OCS Report
BOEM 2014-051

Outer Continental Shelf

# Estimated Oil and Gas Reserves Gulf of Mexico OCS Region December 31, 2010

U.S. Department of the Interior
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region

ON COVER- Shell-operated Perdido Regional Development Spar. Assembling the spar and decks, cranes lower the 9,500-tonne topsides onto the spar. In March 2010 Shell commenced first production from the Perdido Development, the world's deepest offshore oil drilling and production platform. Photo courtesy of Shell.

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# TABLE OF CONTENTS

Page

FIGURES AND TABLES ……iii

ABBREVIATIONS AND ACRONYMS…….. iv

ABSTRACT…….. v

INTRODUCTION……1

BACKGROUND…… 2

Classification of Resources and Reserves……2
Methods Used for Estimating Reserves…… 2

RESERVES AND RELATED DATA BY PLANNING AREA……. 4

FIELD-SIZE DISTRIBUTION…….. 6

RESERVOIR-SIZE DISTRIBUTION……14

DRILLING AND PRODUCTION TRENDS……16

SUMMARY AND CONCLUSIONS…….. 18

Comparison of Proved plus Probable Reserves …… .18
Conclusions……19

CONTRIBUTING PERSONNEL……. 20

REFERENCES…….. 21

APPENDIX A – Definitions of Field, Resource and Reserves Terms ……22

## FIGURES


Page

Figure 1. BOEM GOM production, reserves, and resources....1

Figure 2. BOEM resource classification process....2

Figure 3. BOEM GOM OCS Planning Areas and Protraction Areas .... 5

Figure 4. Field-size distribution of proved fields: (a) GOM, 1,282 fields; (b) Western GOM, 352 fields; (c) Central GOM, 930 fields....7

Figure 5. Field-size distribution of proved oil fields: (a) GOM, 240 fields; (b) Western GOM, 22 fields; (c) Central GOM, 218 fields....8

Figure 6. Field-size distribution of proved gas fields: (a) GOM, 1,042 fields; (b) Western GOM, 330 fields; (c) Central GOM, 712 fields....9

Figure 7. Field-size distribution of fields containing Reserves Justified for Development: (a) GOM BOE, 116 oil and gas fields; (b) GOM oil, 59 fields; (c) GOM gas, 57 fields....10

Figure 8. Cumulative percent total reserves versus rank order of field size for 1,282 proved fields....11

Figure 9. Largest 20 fields, with associated water depths, ranked by Proved plus Probable Reserves and compared to Original Proved plus Probable Reserves....12

Figure 10. Reservoir-size distribution, 2,317 proved combination reservoirs.... 14

Figure 11. Reservoir-size distribution, 8,292 proved oil reservoirs....15

Figure 12. Reservoir-size distribution, 18,391 proved gas reservoirs....15

Figure 13. Number of exploratory wells drilled by water depth....16

Figure 14. Number of development wells drilled by water depth ....16

Figure 15. Original Proved plus Probable Reserves categorized by water depth and reservoir discovery year..17

Figure 16. Annual oil and gas production....17


## TABLES


Table 1. Estimated oil and gas reserves for 1,282 proved fields by area, December 31, 2010 ....4

Table 2. Description of deposit-size classes....6

Table 3. Field and reserves distribution by water depth....11

Table 4. Proved fields by rank order, based on Original Proved plus Probable BOE reserves, top 50 fields.....13

Table 5. Summary and comparison of GOM Proved plus Probable oil and gas reserves as of December 31, 2009, and December 31, 2010....18

Table 6. Proved plus Probable oil and gas reserves and cumulative production at end of year, 1975-2010.....19

# ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| AAPG | American Association of Petroleum Geologists |
| AL | Alabama |
| Bbbl | Billion barrels |
| Bbl | barrels |
| BBO | billion barrels of oil |
| BBOE | billion barrels of oil equivalent |
| Bcf | billion cubic feet |
| BOE | barrels of oil equivalent |
| BOEM | Bureau of Ocean Energy Management |
| BOEMRE | Bureau of Ocean Energy Management, Regulation and Enforcement |
| CFR | Code of Federal Regulations |
| DOCD | Development Operations Coordination Document |
| DOI | U.S. Department of the Interior |
| DPP | Development and Production Plan |
| $^0$F | degrees Fahrenheit |
| FL | Florida |
| ft | feet |
| GOM | Gulf of Mexico |
| GOMR | Gulf of Mexico Region |
| GOR | gas oil ratio |
| LA | Louisiana |
| MMbbl | million barrels |
| MMBOE | million barrels of oil equivalent |
| MMcf | million cubic feet |
| MMS | Minerals Management Service |
| MS | Mississippi |
| N | north |
| OAP | Offshore Atlas Project |
| OCS | Outer Continental Shelf |
| PDN | proved developed non-producing |
| PDP | proved developed producing |
| psia | pounds per square inch absolute |
| PU | proved undeveloped |
| P/Z | pressure/gas compressibility factor |
| RE | Resource Evaluation |
| SCF/STB | standard cubic feet per stock tank barrel |
| SPE | Society of Petroleum Engineers |
| SPE-PRMS | Society of Petroleum Engineers Petroleum Resources Management System |
| SPEE | Society of Petroleum Evaluation Engineers |
| Tcf | trillion cubic feet |
| TVDSS | true vertical depth subsea |
| TX | Texas |
| U.S. | United States |
| USGS | United States Geological Survey |
| WPC | World Petroleum Council |

# ABSTRACT

This is the annual publication that presents the Bureau of Ocean Energy Management (BOEM) estimates of oil and gas reserves in the Gulf of Mexico Outer Continental Shelf. This Estimated Oil and Gas Reserves report is presented in an abbreviated format.

As of December 31, 2010, it is estimated that the *Original Proved plus Probable Reserves* are 21.50 billion barrels of oil and 191.1 trillion cubic feet of gas from 1,282 proved fields. *Original Proved plus Probable Reserves* are the total of the *Cumulative Production* and the *Proved plus Probable Reserves*. This number includes 5 proved fields that were added during 2010. It also includes the 454 proved fields that have produced and expired. C*umulative Production* from the proved fields accounts for 17.11 billion barrels of oil and 179.3 trillion cubic feet of gas. *Proved plus Probable Reserves* are estimated to be 4.39 billion barrels of oil and 11.8 trillion cubic feet of gas. These reserves are recoverable from 828 proved active fields. Reserves estimates are derived for individual reservoirs from geologic and engineering evaluations. In order to more closely align BOEM GOM reserves definitions with the Petroleum Resources Management System definitions (SPE/AAPG/WPC/SPEE 2007), this report clarifies that Proved Reserves in this and previous reports are Proved plus Probable (2P) estimates. For any field spanning State and Federal waters, reserves are estimated for the Federal portion only.

*Reserves Justified for Development* are estimated to be 0.28 billion barrels of oil and 1.1 trillion cubic feet of gas. These reserves are associated with 116 active fields. In total, there are 832 proved and justified for development active fields located in Federal waters. The *Reserves Justified for Development* are not added to *Original Proved plus Probable Reserves* because of decreasing levels of economic certainty and hydrocarbon assurance.

In addition to the *Proved plus Probable Reserves* and the *Reserves Justified for Development* discussed above, there are an estimated 5.33 billion barrels of oil and 12.61 trillion cubic feet of gas resources that are not presented in the tables and figures of this report. These resources can be found in oil and gas fields where the lessee has not made a formal commitment to develop the project; in leases that have not yet qualified and have not been placed in a field; and in fields that expired, relinquished, or terminated without production. As additional drilling and development occur, additional hydrocarbon volumes may become reportable.

The estimates of reserves for this report were completed in September 2013 and represent the combined efforts of engineers, geologists, geophysicists, paleontologists, petrophysicists, and other personnel of the BOEM Gulf of Mexico Region, Office of Resource Evaluation, in New Orleans, Louisiana.

# INTRODUCTION

This report supersedes the *Estimated Oil and Gas Reserves, Gulf of Mexico OCS Region, December 31, 2009* (Maclay et al., 2013). It presents estimated Original Proved plus Probable Reserves, Cumulative Production, Proved plus Probable Reserves, and Reserves Justified for Development as of December 31, 2010, for the Gulf of Mexico (GOM). **Figure 1** represents the percentages of Cumulative Production, Proved plus Probable Reserves, Reserves Justified for Development, and Contingent Resources in the GOM. Estimates of reserves growth (an observed phenomenon that occurs when there is an incremental increase through time in the estimates of Proved plus Probable Reserves) as well as undiscovered and known resources are not presented in detail in this report.

As of December 31, 2010, the 1,282 proved oil and gas fields in the federally regulated part of the Gulf of Mexico Outer Continental Shelf (GOM OCS) contained Original Proved plus Probable Reserves estimated to be 21.50 billion barrels of oil (BBO) and 191.1 trillion cubic feet (Tcf) of gas. Cumulative Production from the proved fields accounts for 17.11 BBO and 179.3 Tcf of gas. Proved plus Probable Reserves are estimated to be 4.39 BBO and 11.8 Tcf of gas for the 828 proved active fields. Proved plus Probable oil reserves have decreased 6.0 percent and the Proved plus Probable gas reserves have decreased 11.3 percent from the 2009 report. Reserves Justified for Development in the federally regulated part of the GOM OCS are estimated to be 0.28 BBO and 1.1 Tcf of gas.

Additionally, the Contingent Resources are an estimated 5.33 BBO and 12.6 Tcf of gas. The Contingent Resources are not presented in subsequent tables and figures of this report. These resources can be found in oil and gas fields where the lessee has not made a formal commitment to develop the project; in leases that have not yet qualified and have not been placed in a field; and in fields that expired, relinquished, or terminated without production. As additional drilling and development occur, additional hydrocarbon volumes may become reportable.

