Figure 27. Field-size distribution of unproved fields: (a) 55 fields, GOM; (b) 32 oil fields, GOM; (c) 23 gas fields, GOM.

Description of Fields	Figure Number	Median*	Mean*	Largest Fields	
				Number	Reserves
1,141 Proved	Fig. 24a	11.5	44.0	10	15%
216 Proved Oil	Fig. 25a	43.0	106.2	8	27%
925 Proved Gas	Fig. 26a	7.7	29.5	16	21%
55 Unproved	Fig. 27a	9.1	54.2	3	60%
32 Unproved Oil	Fig. 27b	23.3	83.1	3	66%
23 Unproved Gas	Fig. 27c	2.8	10.9	1	36%
* 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 1,141 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 81 largest fields. Ninety percent of the proved reserves are contained in the 399 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 1,141 proved fields. The 55 unproved active fields are presented to show current 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 80 percent of the proved reserves. Development of the slope, 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 44.0 MMBOE. For water depths less than 651 ft, it is 39.6 MMBOE; for 651-1,300 ft, it is 38.0 MMBOE; for 1,301-2,600 ft, it is 48.0 MMBOE; and greater than 2,600 ft, it is 127.2 MMBOE.

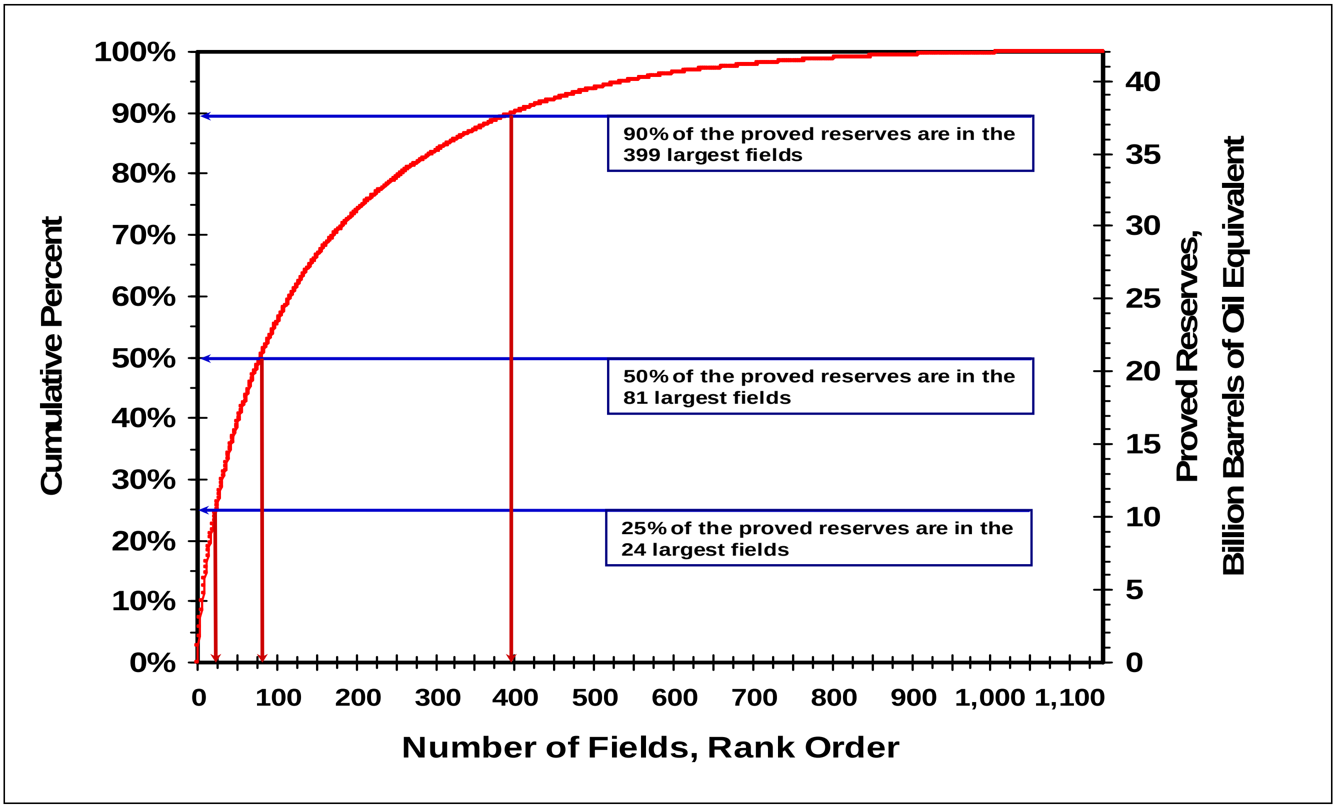


Figure 29. Cumulative percent total reserves versus rank order of field size for 1,141 proved fields.

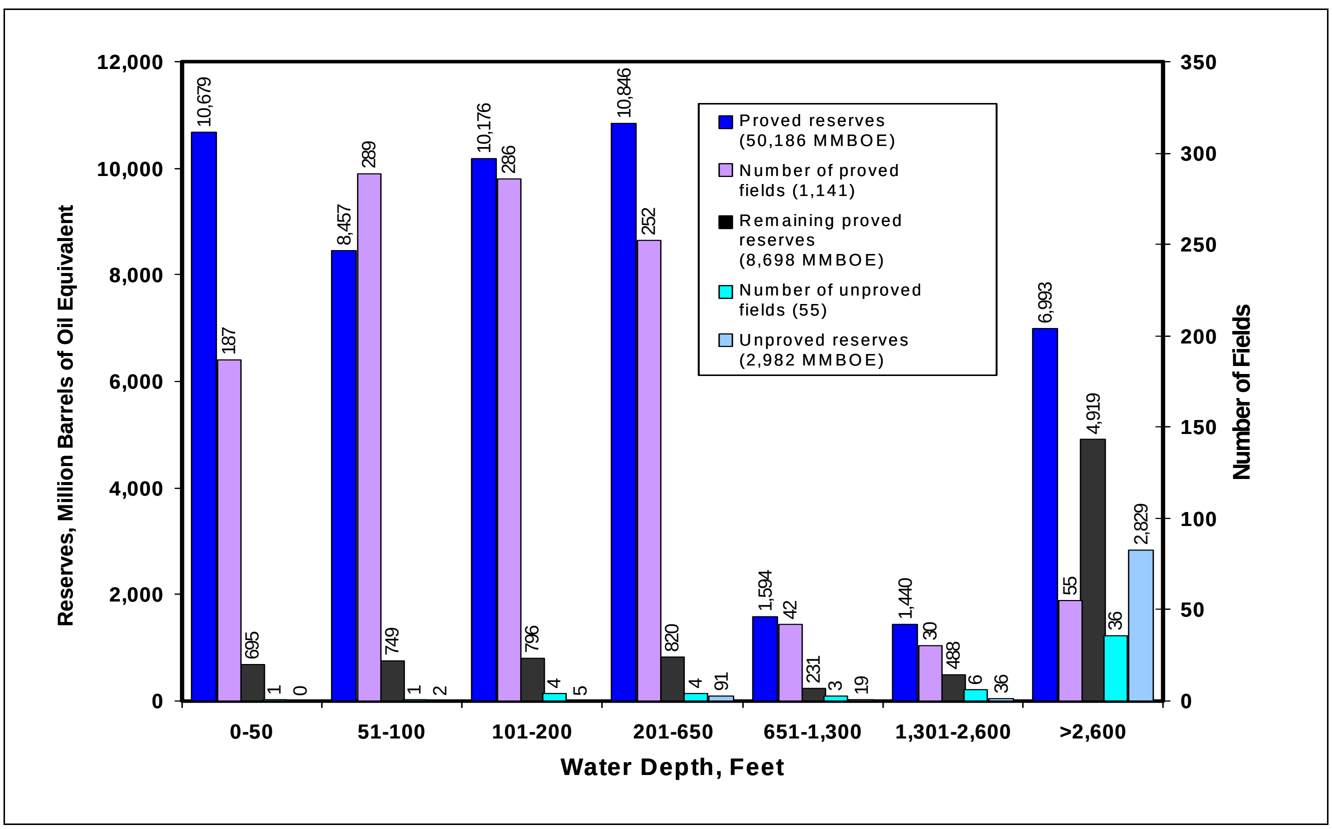


Figure 30. Field and reserves distribution by water depth. (Totals are in parentheses.)

Figure 31 shows the largest 20 fields ranked in order by remaining proved reserves. Seventeen of the twenty top fields lie in water depths of greater than 1,300 ft and account for 50 percent of the remaining proved reserves in the Gulf of Mexico.

Estimates of proved reserves on the slope are increasing. This trend is expected to continue in the future because of additional exploration and development. Of the 127 proved fields in water depths greater than 650 ft, 102 are producing, 8 are depleted, and 17 have yet to produce. There are 45 unproved active fields in water depths greater than 650 ft. These fields contain 2,884 MMBOE, representing 97 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 act 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.

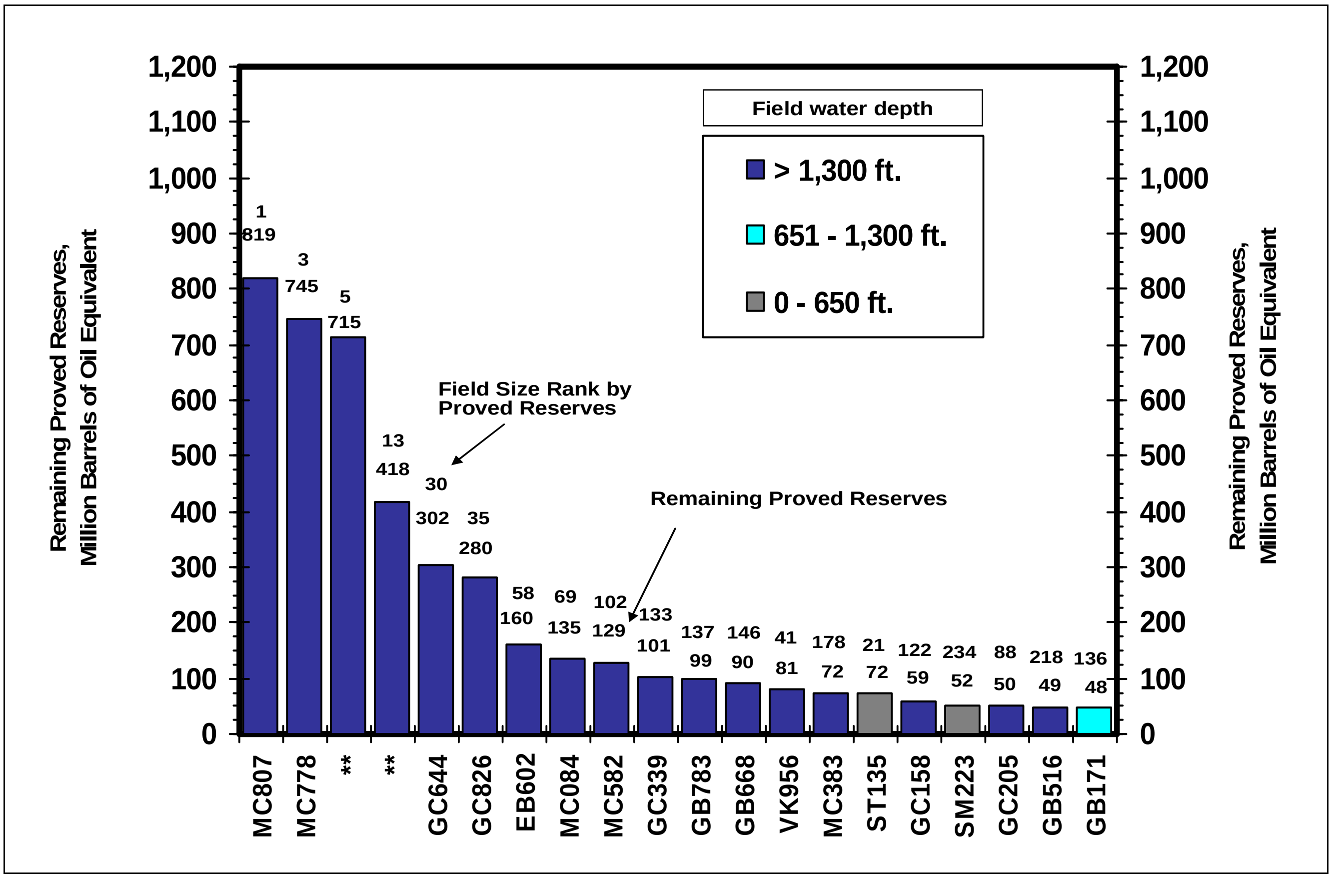


Figure 31. Largest 20 fields ranked by remaining proved reserves. (Note: **indicates the field is proprietary.)

Table 4 lists the 50 largest proved fields ranked by proved reserves expressed in BOE. Rank, field name, new discoveries, discovery year, water depth, field classification, field type, field GOR, proved reserves, cumulative production through 2003, and remaining proved reserves are presented. A complete listing of all 1,141 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. If there were any new fields proved in 2003, they would be identified with an asterisk in the column labeled "New Disc." 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 fields by rank order, based on proved BOE reserves, top 50 fields.

(For proved fields not qualified in 2003 , 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 disc	Disc year	Water depth (feet)	Field class	Field type	Field GOR (SCF/STB)	Proved reserves			Cumulative production through 2003			Remaining proved reserves		
								Oil (MMbbl)	Gas (Bcf)	BOE (MMbbl)	Oil (MMbbl)	Gas (Bcf)	BOE (MMbbl)	Oil (MMbbl)	Gas (Bcf)	BOE (MMbbl)
1	MC807		1989	3,367	PDP	O	1,451	1,148.2	1,665.9	1,444.6	511.4	640.3	625.4	636.7	1,025.6	819.2
2	EI330		1971	246	PDP	O	4,333	426.3	1,847.4	755.1	409.1	1,776.2	725.1	17.3	71.2	29.9
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	49	PDP	O	1,503	566.6	851.4	718.1	552.1	811.3	696.5	14.5	40.2	21.6
5	**		1998	6,593	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	4,322	372.4	1,609.7	658.9	356.0	1,510.3	624.7	16.4	99.5	34.1
7	BM002		1949	50	PDP	O	1,059	524.6	555.7	623.5	515.9	527.9	609.9	8.7	27.8	13.6
8	TS000		1958	13	PDP	G	85,038	37.3	3,170.7	601.5	36.5	3,128.9	593.3	0.7	41.8	8.2
9	VR014		1956	26	PDP	G	64,120	48.1	3,084.0	596.9	47.7	3,037.6	588.2	0.4	46.5	8.6
10	MP041		1956	42	PDP	O	5,878	258.8	1,521.5	529.6	245.0	1,414.9	496.8	13.8	106.7	32.8
11	VR039		1948	38	PDP	G	82,199	31.7	2,606.8	495.6	30.8	2,527.1	480.4	0.9	79.6	15.1
12	SS208		1960	103	PDP	O	6,362	219.0	1,393.0	466.8	212.7	1,319.5	447.4	6.3	73.5	19.4
13	**		2000	5,638	PU	O	1,143	347.1	396.8	417.7	0.0	0.0	0.0	347.1	396.8	417.7
14	WD073		1962	177	PDP	O	2,607	272.4	710.1	398.7	255.4	617.8	365.3	17.0	92.3	33.4
15	GI016		1948	54	PDP	O	1,265	301.0	380.9	368.8	295.7	372.3	361.9	5.3	8.6	6.8
16	GB426		1987	2,863	PDP	O	3,740	219.3	820.2	365.2	197.2	704.0	322.5	22.1	116.2	42.7
17	SP061		1967	221	PDP	O	1,964	263.5	517.6	355.6	254.5	495.7	342.7	9.0	21.9	12.9
18	EI238		1964	146	PDP	G	16,921	87.5	1,480.3	350.9	80.0	1,352.9	320.7	7.5	127.5	30.2
19	SP089		1969	425	PDP	O	4,444	191.2	849.7	342.4	185.1	779.7	323.8	6.1	70.0	18.6
20	ST172		1962	98	PDP	G	159,156	11.5	1,827.8	336.7	10.6	1,776.1	326.6	0.9	51.7	10.1
21	ST135		1956	130	PDP	O	4,791	179.7	860.7	332.8	162.8	553.3	261.2	16.9	307.4	71.6
22	WC180		1961	49	PDP	G	140,801	12.7	1,794.4	332.0	12.6	1,749.3	323.9	0.1	45.2	8.2
23	ST021		1957	46	PDP	O	1,670	252.2	421.1	327.1	240.5	387.5	309.5	11.7	33.6	17.6
24	MC194		1975	1,024	PDP	O	4,314	178.1	768.3	314.8	173.3	717.5	301.0	4.8	50.8	13.8
25	SM048		1961	100	PDP	G	55,396	28.9	1,601.4	313.9	27.4	1,496.3	293.6	1.6	105.0	20.2
26	EI292		1964	211	PDP	G	85,590	19.1	1,632.5	309.6	17.9	1,597.0	302.1	1.2	35.5	7.5
27	SS169		1960	63	PDP	O	5,502	155.3	854.6	307.4	146.6	775.6	284.6	8.7	79.0	22.7
28	EC271		1971	171	PDP	G	19,200	68.6	1,317.1	303.0	66.7	1,298.3	297.7	1.9	18.8	5.3
29	EC064		1957	49	PDP	G	57,506	26.9	1,548.1	302.4	26.2	1,524.9	297.5	0.7	23.2	4.8
30	GC644		1999	4,339	PU	O	1,378	242.6	334.2	302.0	0.0	0.0	0.0	242.6	334.2	302.0
31	ST176		1963	127	PDP	G	15,001	82.3	1,234.3	301.9	77.1	1,090.3	271.1	5.2	144.0	30.8
32	SP027		1954	63	PDP	O	5,283	150.5	795.0	291.9	148.1	752.0	281.9	2.4	43.0	10.0
33	SS176		1956	100	PDP	G	20,369	62.8	1,278.5	290.3	60.9	1,238.9	281.3	1.9	39.7	8.9
34	WC587		1971	211	PDP	G	120,453	12.8	1,541.0	287.0	12.6	1,512.5	281.7	0.2	28.5	5.3
35	GC826		1998	4,738	PU	O	554	254.5	141.1	279.6	0.0	0.0	0.0	254.5	141.1	279.6
36	EI296		1971	213	PDP	G	69,383	20.4	1,418.3	272.8	20.2	1,400.1	269.4	0.2	18.1	3.4
37	WD079		1966	125	PDP	O	3,824	162.3	620.7	272.8	159.7	606.4	267.6	2.6	14.3	5.2
38	WC192		1954	57	PDP	G	60,740	22.8	1,382.9	268.8	21.5	1,314.4	255.4	1.2	68.5	13.4
39	MI623		1980	82	PDP	G	98,889	14.3	1,413.9	265.9	12.9	1,264.6	237.9	1.4	149.3	28.0
40	HI573A		1973	342	PDP	O	8,012	106.5	853.6	258.4	104.1	841.7	253.9	2.5	11.9	4.6
41	VK956		1985	3,242	PDP	O	11,294	81.1	916.1	244.1	67.2	536.3	162.6	13.9	379.7	81.5
42	SM023		1960	82	PDP	G	38,365	30.7	1,178.2	240.3	29.1	1,124.1	229.1	1.6	54.1	11.2
43	GI047		1955	89	PDP	O	3,511	145.8	512.1	237.0	139.1	493.8	227.0	6.7	18.3	10.0
44	SP078		1972	204	PDP	G	12,031	74.8	900.2	235.0	68.9	862.5	222.4	5.9	37.7	12.6
45	VR076		1949	31	PDP	G	122,642	10.2	1,250.0	232.6	6.2	1,134.8	208.1	4.0	115.3	24.5
46	SM130		1973	215	PDP	O	1,373	185.6	254.9	231.0	179.7	237.8	222.0	5.9	17.1	8.9
47	SM066		1963	124	PDP	G	253,344	4.9	1,234.0	224.4	4.8	1,210.1	220.1	0.1	24.0	4.4
48	PL020		1951	33	PDP	O	5,556	112.8	627.0	224.4	103.3	579.4	206.4	9.6	47.6	18.0
49	GC244		1994	2,679	PDP	O	2,029	164.7	334.2	224.2	147.5	295.3	200.0	17.2	38.9	24.1
50	EI266		1962	160	PDP	G	124,036	9.5	1,183.7	220.2	7.6	1,100.5	203.4	2.0	83.1	16.8