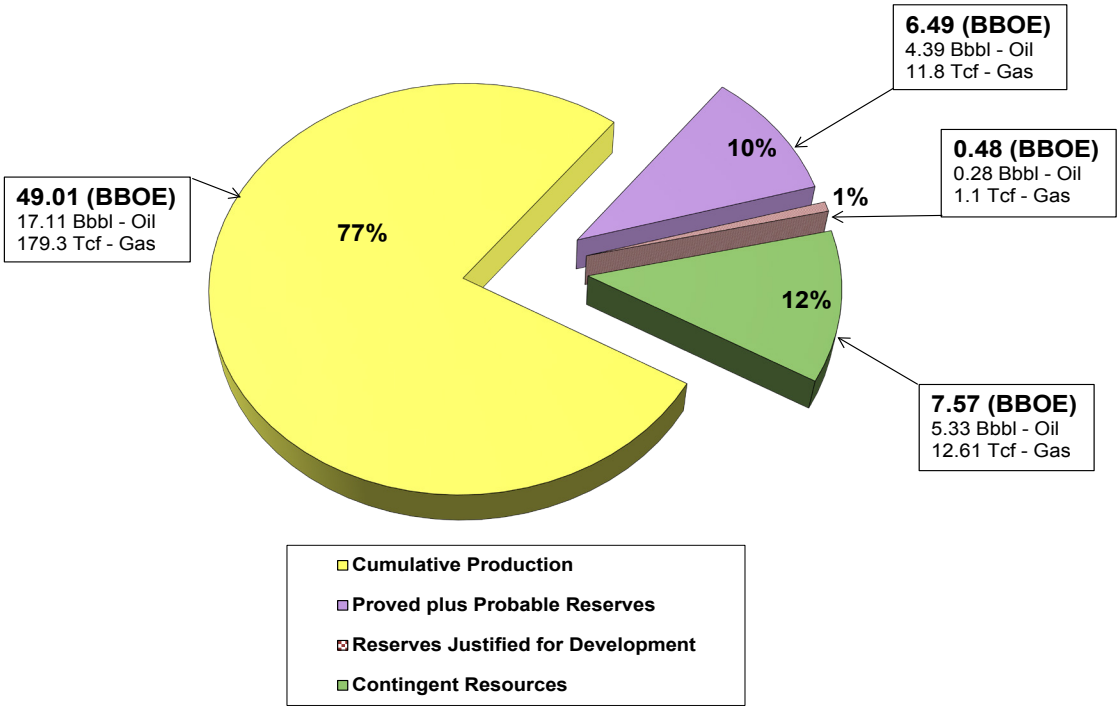


Figure 1. BOEM GOM production, reserves, and resources.

# BACKGROUND

## Classification of Resources and Reserves

The BOEM classification process is shown in **Figure 2**. Definitions for each resource class are presented in **Appendix A**. At the point in time a discovery is made, the identified accumulation of hydrocarbons is classified as a Contingent Resource, since a development project has not yet been identified. When the lessee makes a formal commitment to develop and produce the accumulation, it is classified as a Reserves Justified for Development. During the period when infrastructure is being constructed and installed, the accumulation is classified as Proved Undeveloped Reserves. After the equipment is in place and production of the accumulation has begun, the status becomes Proved Developed Producing Reserves. In order to more closely align BOEM GOM reserves definitions with the Petroleum Resources Management System definitions (SPE/AAPG/WPC/SPEE 2007), this report clarifies that Proved Reserves in this and previous reports are Proved plus Probable (2P) estimates. All hydrocarbons produced and sold are included in Cumulative Production category. Should a project be abandoned, at any phase of development, any estimates of remaining hydrocarbon volumes could be re-classified to Contingent Resources.

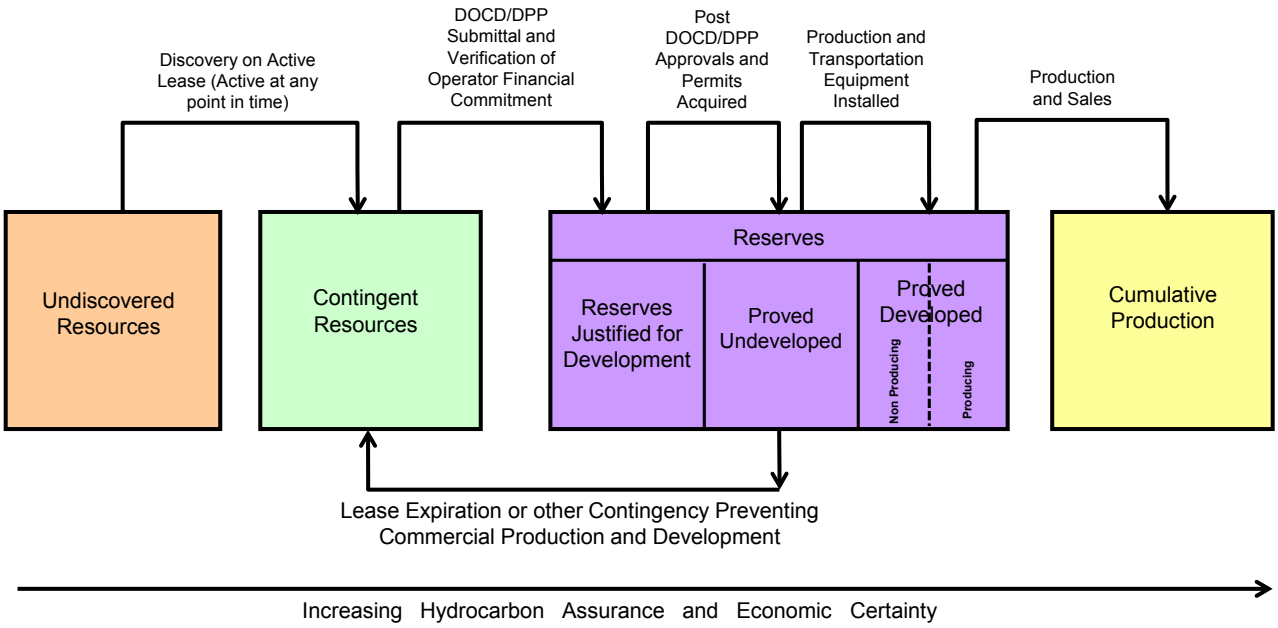


Figure 2. BOEM resource classification process.

## Methods Used for Estimating Reserves

The Reserves inventory component of the Resource Evaluation (RE) Program assigns new producible leases to fields and establishes field limits**.** The RE Program also develops independent estimates of original amounts of natural gas and oil in discovered OCS fields by conducting field reserve studies and reviews of fields, sands, and reservoirs. The Program periodically revises the estimates of natural gas and oil to reflect new discoveries, development information, and annual production. This report, *Estimated Oil and Gas Reserves, Gulf of Mexico*

*OCS Region, December 31, 2010*, is based on 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).

Additional reports address GOM reserves. Minerals Management Service (MMS) OCS Report, *Atlas of Gulf of Mexico Gas and Oil Sands as of January 1, 1999* (Bascle et al., 2001) provides a detailed geologic reporting of oil and gas reserves. A brief summary of the Atlas is available on the BOEM's Web site at http://www.boem.gov/BOEM-Newsroom/Library/Publications/Gulf-of-Mexico-OCS-Region-Publications.aspx%23ATLASES%23ATLASES#ATLASES. The MMS OCS Report, *2000 Assessment of Conventionally Recoverable Hydrocarbon Resources of the Gulf of Mexico and Atlantic Outer Continental Shelf as of January 1, 1999* (Lore et al., 2001) also known as the National Assessment, and its update, *Assessment of Undiscovered Technically Recoverable Oil and Gas Resources of the Nation's Outer Continental Shelf, 2006* (Lore, 2006*)* address reserves, reserves appreciation, and undiscovered resources. For more information visit BOEM's Web site at http://www.boem.gov/Oil-and-Gas-Energy-Program/Resource-Evaluation/Resource-Assessment/index.aspx

Reserve estimates from geological and engineering analyses have been completed for the 1,282 proved fields. The accuracy of the reserve estimate improves as more reservoir data become available to geoscientists and engineers. Well logs, well file data, seismic data, and production data are periodically analyzed to improve the accuracy of the reserve estimate. As a field is depleted and/or abandoned, the Proved plus Probable Reserves of productive reservoirs are assigned a value equal to the amount produced and the unrecovered reserve volumes may be converted to Contingent Resources. Currently, there are 454 proved expired, depleted fields.

Methods used for estimating reserves can be categorized into three groups: analog, volumetric, and performance. Reserve estimates in this report are based primarily on volumetric and performance methods. Reserve estimates are reported deterministically, providing a single "best estimate" (2P) based on known geological, engineering, and economic data.

Production data are the metered volumes of raw liquids and gas reported to BOEM by Federal unit and lease operators. 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.

Oil and gas volume measurements and reserves are corrected to reference standard conditions of 60°F and one atmosphere (14.73 pounds per square inch absolute [psia]). Prior to September 1998, gas was reported at 15.025 psia. BOEM has converted all historical gas production to the 14.73 pressure base.

# RESERVES AND RELATED DATA BY PLANNING AREA

The GOM OCS is divided into three planning areas for administrative purposes (**Figure 3**). Each planning area is subdivided into protractions, which in turn are divided into numbered blocks. Fields in the GOM are identified by the protraction area name and block number of discovery – for example, East Cameron Block 271 (EC 271) Field. As the field is developed, the limits may expand into adjacent blocks and areas. These adjacent blocks are then identified as part of the original field and are given that field name. Statistics in this report are presented as area totals compiled under each field name. All of the data associated with EC 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: 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, 2010, there were 832 proved and justified for development fields active in the federally regulated part of the GOM. A list, updated quarterly, of the active and expired fields can be found in the *OCS Operations Field Directory*. There were 828 proved, active (producing and non-producing) fields and 4 justified for development active fields studied. Included are the 454 proved expired, depleted fields, abandoned after having produced 6.0 percent barrels oil equivalent (BOE) of the total cumulative oil and gas production. One hundred eight fields expired, relinquished, or terminated without production. These fields may be included in the *Indicated Hydrocarbon List*. Reserves data are presented as area totals in **Table 1.**

Table 1.Estimated oil and gas reserves for 1,282 proved fields by area, December 31, 2010.