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 2,199 proved combination reservoirs. The median is 0.9 MMBOE and the mean is 3.0 MMBOE. The GOR for the oil portion of the reservoirs is 1,152 SCF/STB, and the yield for the gas cap is 19.4 barrels of condensate per MMcf of gas.

Figure 33 shows the reservoir-size distribution, on the basis of proved oil, for 8,434 proved undersaturated oil reservoirs. The median is 0.3 MMbbl, the mean is 1.7 MMbbl, and the GOR is 1,246 SCF/STB.

Figure 34 shows the reservoir-size distribution, on the basis of proved gas, for 17,508 gas reservoirs. The median is 2.4 billion cubic feet (Bcf) of gas, the mean is 9.1 Bcf, and the yield is 11.8 barrels of condensate per MMcf of gas.

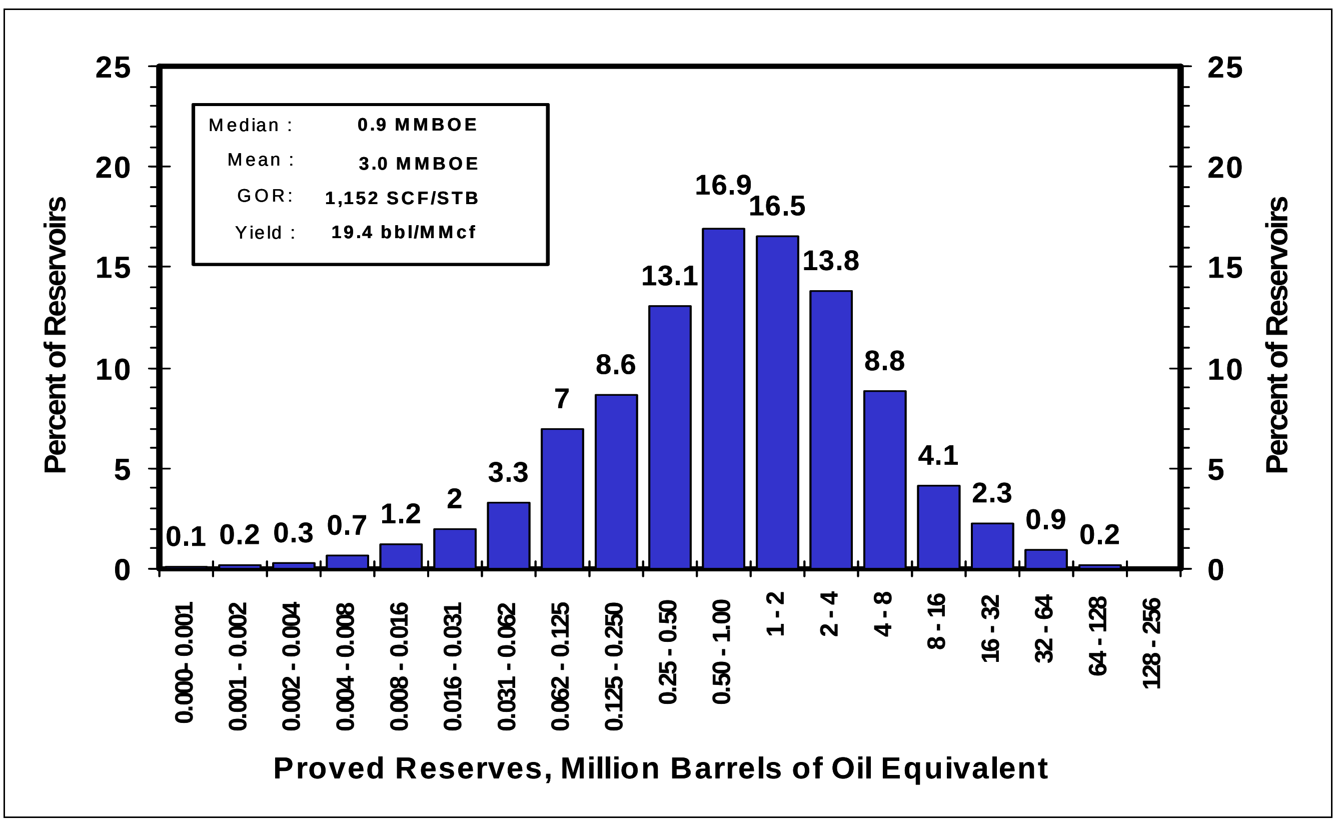


Figure 32. Reservoir-size distribution, 2,199 proved combination reservoirs.

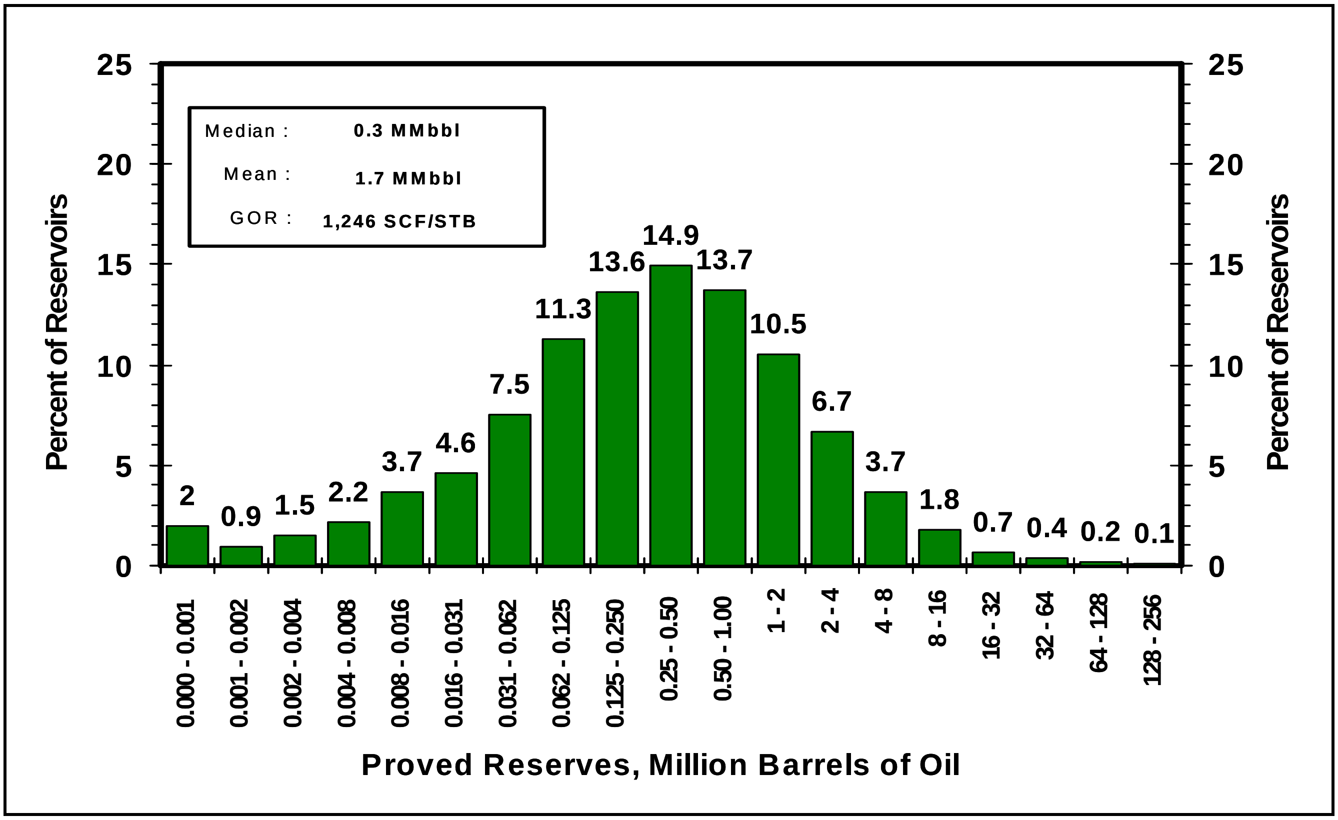


Figure 33. Reservoir-size distribution, 8,434 proved oil reservoirs.

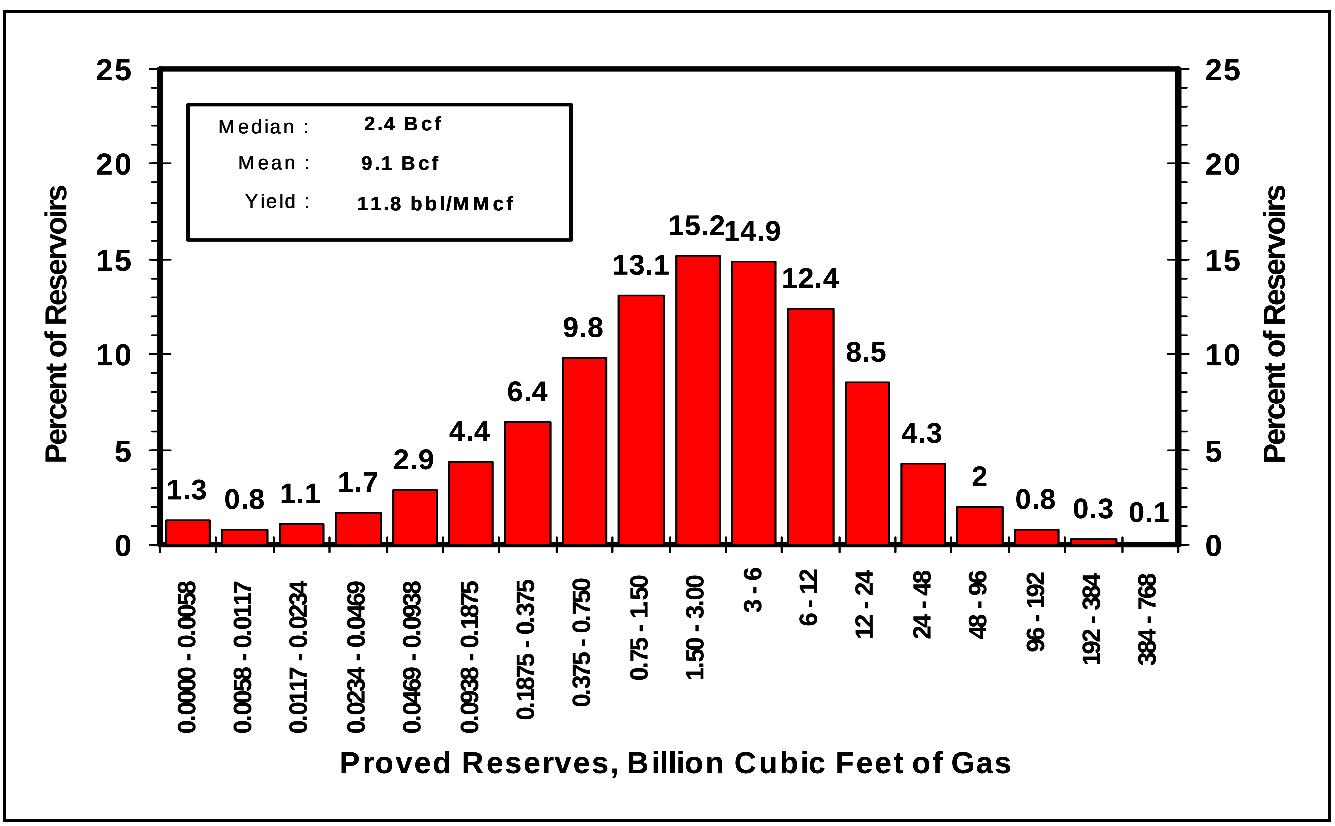


Figure 34. Reservoir-size distribution, 17,508 proved gas reservoirs.

Production Rates and Discovery Trends

The mean daily production in the Gulf of Mexico OCS during 2003 was 1,259,000 bbl of crude oil, 268,000 bbl of gas condensate, 1.98 Bcf of casinghead gas, and 10.09 Bcf of gas-well gas. The mean GOR of oil wells was 1,575 SCF/STB, and the mean yield from gas wells was 26.52 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 2003. Since the number of completions within a given range changes from month to month, the completion numbers presented are means of the 2003 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.

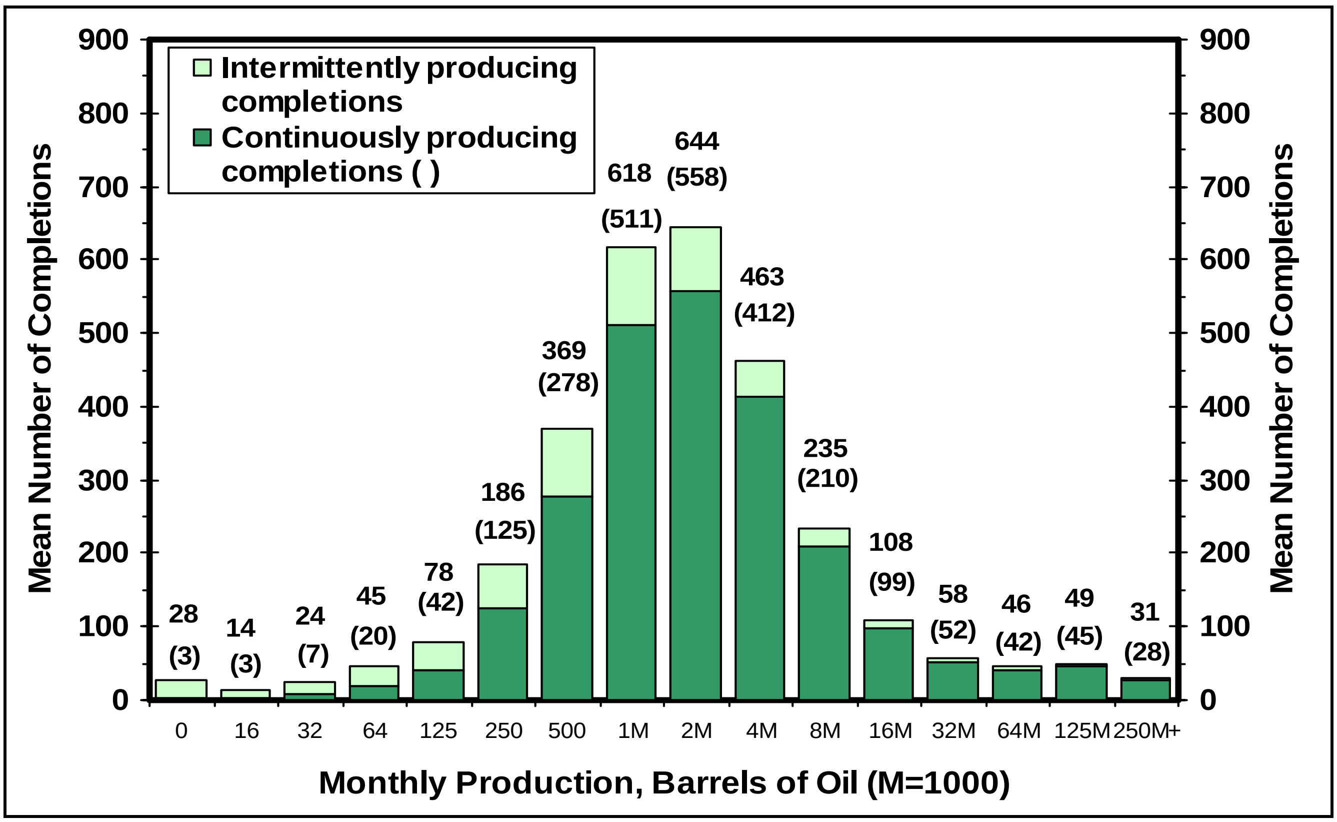


Figure 35. Monthly distribution of oil production, 2,996 completions (2,435 continuously producing completions).

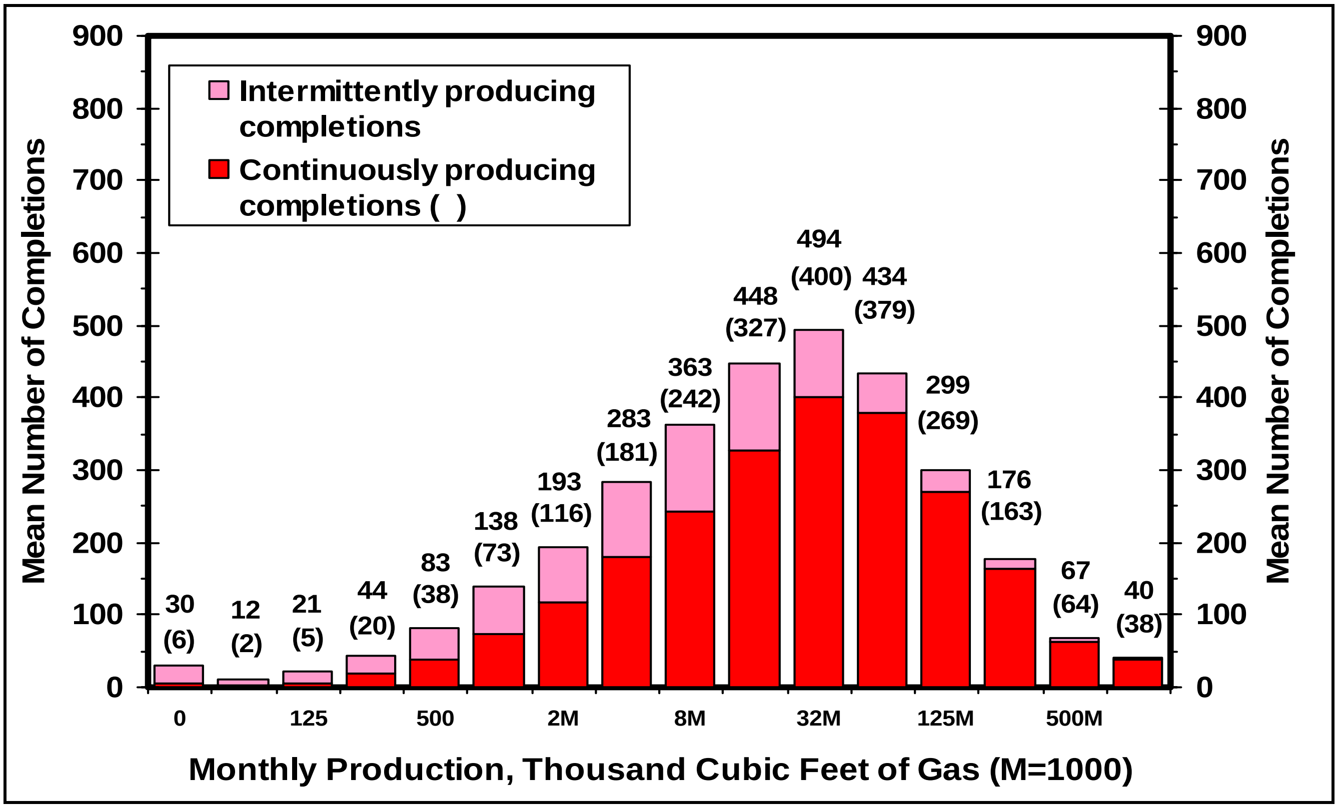


Figure 36. Monthly distribution of gas production, 3,125 completions (2,323 continuously producing completions).