| Area(s) (Fig. 3) | Number of fields | | | | | Original Proved plus Probable Reserves | | | Cumulative Production through 2010 | | | Proved plus Probable Reserves | | | Reserves Justified for Development | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Proved active prod | Proved active nonprod | Proved expired depleted | Justified active | Expired nonprod | Oil (MMbbl) | Gas (Bcf) | BOE (MMbbl) | Oil (MMbbl) | Gas (Bcf) | BOE (MMbbl) | Oil (MMbbl) | Gas (Bcf) | BOE (MMbbl) | Oil (MMbbl) | Gas (Bcf) | BOE (MMbbl) |
| **Western Planning Area** | | | | | | | | | | | | | | | | | |
| Alaminos Canyon | 5 | 0 | 0 | 0 | 5 | 306 | 484 | 392 | 73 | 123 | 95 | 233 | 361 | 297 | 102 | 93 | 119 |
| Brazos | 15 | 4 | 19 | 0 | 2 | 10 | 3,725 | 673 | 10 | 3,616 | 653 | 0 | 109 | 20 | 0 | 0 | 0 |
| East Breaks | 14 | 3 | 4 | 0 | 4 | 290 | 2,309 | 701 | 228 | 1,950 | 575 | 62 | 359 | 126 | 0 | 0 | 0 |
| Galveston | 20 | 2 | 28 | 0 | 3 | 65 | 2,256 | 466 | 59 | 2,121 | 436 | 6 | 135 | 30 | 0 | 0 | 0 |
| Garden Banks | 4 | 0 | 3 | 0 | 2 | 46 | 342 | 106 | 30 | 307 | 84 | 16 | 35 | 22 | 0 | 0 | 0 |
| High Island and Sabine Pass | 57 | 5 | 66 | 0 | 10 | 422 | 15,623 | 3,201 | 398 | 15,206 | 3,103 | 24 | 417 | 98 | 0 | 0 | 0 |
| Matagorda Island | 13 | 1 | 15 | 0 | 2 | 25 | 5,333 | 974 | 24 | 5,198 | 949 | 1 | 135 | 25 | 0 | 0 | 0 |
| Mustang Island | 8 | 0 | 21 | 0 | 5 | 9 | 1,801 | 328 | 8 | 1,759 | 320 | 1 | 42 | 8 | 0 | 0 | 0 |
| N.& S.Padre Island | 8 | 0 | 11 | 0 | 0 | 0 | 637 | 113 | 0 | 613 | 109 | 0 | 24 | 4 | 0 | 0 | 0 |
| West Cameron and Sabine Pass | 13 | 2 | 11 | 0 | 1 | 35 | 2,943 | 559 | 34 | 2,904 | 551 | 1 | 39 | 8 | 0 | 0 | 0 |
| Western Planning Area (Other)* | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Western Planning Area Subtotal*** | ***157*** | ***17*** | ***178*** | ***0*** | ***35*** | ***1,208*** | ***35,453*** | ***7,513*** | ***864*** | ***33,797*** | ***6,875*** | ***344*** | ***1,656*** | ***638*** | ***102*** | ***93*** | ***119*** |
| **Central Planning Area** | | | | | | | | | | | | | | | | | |
| Atwater Valley | 6 | 0 | 0 | 0 | 5 | 51 | 679 | 172 | 16 | 362 | 81 | 35 | 317 | 91 | 0 | 0 | 0 |
| Chandeleur | 5 | 0 | 9 | 0 | 0 | 0 | 385 | 68 | 0 | 378 | 67 | 0 | 7 | 1 | 0 | 0 | 0 |
| East Cameron | 35 | 5 | 27 | 0 | 0 | 353 | 11,092 | 2,327 | 339 | 10,830 | 2,266 | 14 | 262 | 61 | 0 | 0 | 0 |
| Eugene Island | 60 | 6 | 23 | 0 | 3 | 1,696 | 20,247 | 5,298 | 1,638 | 19,714 | 5,146 | 58 | 533 | 152 | 25 | 141 | 50 |
| Ewing Bank | 13 | 1 | 4 | 0 | 2 | 375 | 734 | 507 | 311 | 627 | 423 | 64 | 107 | 84 | 0 | 0 | 0 |
| Garden Banks | 20 | 3 | 8 | 1 | 4 | 756 | 4,094 | 1,484 | 590 | 3,455 | 1,205 | 166 | 639 | 279 | 3 | 95 | 20 |
| Grand Isle | 13 | 2 | 8 | 0 | 1 | 1,005 | 5,060 | 1,904 | 974 | 4,853 | 1,837 | 31 | 207 | 67 | 14 | 101 | 31 |
| Green Canyon | 29 | 5 | 7 | 1 | 21 | 2,760 | 3,842 | 3,444 | 1,374 | 2,696 | 1,854 | 1,386 | 1,146 | 1,590 | 95 | 139 | 119 |
| Main Pass and Breton Sound | 52 | 7 | 31 | 0 | 4 | 1,155 | 7,066 | 2,412 | 1,090 | 6,644 | 2,272 | 65 | 422 | 140 | 4 | 15 | 7 |
| Mississippi Canyon | 38 | 6 | 5 | 1 | 9 | 3,897 | 10,133 | 5,700 | 2,216 | 7,662 | 3,579 | 1,681 | 2,471 | 2,121 | 14 | 258 | 60 |
| Mobile | 19 | 4 | 11 | 0 | 2 | 1 | 2,354 | 420 | 0 | 2,104 | 375 | 1 | 250 | 45 | 0 | 9 | 2 |
| Ship Shoal | 49 | 4 | 16 | 0 | 3 | 1,442 | 12,665 | 3,696 | 1,385 | 12,245 | 3,564 | 57 | 420 | 132 | 12 | 107 | 31 |
| South Marsh Island | 38 | 4 | 9 | 0 | 0 | 980 | 15,185 | 3,682 | 914 | 14,416 | 3,479 | 66 | 769 | 203 | 0 | 0 | 0 |
| South Pass | 9 | 0 | 4 | 0 | 1 | 1,114 | 4,539 | 1,922 | 1,075 | 4,400 | 1,858 | 39 | 139 | 64 | 1 | 6 | 2 |
| South Pelto | 8 | 0 | 1 | 0 | 0 | 163 | 1,212 | 379 | 155 | 1,148 | 359 | 8 | 64 | 20 | 1 | 6 | 2 |
| South Timbalier | 42 | 2 | 18 | 0 | 1 | 1,616 | 10,426 | 3,470 | 1,541 | 9,963 | 3,313 | 75 | 463 | 157 | 0 | 0 | 0 |
| Vermilion | 49 | 4 | 31 | 0 | 1 | 585 | 16,815 | 3,577 | 553 | 16,426 | 3,476 | 32 | 389 | 101 | 0 | 0 | 0 |
| Viosca Knoll | 26 | 0 | 26 | 0 | 7 | 629 | 3,666 | 1,282 | 516 | 3,257 | 1,096 | 113 | 409 | 186 | 5 | 35 | 11 |
| West Cameron and Sabine Pass | 49 | 10 | 35 | 0 | 0 | 200 | 18,835 | 3,551 | 187 | 18,116 | 3,410 | 13 | 719 | 141 | 0 | 0 | 0 |
| West Delta | 18 | 3 | 3 | 0 | 3 | 1,467 | 5,727 | 2,486 | 1,375 | 5,599 | 2,371 | 92 | 128 | 115 | 7 | 47 | 16 |
| Central Planning Area (Other)** | 6 | 4 | 0 | 1 | 5 | 48 | 865 | 202 | 0 | 568 | 101 | 48 | 297 | 101 | 2 | 58 | 12 |
| ***Central Planning Area Subtotal*** | ***584*** | ***70*** | ***276*** | ***4*** | ***72*** | ***20,293*** | ***155,621*** | ***47,983*** | ***16,249*** | ***145,463*** | ***42,132*** | ***4,044*** | ***10,158*** | ***5,851*** | ***183*** | ***1,017*** | ***363*** |
| ***Eastern Planning Area Subtotal****** | ***0*** | ***0*** | ***0*** | ***0*** | ***1*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| ***GOM Total:*** | ***741*** | ***87*** | ***454*** | ***4*** | ***108*** | ***21,501*** | ***191,074*** | ***55,496*** | ***17,113*** | ***179,260*** | ***49,007*** | ***4,388*** | ***11,814*** | ***6,489*** | ***285*** | ***1,110*** | ***482*** |
| | ***1,282*** | | | | | | | | | | | | | | | | |

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

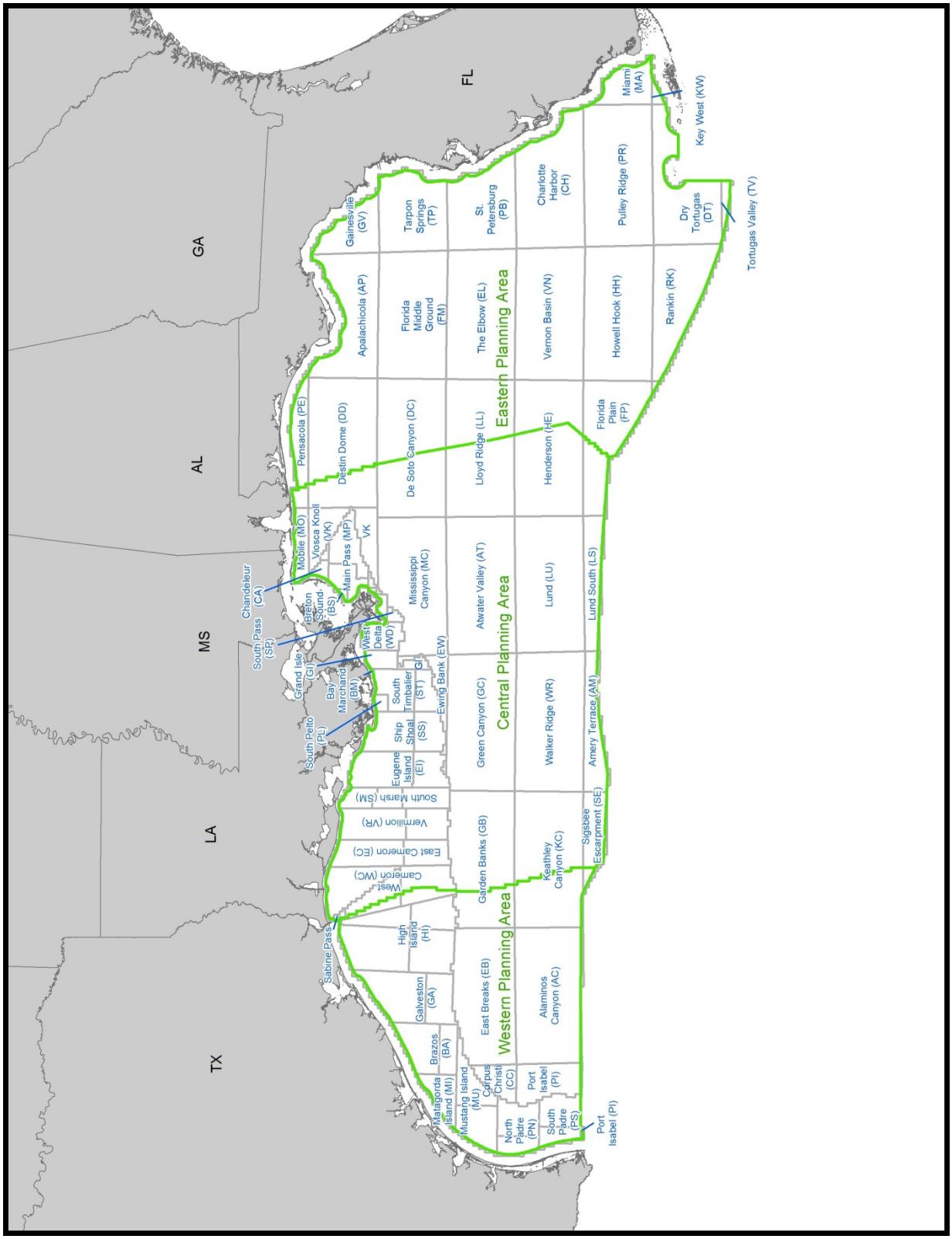


Figure 3. BOEM GOM OCS Planning Areas and Protraction Areas.

# FIELD-SIZE DISTRIBUTION

Reserve sizes are expressed in terms of BOE. Gas reserves are converted to BOE and added to the liquid reserves for the convenience of comparison. The conversion factor of 5,620 standard cubic feet of gas equals 1 BOE is based on the average heating values of domestic hydrocarbons. A geometric progression, developed by the United States Geological Survey (USGS) (Attanasi, 1998), was selected for field-size (deposit-size) distribution ranges (**Table 2**).

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.

Table 2. Description of deposit-size classes.

| 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) | | | |

The field-size distribution based on Original Proved plus Probable Reserves (in BOE) for 1,282 proved fields is shown in **Figure 4(a)**. Of the 1,282 proved oil and gas fields, there are 240 proved oil fields represented in **Figure 5(a)** and 1,042 gas fields shown in **Figure 6(a)**. The Western Gulf of Mexico field-size distributions are displayed on **Figures 4(b)**, **5(b)**, and **6(b)**. **Figures 4(c)**, **5(c)**, and **6(c)** present the Central GOM field-size distributions of Original Proved plus Probable Reserves. The field-size distribution, derived from the 116 fields containing Reserves Justified for Development, is shown in **Figure 7(a)**. There are 59 oil fields in **Figure 7(b)** and 57 gas fields containing Reserves Justified for Development in **Figure 7(c)**.

Analysis of the 1,282 proved oil and gas fields indicates that the GOM is historically a gas-prone basin. The GOR, based on original recoverable reserves of the 240 proved oil fields is 2,540 SCF/STB. The GOR of the 59 oil fields containing Reserves Justified for Development is 2,250 SCF/STB. The yield (condensate divided by gas), based on original recoverable reserves for the 1,042 proved gas fields is 24.6 barrels (Bbl) of condensate per million cubic feet (MMcf) of gas. The yield of the 57 gas fields containing Reserves Justified for Development is 34.8 Bbl of condensate per MMcf.

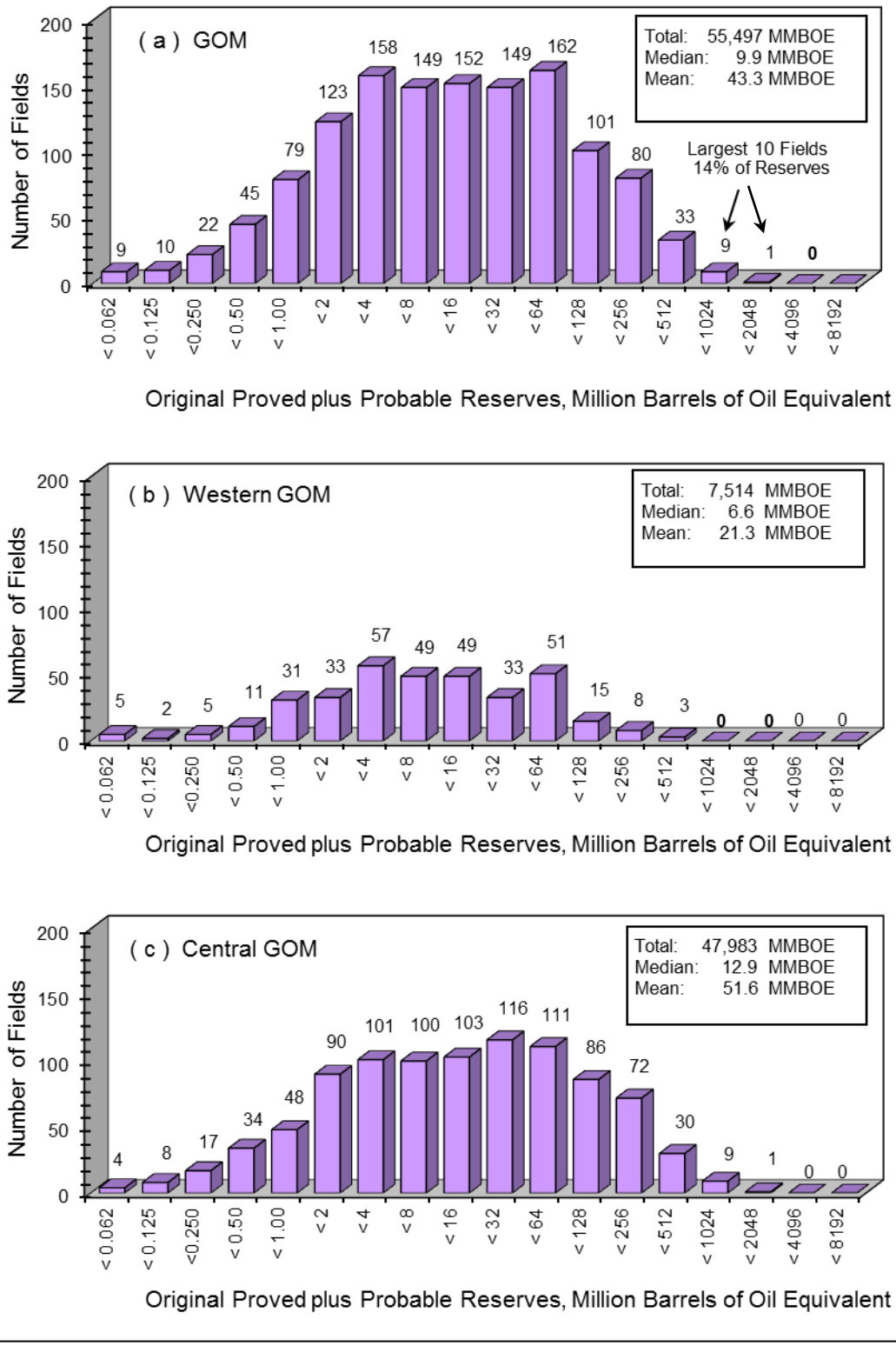


Figure 4. Field-size distribution of proved fields: (a) GOM, 1,282 fields; (b) Western GOM, 352 fields; (c) Central GOM, 930 fields.

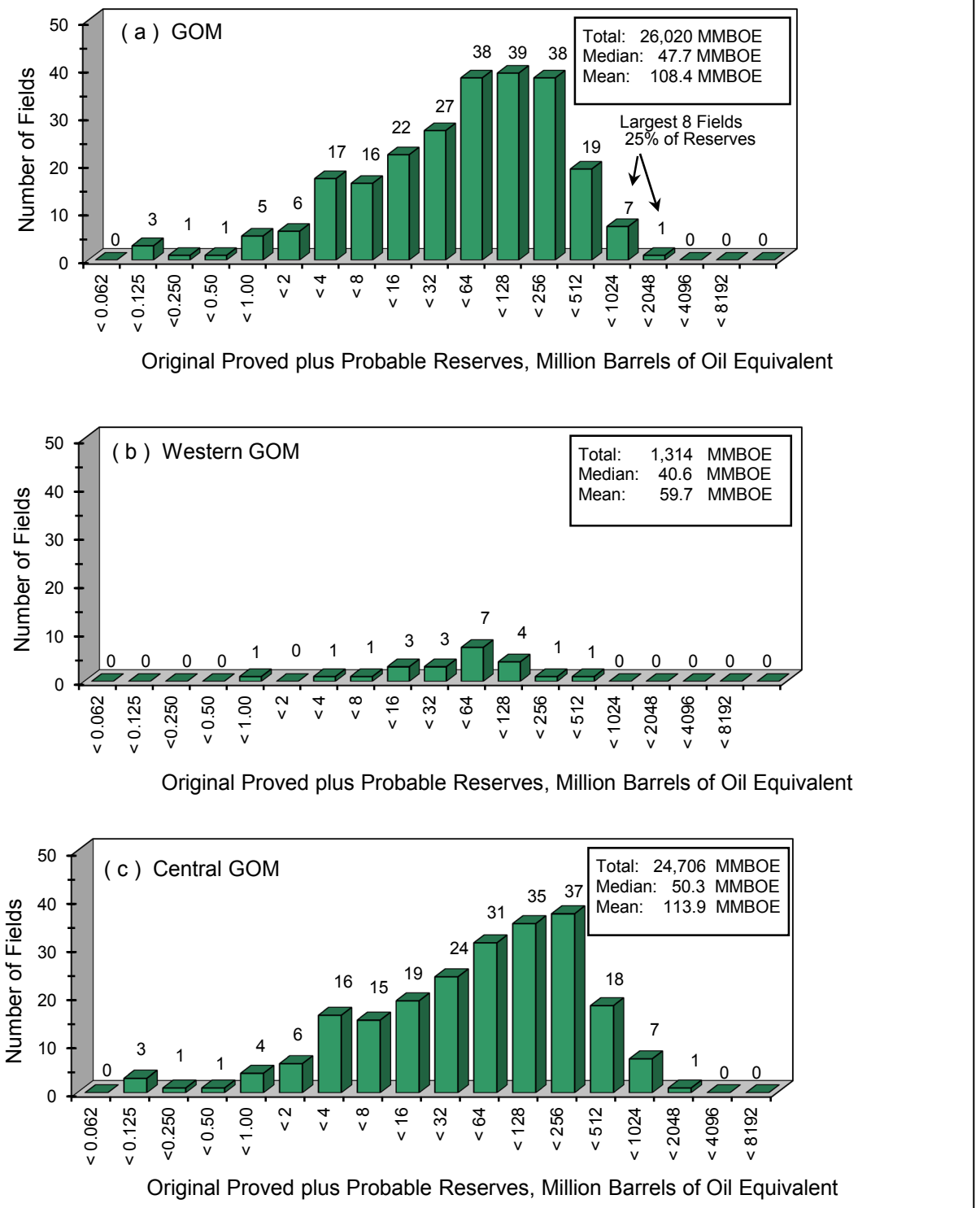


Figure 5. Field-size distribution of proved oil fields: (a) GOM, 240 fields; (b) Western GOM, 22 fields; (c) Central GOM, 218 fields