Figure 37 summarizes the data from monthly distributions of oil and gas production rates. The highest reported monthly oil production volume was from a Pliocene reservoir with a subsea depth of 17,650 ft, during the month of January. The highest reported monthly gas production volume was from a Miocene reservoir with a subsea depth of 15,395 ft, during the month of December. The mean number of oil completions producing more than 1,000 bbl per day was 190, and the mean number of gas completions producing more than 10 MMcf per day was 224.

2003	Oil	Gas
Mean Number of Producing Completions	2,996	3,125
Mean Number of Continuously Producing Completions	2,435	2,323
Highest Monthly Mean Number of Producing Completions	3,049 (March)	3,154 (March)
Lowest Monthly Mean Number of Producing Completions	2,945 (December)	3,092 (November)
Mean Production Volume Mean Producing Rate	12,781 bbl (453 bbl per day)	98.1 MMcf (3.6 MMcf per day)
Median Production Volume Median Producing Rate	2,281 bbl (75 bbl per day)	29.6 MMcf (1.0 MMcf per day)
Highest Production Volume Highest Producing Rate	993,800 bbl (32,058 bbl per day)	4,749 MMcf (153.2 MMcf per day)

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, reflecting low world oil prices. From 1990 through 2002, annual oil production increased 105 percent, from 275 MMbbl to 565 MMbbl, because of the addition of deepwater production. In 2003 oil production decreased 1 percent to 557 MMbbl.

From 1990 through 1993, gas production declined 5 percent. From 1993 through 2003, 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 13 percent to 4.4 Tcf. For further analysis of the gas production decline, see the MMS OCS Report MMS 2004-065, ***Gulf of Mexico Oil and Gas Production Forecast: 2004-2013***, 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, 2003, 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, and is in a state of decline currently. 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 2003, the oil fields discovered rose to 21 percent, reflecting recent deepwater discoveries.

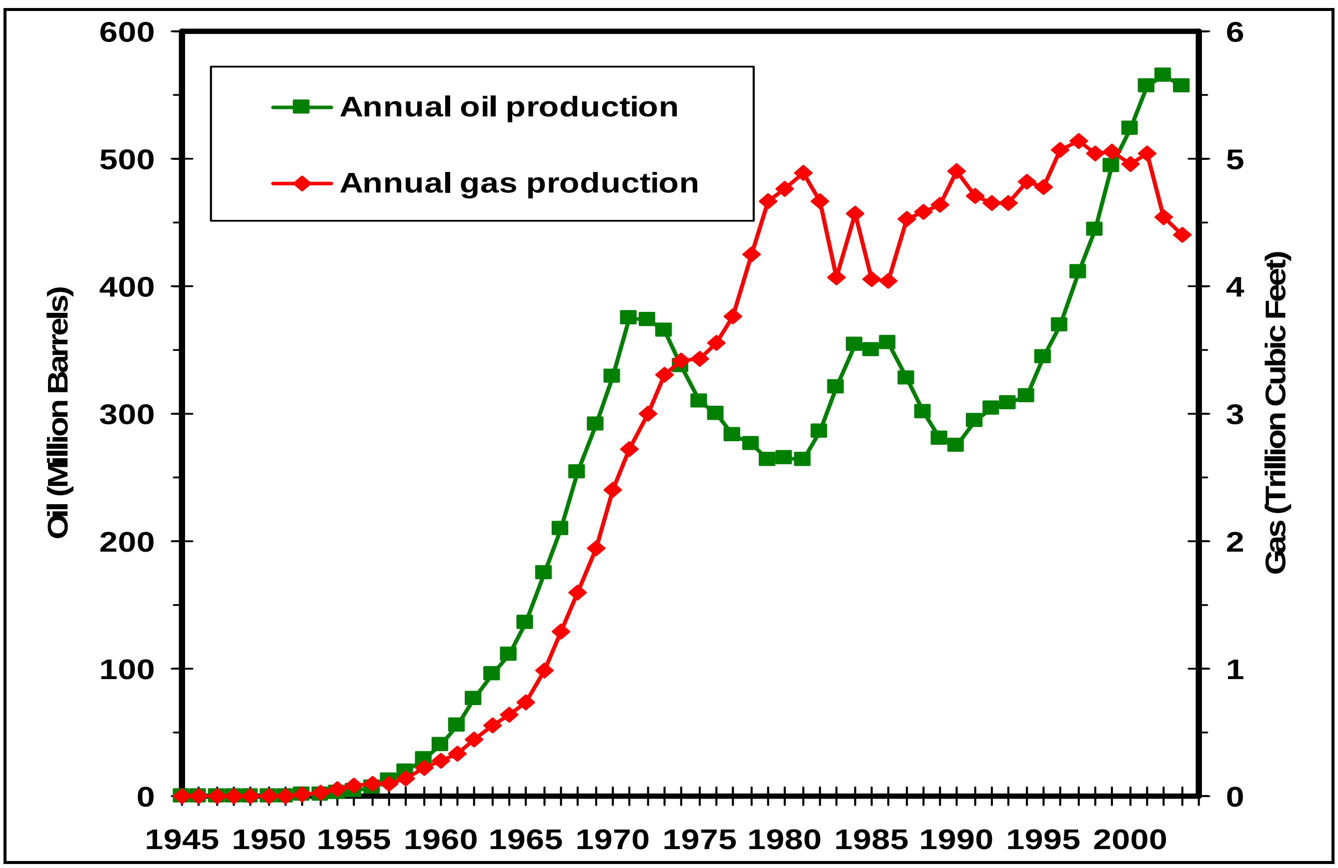


Figure 38. Annual oil and gas production.

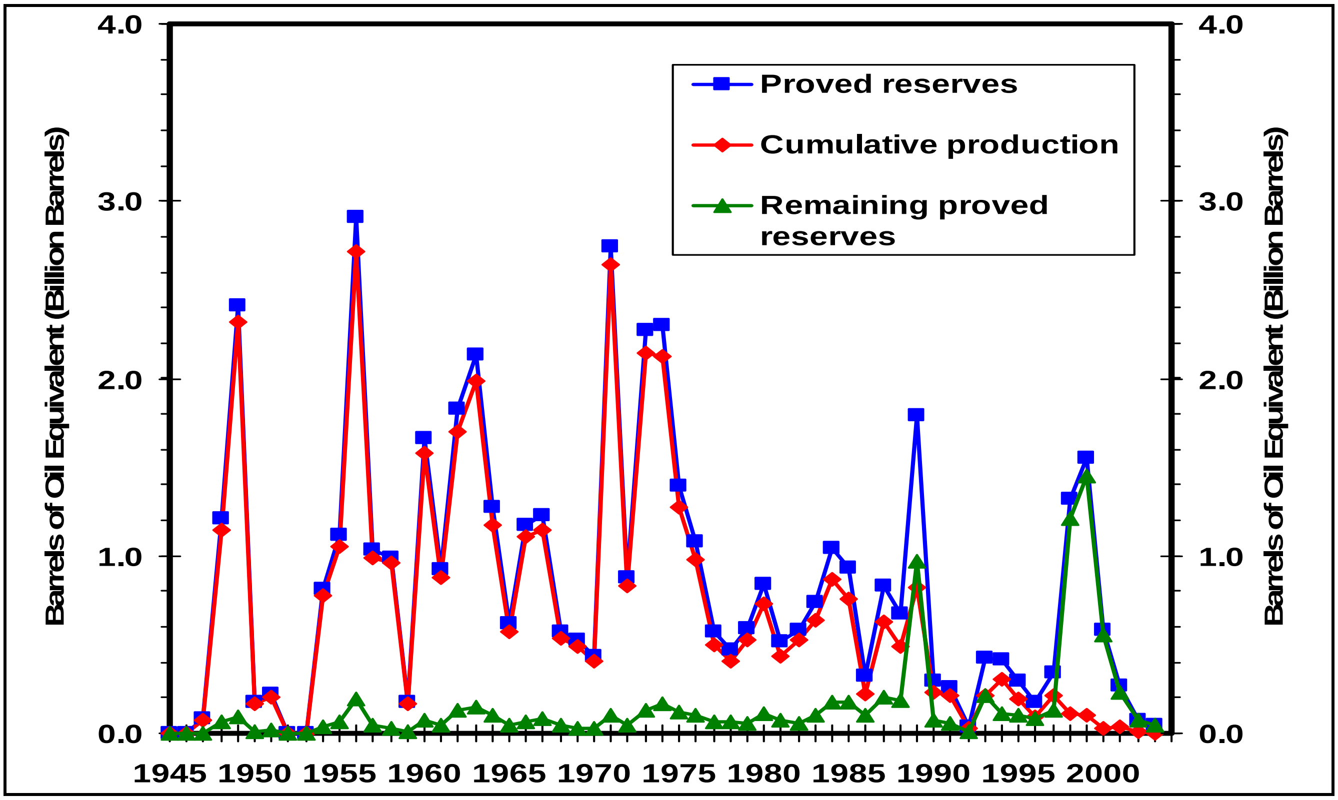


Figure 39. Proved reserves and production by field discovery year.