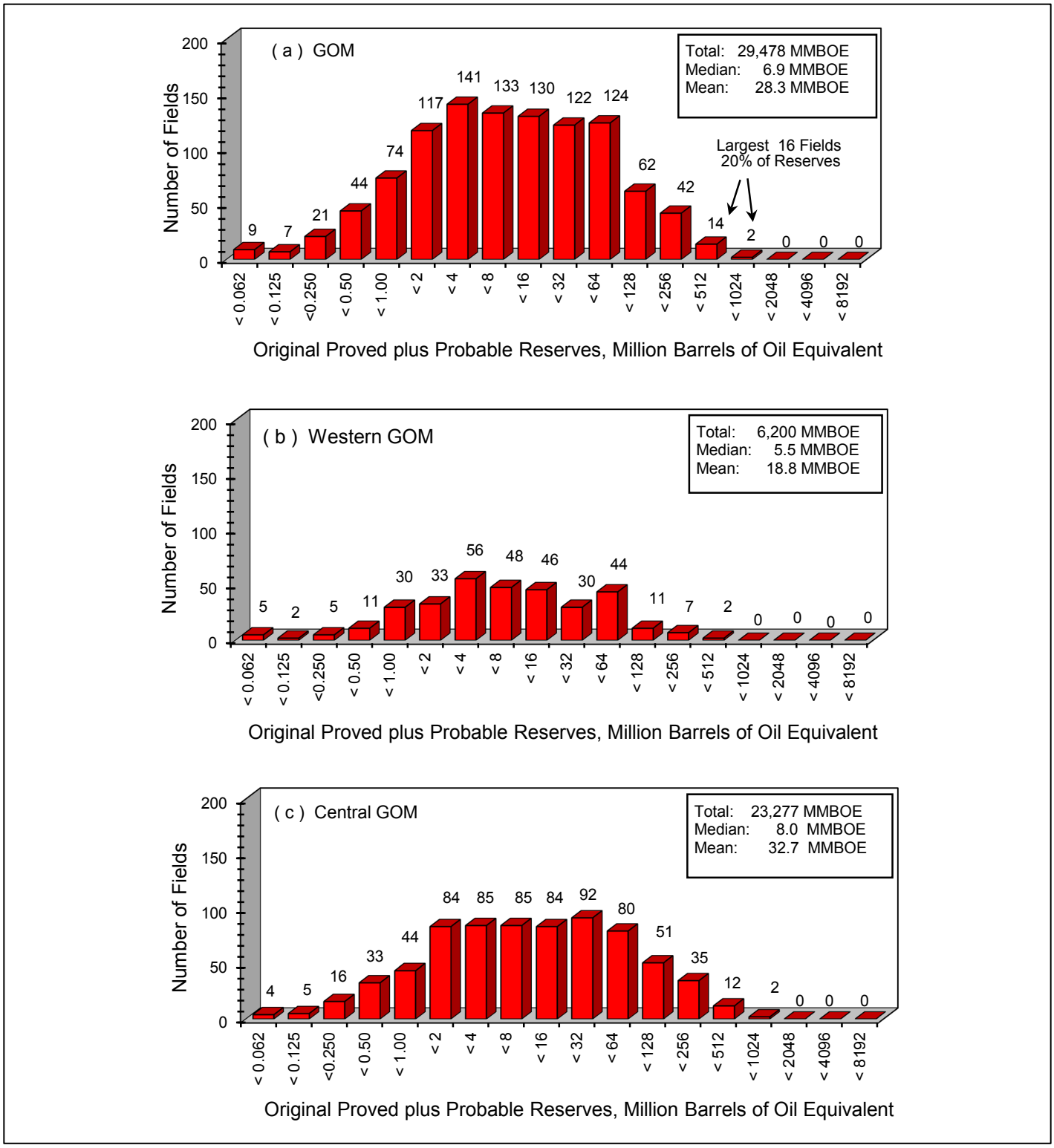


Figure 6. Field-size distribution of proved gas fields: (a) GOM, 1,042 fields; (b) Western GOM, 330 fields; (c) Central GOM, 712 fields.

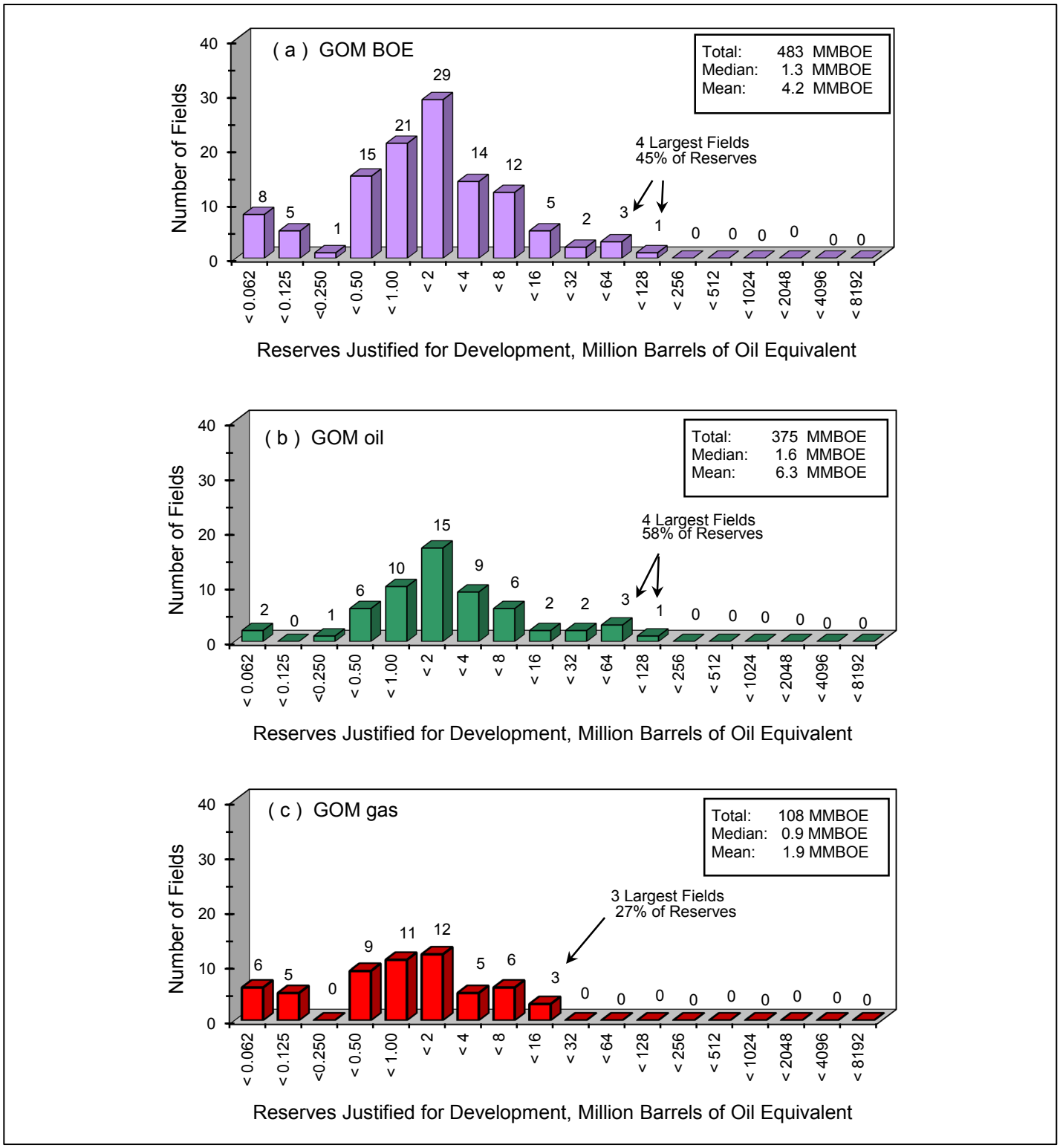


Figure 7. Field-size distribution of fields containing Reserves Justified for Development: (a) GOM BOE, 116 oil and gas fields; (b) GOM oil, 59 fields; (c) GOM gas, 57 fields.

**Figure 8** shows the cumulative percent distribution of Original Proved plus Probable Reserves in billion barrels of oil equivalent (BBOE), by field size rank. All 1,282 proved fields in the GOM OCS are included in this figure. A phenomenon often observed in hydrocarbon-producing basins is a rapid drop-off in size from that of largest known field to smallest. Twenty-five percent of the Original Proved plus Probable Reserves are contained in the 26 largest fields. Fifty percent of the Original Proved plus Probable Reserves are contained in the 87 largest fields. Ninety percent of the Original Proved plus Probable Reserves are contained in the 427 largest fields.

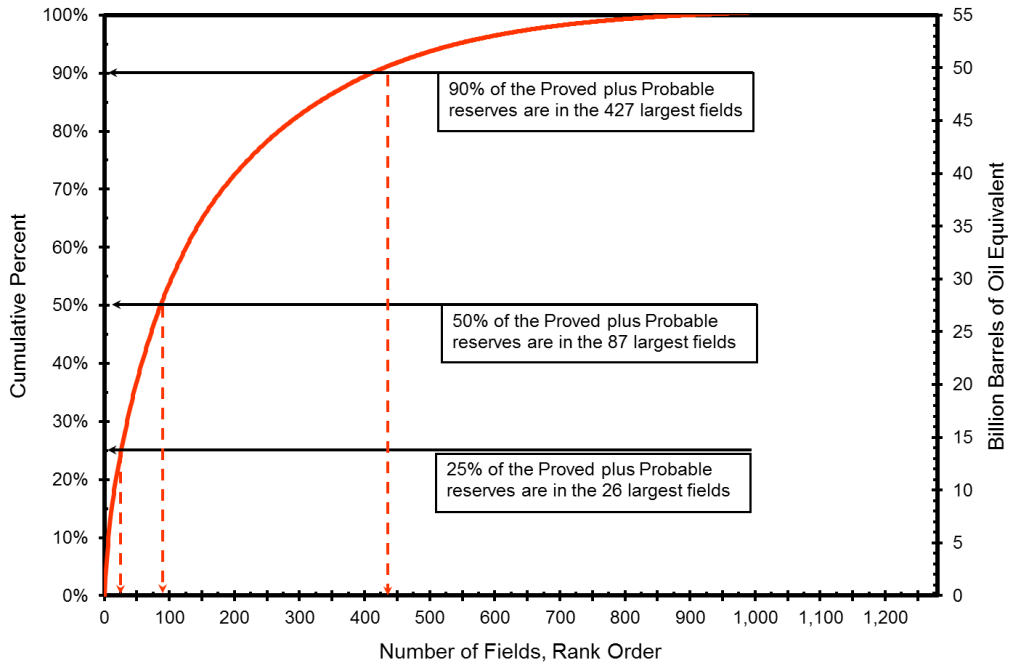


Figure 8. Cumulative percent total reserves versus rank order of field size for 1,282 proved fields.

**Table 3** shows the distribution of the number of fields and reserves by water depth. A field's water depth is determined by averaging the water depth where the wells are drilled in the field. The water depth ranges used in this figure are less than 500 ft, 500-999 ft, 1,000-1,499 ft, 1,500-4,999 ft, 5,000-7,499 ft, and greater than or equal to 7,500 ft. Proved plus Probable Reserves, reported in MMBOE, are associated with the 1,282 proved fields. Proved plus Probable Reserves located in greater than or equal to 1500 ft of water accounts for 74 percent of the total GOM Proved plus Probable Reserves.

Table 3. Field and reserves distribution by water depth.

| Water Depth Range (Feet) | Number of Proved Fields | Proved plus Probable Reserves (MMBOE) | Number of Fields with Reserves Justified for Development | Reserves Justified for Development (MMBOE) |
|---|---|---|---|---|
| < 500 | 1,077 | 1,620 | 75 | 144 |
| 500 - 999 | 54 | 70 | 2 | 3 |
| 1,000 - 1,499 | 25 | 179 | 4 | 6 |
| 1,500 - 4,999 | 89 | 2,471 | 22 | 119 |
| 5,000 - 7,499 | 21 | 1,716 | 8 | 85 |
| >= 7,500 | 16 | 433 | 5 | 125 |
| Totals: | 1,282 | 6,489 | 116 | 482 |

**Figure 9** shows the largest 20 fields ranked in order by Proved plus Probable Reserves. Seventeen of the 20 fields lie in water depths of greater than or equal to 1,500 ft and account for 54 percent of the Proved plus Probable Reserves in the GOM. Of the 205 proved fields in water depths greater than 500 ft, 147 are producing, 55 are depleted or expired, and 3 have yet to produce.

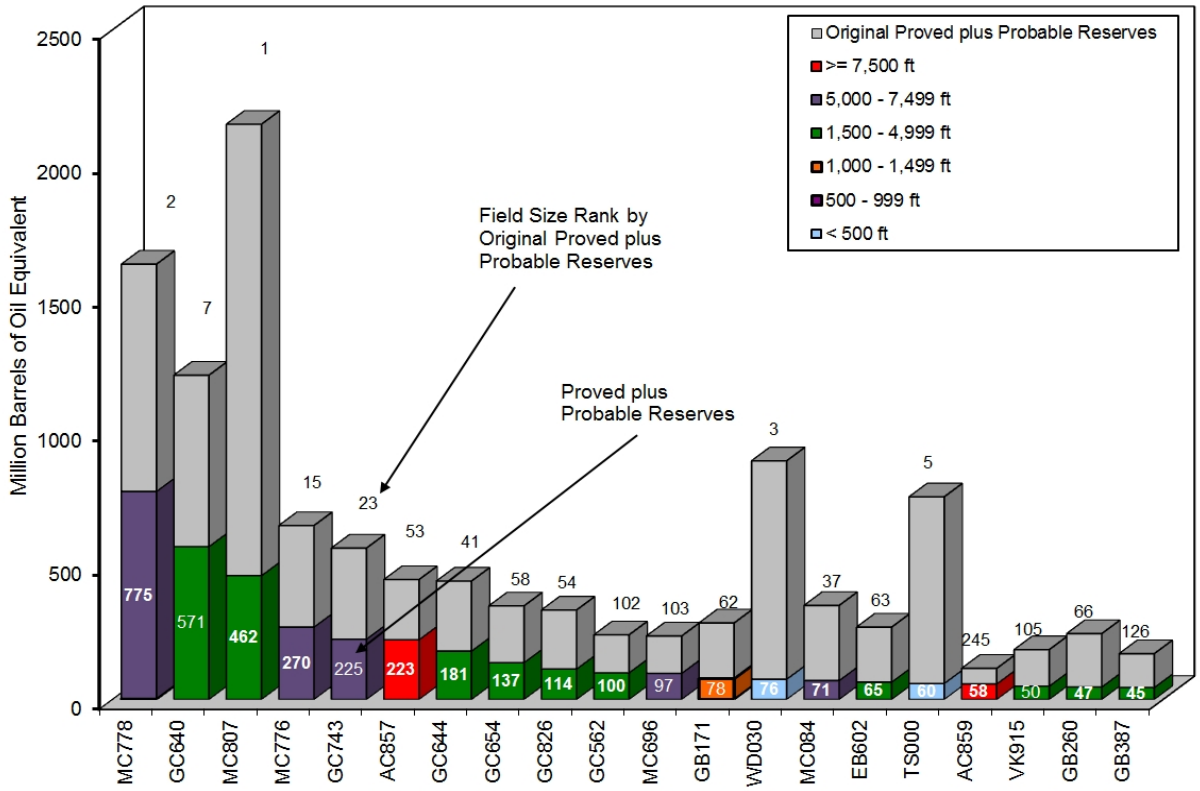


Figure 9. Largest 20 fields, with associated water depths, ranked by Proved plus Probable Reserves and compared to Original Proved plus Probable Reserves.

**Table 4** ranks the 50 largest proved fields based on Original Proved plus Probable Reserves expressed in BOE. Rank, field name, field nickname, discovery year, water depth, field classification, field type, field GOR, original Proved plus Probable Reserves, cumulative production through 2010, and Proved plus Probable Reserves are presented. A complete listing of all 1,282 proved fields is available on the BOEM Web site at: http://www.data.boem.gov/homepg/data_center/field/estimated2010.asp.

Table 4. Proved fields by rank order, based on Original Proved plus Probable BOE reserves, top 50 fields.

*(Field class: PDP - Proved Developed Producing; PDN - Proved Developed Non-Producing; PU - Proved Undeveloped)*
*(Field type: O - Oil; G - Gas)*