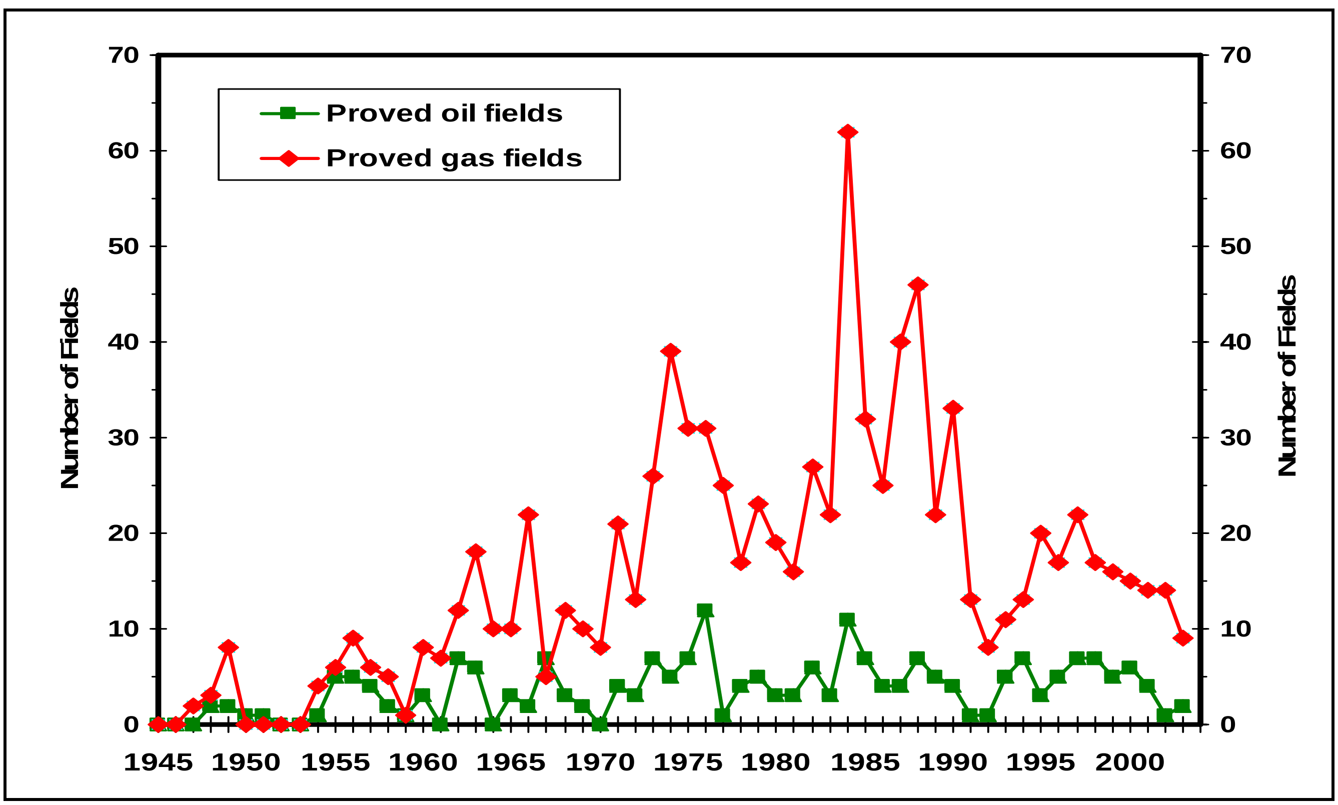


Figure 40. Annual oil and gas field discoveries.

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 1998 through 2000. The mean field size discovered is expected to increase because of reserves growth and additions in proved fields and reserves from unproved fields discovered in recent years.

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 five 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 curve 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 after the 1986 collapse in oil prices. A second decline occurred in 1991-92. Drilling increased from 1992 to 1997, reflecting stable energy prices and improvements in exploration and production technology. The variation in 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.

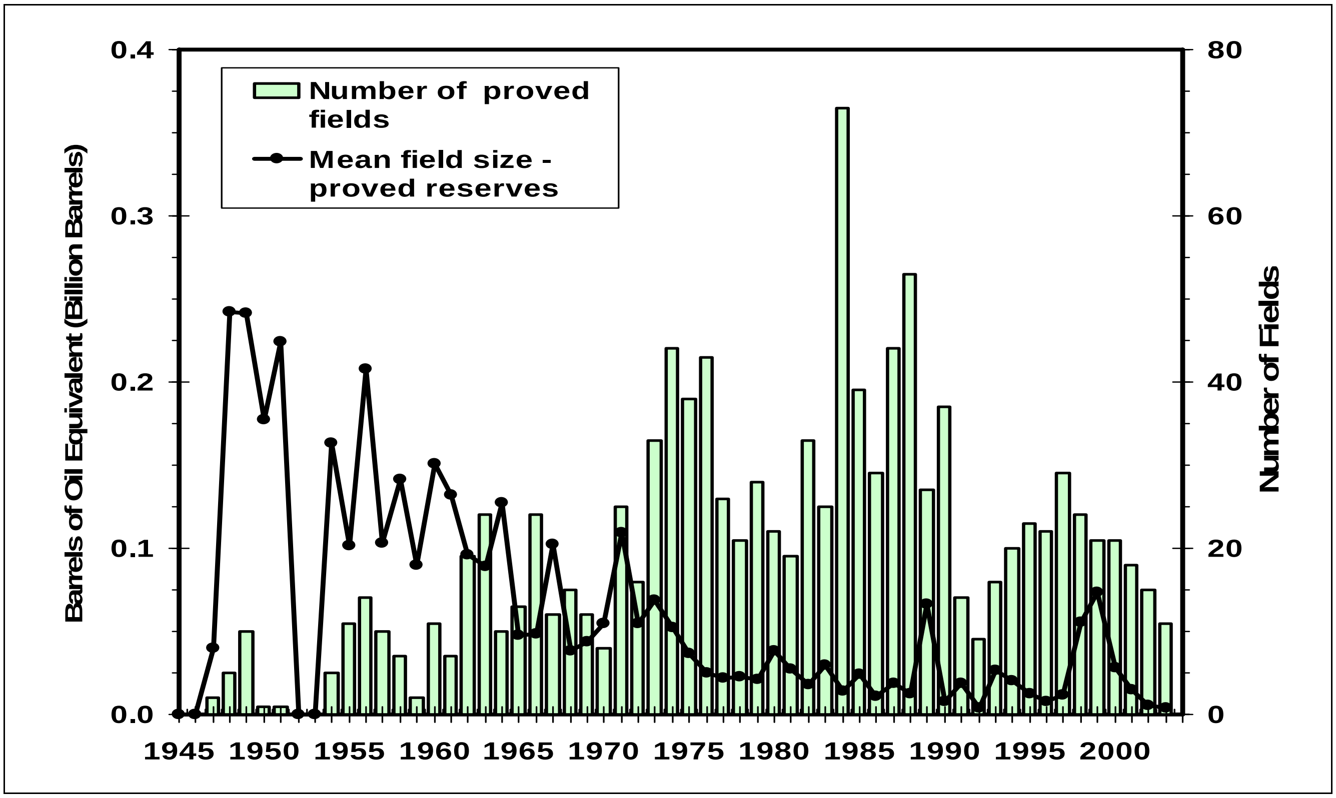


Figure 41. Number of proved fields and mean field size by field discovery year.