| Rank | Field name | Field Nickname | Disc year | Water depth (feet) | Field class | Field type | Field GOR (SCF/STB) | Original Proved and Probable Reserves | | | Cumulative Production through 2010 | | | Proved and Probable Reserves | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Oil (MMbbl) | Gas (Bcf) | BOE (MMbbl) | Oil (MMbbl) | Gas (Bcf) | BOE (MMbbl) | Oil (MMbbl) | Gas (Bcf) | BOE (MMbbl) |
| 1 | MC807 | MARS-URSA | 1989 | 3334 | PDP | O | 1,401 | 1,349.0 | 1,889.4 | 1,685.2 | 994.4 | 1,285.3 | 1,223.1 | 354.6 | 604.1 | 462.1 |
| 2 | MC778 | THUNDER HORSE | 1999 | 6078 | PDP | O | 883 | 733.2 | 647.8 | 848.4 | 64.0 | 50.9 | 73.0 | 669.2 | 596.9 | 775.4 |
| 3 | WD030 | | 1949 | 48 | PDP | O | 1,504 | 642.9 | 968.0 | 815.2 | 572.7 | 937.9 | 739.6 | 70.2 | 30.1 | 75.6 |
| 4 | EI330 | | 1971 | 248 | PDP | O | 4,283 | 435.7 | 1,865.8 | 767.7 | 429.4 | 1,851.8 | 758.9 | 6.3 | 14.0 | 8.8 |
| 5 | TS000 | | 1958 | 13 | PDP | G | 80,842 | 45.2 | 3,660.8 | 696.7 | 40.1 | 3,354.4 | 637.0 | 5.1 | 306.4 | 59.7 |
| 6 | GI043 | | 1956 | 140 | PDP | O | 4,398 | 384.5 | 1,690.8 | 685.3 | 369.6 | 1,604.4 | 655.0 | 14.9 | 86.4 | 30.3 |
| 7 | GC640 | TAHITI | 2002 | 4312 | PDP | O | 543 | 583.3 | 317.0 | 639.7 | 63.0 | 34.1 | 69.0 | 520.3 | 282.9 | 570.7 |
| 8 | BM002 | | 1949 | 50 | PDP | O | 1,064 | 536.6 | 571.2 | 638.2 | 530.9 | 559.4 | 630.4 | 5.7 | 11.8 | 7.8 |
| 9 | VR014 | | 1956 | 26 | PDP | G | 65,345 | 48.1 | 3,142.6 | 607.2 | 47.9 | 3,123.8 | 603.7 | 0.2 | 18.8 | 3.5 |
| 10 | MP041 | | 1956 | 43 | PDP | O | 5,739 | 267.2 | 1,529.4 | 539.3 | 259.7 | 1,495.8 | 525.8 | 7.5 | 33.6 | 13.5 |
| 11 | VR039 | | 1948 | 38 | PDP | G | 81,398 | 32.3 | 2,626.8 | 499.7 | 31.6 | 2,600.2 | 494.2 | 0.7 | 26.6 | 5.5 |
| 12 | SS208 | | 1960 | 102 | PDP | O | 6,330 | 222.7 | 1,409.8 | 473.6 | 218.2 | 1,373.5 | 462.6 | 4.5 | 36.3 | 11.0 |
| 13 | GB426 | AUGER | 1987 | 2846 | PDP | O | 3,617 | 242.9 | 879.0 | 399.4 | 224.9 | 819.2 | 370.7 | 18.0 | 59.8 | 28.7 |
| 14 | WD073 | | 1962 | 177 | PDP | O | 2,499 | 271.6 | 678.8 | 392.5 | 264.6 | 664.4 | 382.9 | 7.0 | 14.4 | 9.6 |
| 15 | MC776 | N.THUNDER HORSE | 2000 | 5665 | PDP | O | 978 | 322.9 | 315.7 | 379.0 | 93.4 | 87.0 | 108.8 | 229.5 | 228.7 | 270.2 |
| 16 | GI016 | | 1948 | 54 | PDP | O | 1,296 | 305.6 | 396.2 | 376.1 | 301.7 | 387.3 | 370.6 | 3.9 | 8.9 | 5.5 |
| 17 | EI238 | | 1964 | 147 | PDP | G | 16,020 | 97.2 | 1,558.0 | 374.5 | 89.5 | 1,488.1 | 354.3 | 7.7 | 69.9 | 20.2 |
| 18 | SP061 | | 1967 | 220 | PDP | O | 1,945 | 273.4 | 531.7 | 368.0 | 265.8 | 522.5 | 358.8 | 7.6 | 9.2 | 9.2 |
| 19 | ST172 | | 1962 | 98 | PDP | G | 141,315 | 13.6 | 1,928.5 | 356.8 | 11.9 | 1,889.6 | 348.1 | 1.7 | 38.9 | 8.7 |
| 20 | SP089 | | 1969 | 421 | PDP | O | 4,450 | 196.0 | 872.2 | 351.2 | 191.6 | 858.1 | 344.3 | 4.4 | 14.1 | 6.9 |
| 21 | WC180 | | 1961 | 48 | PDP | G | 138,927 | 13.5 | 1,868.7 | 346.0 | 13.1 | 1,835.5 | 339.7 | 0.4 | 33.2 | 6.3 |
| 22 | ST021 | | 1957 | 46 | PDP | O | 1,650 | 264.5 | 436.4 | 342.1 | 254.4 | 420.5 | 329.2 | 10.1 | 15.9 | 12.9 |
| 23 | GC743 | ATLANTIS | 1998 | 6297 | PDP | O | 638 | 305.1 | 194.5 | 339.7 | 102.7 | 65.2 | 114.3 | 202.4 | 129.3 | 225.4 |
| 24 | SS169 | | 1960 | 63 | PDP | O | 5,380 | 166.6 | 896.1 | 326.0 | 160.7 | 868.2 | 315.2 | 5.9 | 27.9 | 10.8 |
| 25 | SM048 | | 1961 | 101 | PDP | G | 52,720 | 30.8 | 1,624.0 | 319.8 | 27.9 | 1,551.0 | 303.9 | 2.9 | 73.0 | 15.9 |
| 26 | ST176 | | 1963 | 127 | PDP | G | 14,328 | 89.9 | 1,289.2 | 319.4 | 83.9 | 1,233.9 | 303.5 | 6.0 | 55.3 | 15.9 |
| 27 | MC194 | COGNAC | 1975 | 1022 | PDP | O | 4,166 | 182.0 | 758.5 | 317.1 | 179.1 | 755.0 | 313.5 | 2.9 | 3.5 | 3.6 |
| 28 | EC064 | | 1957 | 50 | PDP | G | 59,096 | 27.4 | 1,617.7 | 315.2 | 27.0 | 1,591.1 | 310.1 | 0.4 | 26.6 | 5.1 |
| 29 | EI292 | | 1964 | 213 | PDP | G | 80,265 | 20.6 | 1,648.4 | 313.8 | 19.0 | 1,644.3 | 311.5 | 1.6 | 4.1 | 2.3 |
| 30 | EC271 | | 1971 | 171 | PDP | G | 19,143 | 70.6 | 1,351.6 | 311.1 | 68.7 | 1,340.1 | 307.2 | 1.9 | 11.5 | 3.9 |
| 31 | SS176 | | 1956 | 101 | PDP | G | 19,859 | 66.4 | 1,319.7 | 301.3 | 65.0 | 1,305.1 | 297.3 | 1.4 | 14.6 | 4.0 |
| 32 | SP027 | EAST BAY | 1954 | 64 | PDP | O | 5,291 | 152.9 | 808.6 | 296.7 | 151.1 | 781.9 | 290.2 | 1.8 | 26.7 | 6.5 |
| 33 | WC587 | | 1971 | 211 | PDP | G | 118,266 | 13.4 | 1,589.6 | 296.3 | 13.3 | 1,576.3 | 293.8 | 0.1 | 13.3 | 2.5 |
| 34 | EI296 | | 1971 | 214 | PDP | G | 71,442 | 20.6 | 1,469.9 | 282.1 | 20.5 | 1,456.6 | 279.7 | 0.1 | 13.3 | 2.4 |
| 35 | ST135 | | 1956 | 129 | PDP | O | 3,672 | 170.5 | 624.8 | 281.6 | 167.1 | 609.5 | 275.5 | 3.4 | 15.3 | 6.1 |
| 36 | WC192 | | 1954 | 57 | PDP | G | 60,865 | 23.7 | 1,442.7 | 280.4 | 23.0 | 1,405.8 | 273.1 | 0.7 | 36.9 | 7.3 |
| 37 | MC084 | KING/HORN MT. | 1993 | 5300 | PDP | O | 1,135 | 233.2 | 264.6 | 280.3 | 175.2 | 193.3 | 209.6 | 58.0 | 71.3 | 70.7 |
| 38 | WD079 | | 1966 | 123 | PDP | O | 3,873 | 165.3 | 640.4 | 279.3 | 162.0 | 625.7 | 273.4 | 3.3 | 14.7 | 5.9 |
| 39 | MI623 | | 1980 | 83 | PDP | G | 101,832 | 14.3 | 1,454.0 | 273.0 | 13.5 | 1,383.9 | 259.8 | 0.8 | 70.1 | 13.2 |
| 40 | HI573A | | 1973 | 341 | PDP | O | 7,548 | 116.0 | 875.2 | 271.7 | 111.1 | 870.7 | 266.0 | 4.9 | 4.5 | 5.7 |
| 41 | GC644 | HOLSTEIN | 1999 | 4341 | PDP | O | 1,181 | 215.9 | 255.0 | 261.3 | 68.4 | 68.8 | 80.6 | 147.5 | 186.2 | 180.7 |
| 42 | GC244 | TROIKA | 1994 | 2795 | PDP | O | 1,900 | 192.8 | 366.3 | 258.0 | 168.5 | 330.6 | 227.3 | 24.3 | 35.7 | 30.7 |
| 43 | GI047 | | 1955 | 88 | PDP | O | 3,812 | 152.7 | 582.1 | 256.2 | 148.7 | 564.8 | 249.2 | 4.0 | 17.3 | 7.0 |
| 44 | VK956 | RAM-POWELL | 1985 | 3238 | PDP | O | 9,392 | 95.0 | 891.5 | 253.5 | 89.4 | 850.3 | 240.6 | 5.6 | 41.2 | 12.9 |
| 45 | SP078 | | 1972 | 202 | PDP | G | 11,234 | 81.7 | 917.6 | 245.0 | 77.5 | 910.7 | 239.6 | 4.2 | 6.9 | 5.4 |
| 46 | SM023 | | 1960 | 82 | PDP | G | 39,386 | 30.0 | 1,182.0 | 240.3 | 29.7 | 1,172.4 | 238.3 | 0.3 | 9.6 | 2.0 |
| 47 | PL020 | | 1951 | 33 | PDP | O | 5,740 | 117.8 | 676.1 | 238.1 | 112.3 | 647.4 | 227.5 | 5.5 | 28.7 | 10.6 |
| 48 | SM130 | | 1973 | 214 | PDP | O | 1,386 | 189.2 | 262.2 | 235.9 | 185.0 | 252.1 | 229.9 | 4.2 | 10.1 | 6.0 |
| 49 | SM066 | | 1963 | 124 | PDP | G | 260,991 | 4.9 | 1,287.6 | 234.0 | 4.8 | 1,256.6 | 228.4 | 0.1 | 31.0 | 5.6 |
| 50 | VR076 | | 1949 | 31 | PDP | G | 140,453 | 9.0 | 1,255.8 | 232.3 | 8.2 | 1,219.4 | 225.1 | 0.8 | 36.4 | 7.2 |

# RESERVOIR-SIZE DISTRIBUTION

The size distributions of the proved reservoirs are shown in **Figures 10**, **11**, and **12**. The size ranges are based on Original Proved plus Probable Reserves and are presented on a geometrically progressing horizontal scale. These sizes correspond with the USGS deposit-size ranges shown in **Table 2** with a modification to subdivide small reservoirs into finer distributions. For **Figures 11** and **12**, the Original Proved plus Probable Reserves are presented in million barrels (MMbbl) and billion cubic feet (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 10**, gas is converted to BOE and added to the liquid reserves.

**Figure 10** shows the reservoir-size distribution, on the basis of Original Proved plus Probable BOE, for 2,317 proved combination reservoirs. The median is 0.9 MMBOE and the mean is 3.0 MMBOE. The GOR, based on Original Proved plus Probable reserves, for the oil portion of the reservoirs is 1,195 SCF/STB, and the yield, based on Original Proved plus Probable reserves, for the gas cap is 22.1 Bbl of condensate per MMcf of gas.

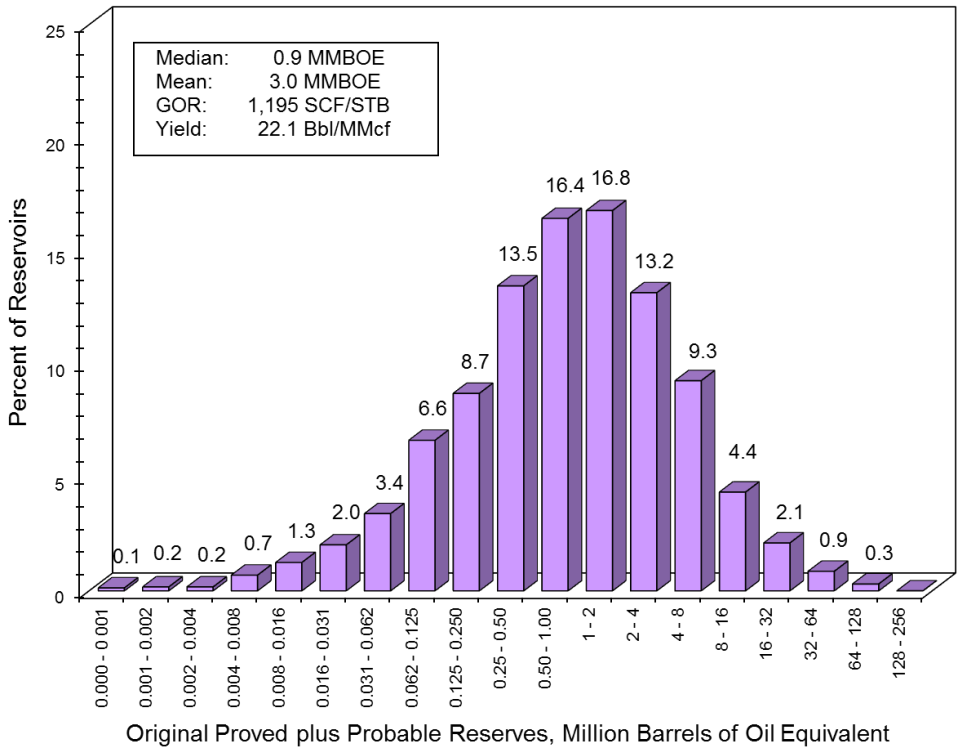


Figure 10. Reservoir-size distribution, 2,317 proved combination reservoirs.

**Figure 11** shows the reservoir-size distribution, on the basis of Original Proved plus Probable oil, for 8,292 proved undersaturated oil reservoirs. The median is 0.3 MMbbl, the mean is 1.9 MMbbl, and the GOR, based on Original Proved plus Probable reserves, is 1,232 SCF/STB. **Figure 12** shows the reservoir-size distribution, on the basis of Original Proved plus Probable gas, for 18,391 gas reservoirs. The median is 2.1 Bcf of gas, the mean is 8.5 Bcf, and the yield, based on Original Proved plus Probable reserves, is 11.9 Bbl of condensate per MMcf of gas.