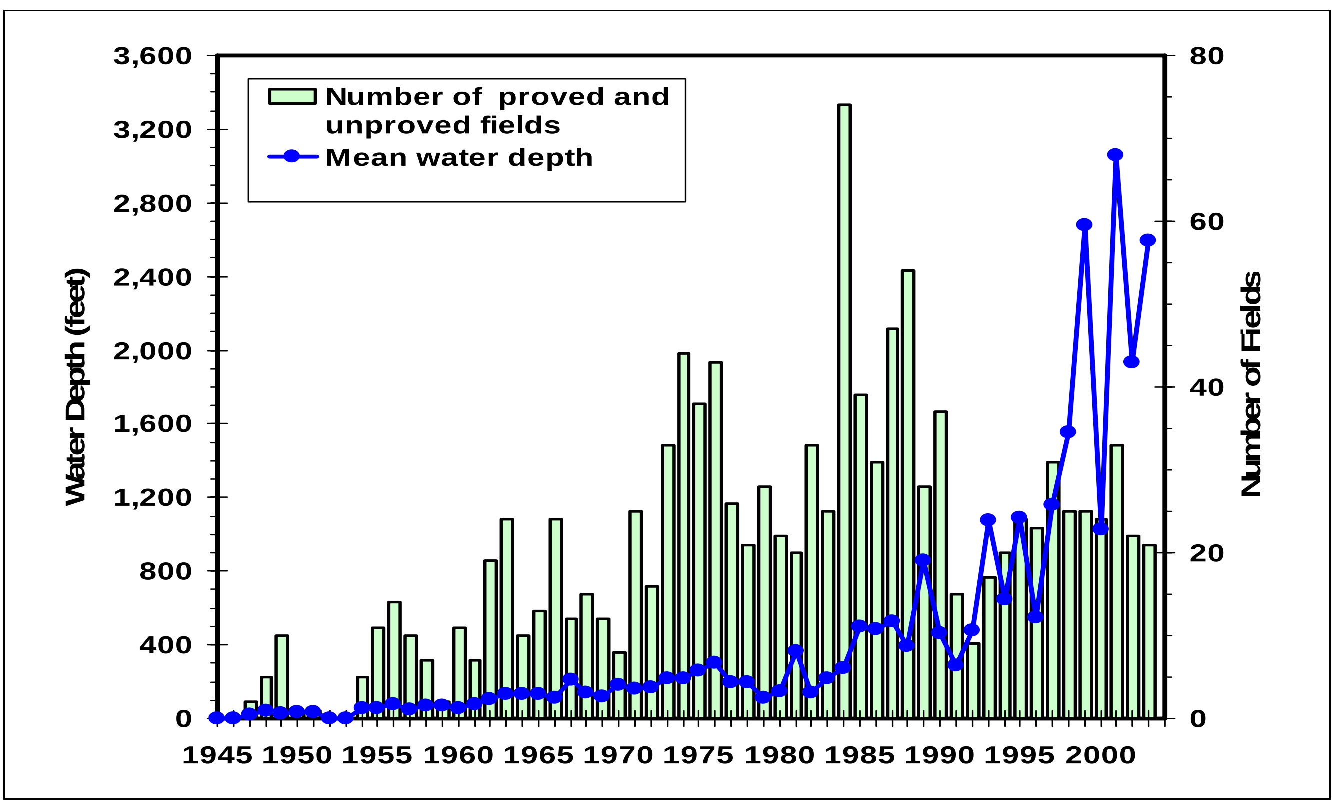


Figure 42. Number of proved and unproved fields and mean water depth by field discovery year.

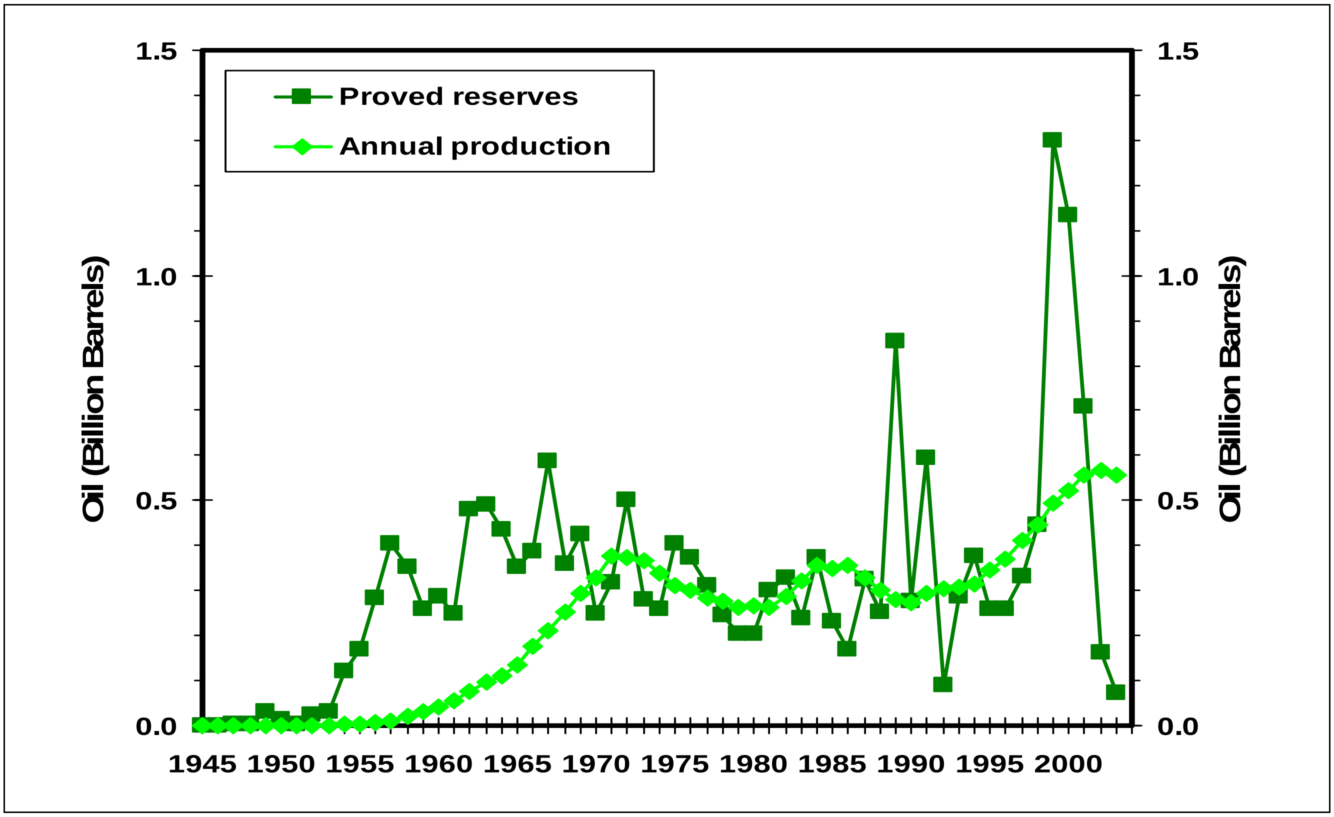


Figure 43. Proved oil reserves by reservoir discovery year and annual oil production.

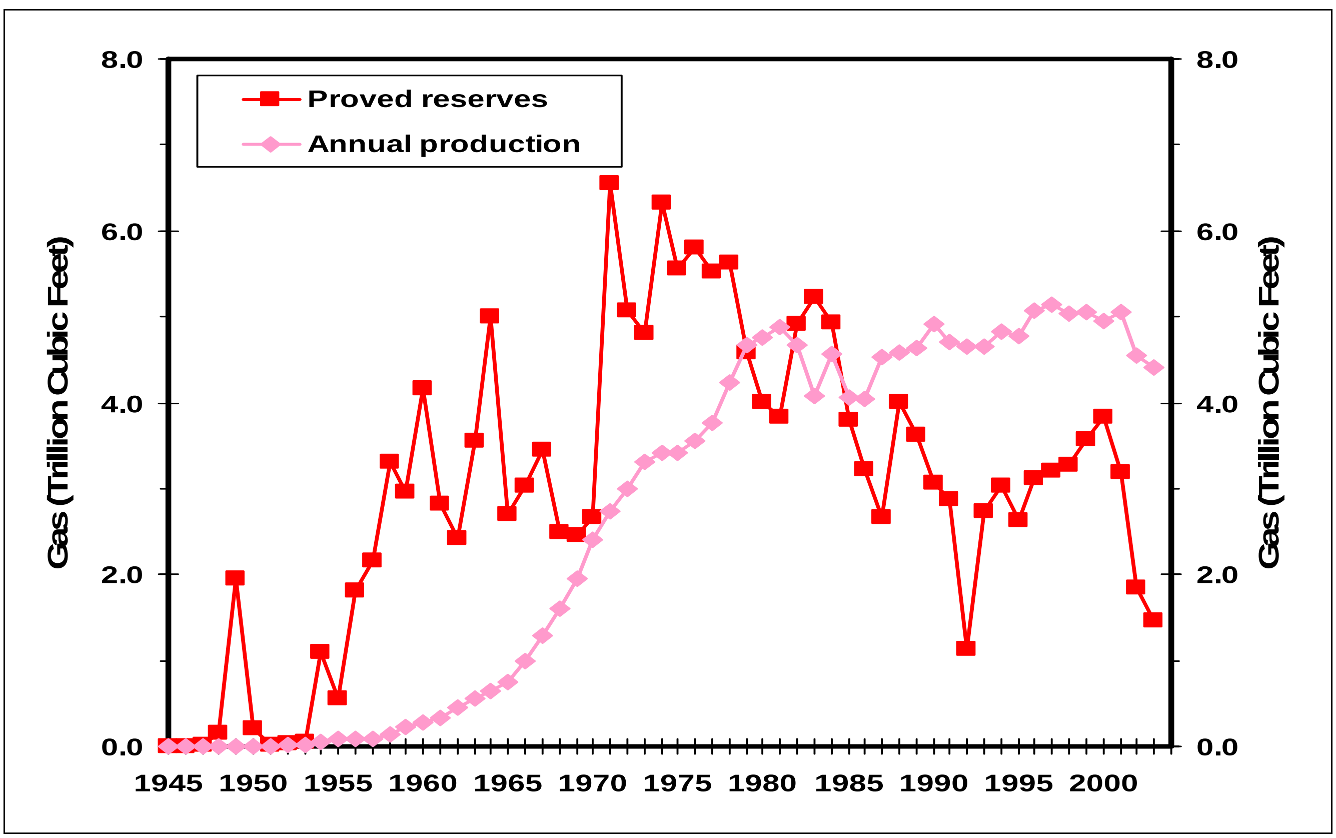


Figure 44. Proved gas reserves by reservoir discovery year and annual gas production.

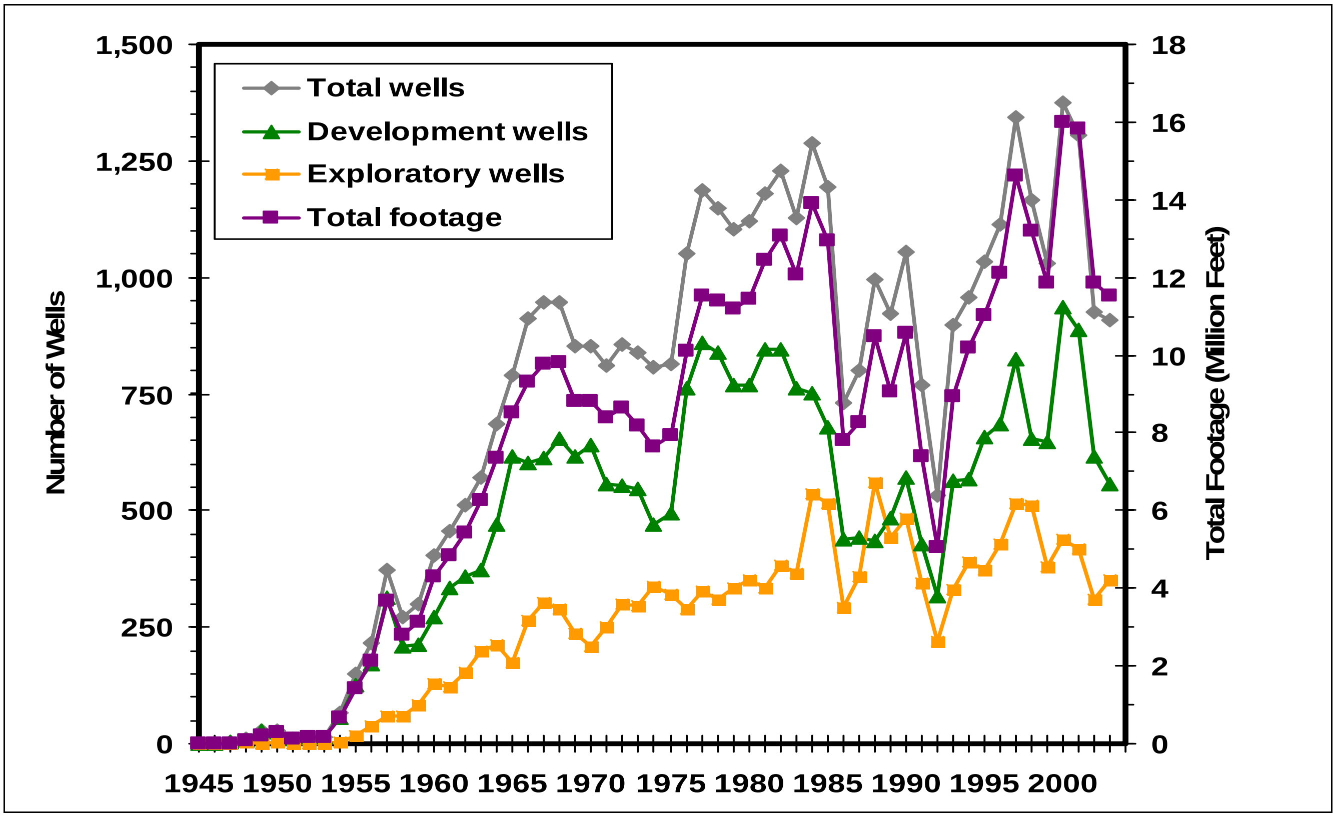


Figure 45. Wells and footage drilled.

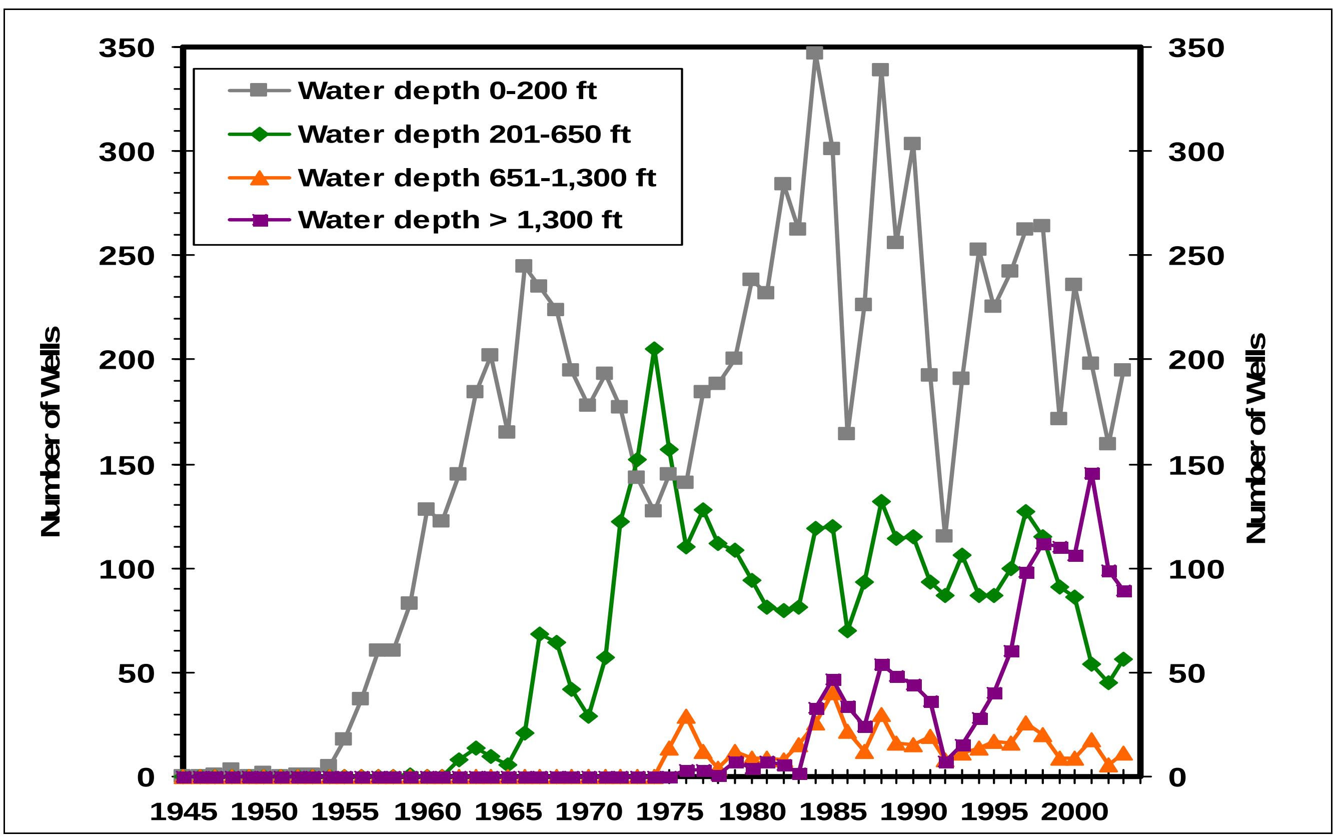


Figure 46. Number of exploratory wells drilled by water depth.

Summary and Comparison of Proved Reserves

A summary of proved reserve estimates during the year and a comparison with estimates from last year's report (December 31, 2002) are shown in table 5. There were 30 proved fields added during 2003 (6 oil fields and 24 gas fields), which are summarized and tabulated as increases to proved reserves. Note that 18 of the proved fields were discovered prior to 2003.

Proved reserve estimates are revised as needed, resulting in increases as additional wells are drilled and new leases are added to existing fields, and decreases 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. Increases and decreases of proved reserves are summarized and presented as changes because of revisions. Based on periodic reviews and revisions of field studies conducted since the 2002 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 2003 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 2002 report.

Table 5. Summary and comparison of proved oil and gas reserves as of December 31, 2002, and December 31, 2003.

	Oil (billion bbl)		Gas (trillion cu ft)	
Proved reserves:				
Previous estimates, as of 12/31/2002*	**18.75**		**176.8**	
Discoveries	0.01		0.4	
Revisions	-0.28		1.0	
Net Change	**-0.27**		**1.4**	
Estimate, as of 12/31/2003 (this report)		**18.48**		**178.2**
Cumulative production:				
Previous estimates, as of 12/31/2002*	**13.04**		**152.2**	
Discoveries	0.00		0.0	
Revisions	0.57		4.5	
Net Change	**0.57**		**4.5**	
Estimate, as of 12/31/2003 (this report)		**13.61**		**156.7**
Remaining proved reserves:				
Previous estimates, as of 12/31/2002*	**5.71**		**24.6**	
Discoveries	0.01		0.4	
Revisions	-0.28		1.0	
Production during 2003	-0.57		-4.5	
Net Change	**-0.84**		**-3.1**	
Estimate, as of 12/31/2003 (this report)		**4.87**		**21.5**

*Crawford and others, 2005

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, 1975-2003, 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

* Gas plant liquids dropped from system
+ Basis of reserves changed from demonstrated to SPE proved.

Conclusions

As of December 31, 2003, the 1,141 proved oil and gas fields in the federally regulated part of the Gulf of Mexico OCS contained proved reserves estimated to be 18.48 billion barrels of oil and 178.2 trillion cubic feet of gas. Cumulative production from the proved fields accounts for 13.61 billion barrels of oil and 156.7 trillion cubic feet of gas. Remaining proved reserves are estimated to be 4.87 billion barrels of oil and 21.5 trillion cubic feet of gas for the 915 proved active fields. Remaining proved oil reserves have decreased 14 percent and the remaining proved gas reserves have decreased 12 percent from last year's report.

Unproved reserves in the federally regulated part of the Gulf of Mexico OCS are estimated to be 3.36 billion barrels of oil and 9.0 trillion cubic feet of gas. Included are unproved reserves of 2.35 billion barrels of oil and 2.9 trillion cubic feet of gas from 43 fields in water depths greater than 1,000 feet. Estimated unproved reserves for oil are 4.2 times annual oil production, and for gas are 0.6 times less than annual gas production.

The large increase in oil production is primarily caused by large deepwater oil-prone fields coming on production. The decrease in proved oil reserves is likely temporary as new deepwater discoveries are classified as proved.

In addition to the proved and unproved reserves discussed above, at a minimum there are 1.3 billion barrels of oil and 7.6 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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Lesley D. Nixon
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Notice

This report, *Estimated Oil and Gas Reserves, Gulf of Mexico, December 31, 2003,* 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) 736-2680 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.

For information on purchasing copies of this publication or the CD-ROM contact:

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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.