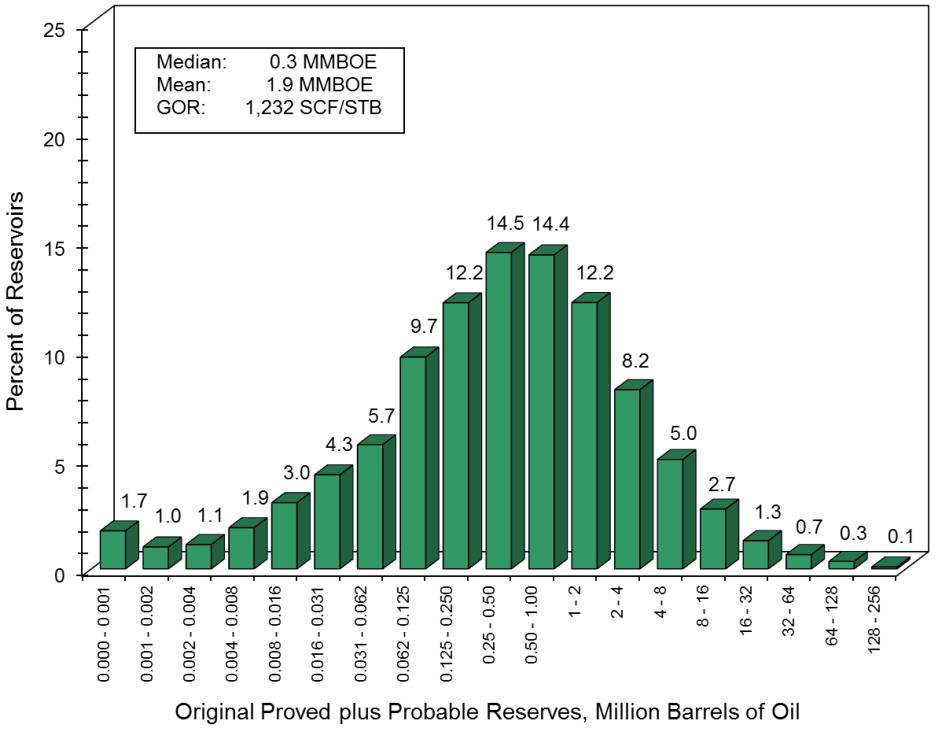


Figure 11. Reservoir-size distribution, 8,292 proved oil reservoirs.

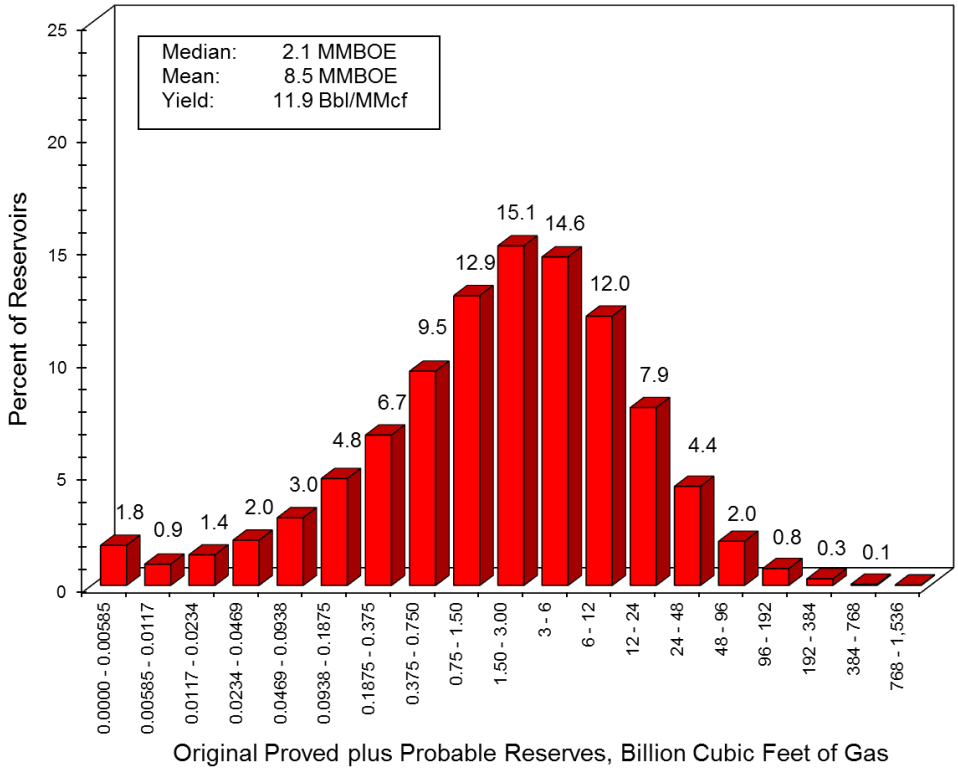


Figure 12. Reservoir-size distribution, 18,391 proved gas reservoirs.

# DRILLING AND PRODUCTION TRENDS

**Figure 13** presents the number of exploratory wells drilled each year by water depth category. The total footage drilled in 2010 was 1.48 million feet compared to 2.66 million feet in 2009.

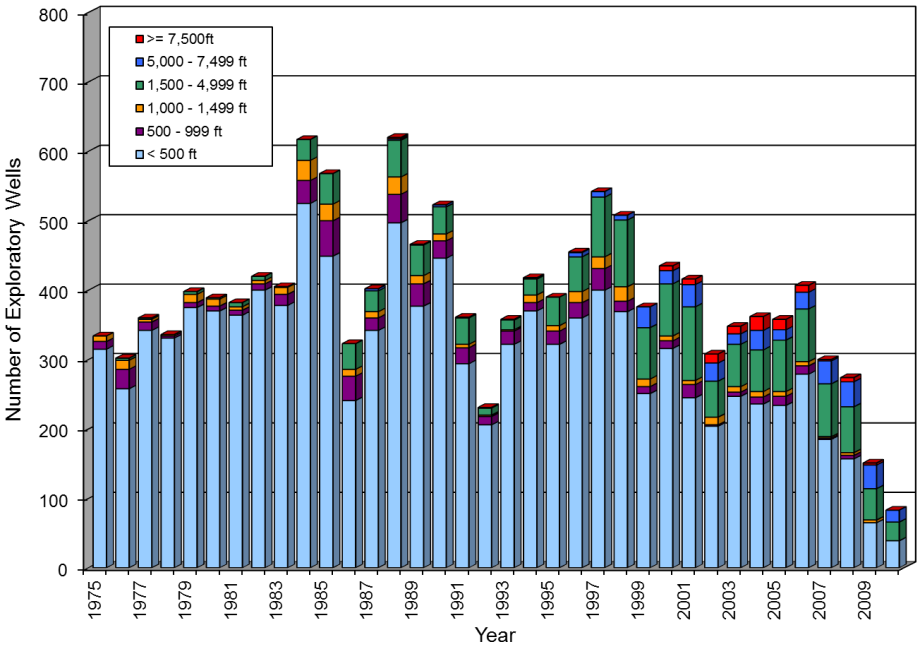


Figure 13. Number of exploratory wells drilled by water depth.

**Figure 14** presents the number of development wells drilled each year by water depth category. The total footage drilled in 2010 was 1.95 million feet compared to 2.32 million feet in 2009.

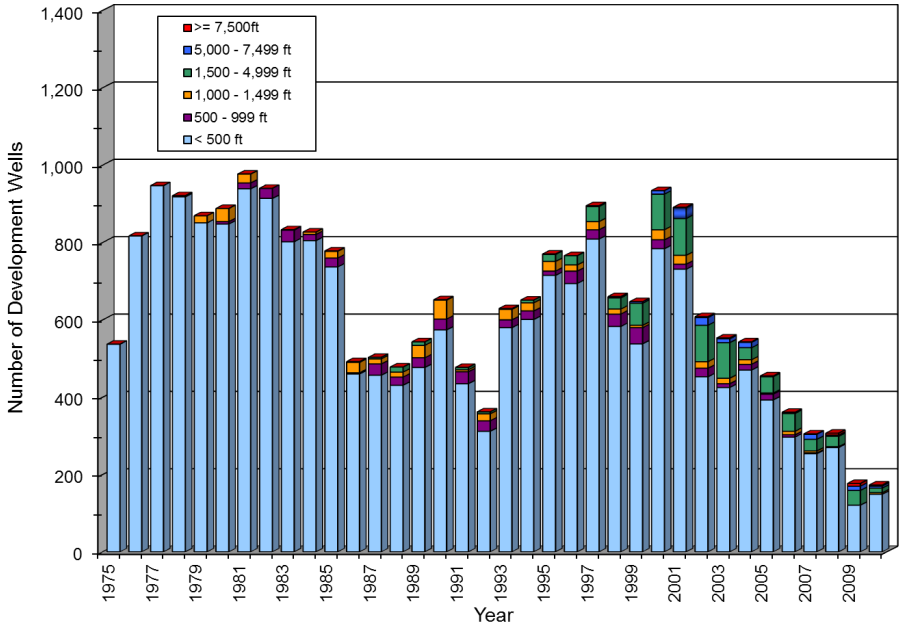


Figure 14. Number of development wells drilled by water depth.

**Figure 15** presents Original Proved plus Probable Reserves in BBOE for water depth categories by reservoir discovery year.

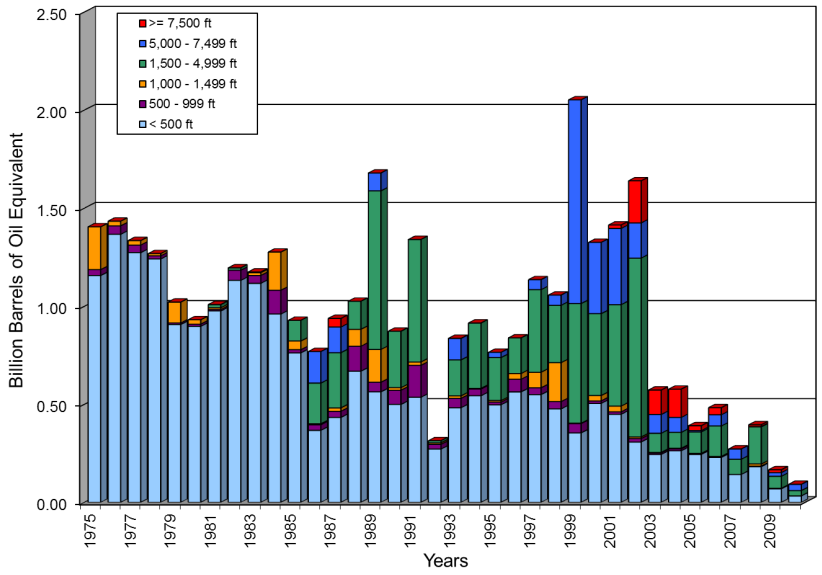


Figure 15. Original Proved plus Probable Reserves categorized by water depth and reservoir discovery year.

Annual production in the GOM is shown in **Figure 16**. The oil plot includes condensate and the gas plot includes casinghead gas. Annual production for oil and gas is presented as a total, in shallow water (less than 1,000 ft), and in deepwater (greater than 1,000 ft). From 2009 to 2010 annual oil production decreased 1 percent to 562 MMbbl and annual gas production decreased 8 percent to 2.2 Tcf. The mean daily production in the GOM during 2010 was 1.39 MMbbl of crude oil, 0.16 MMbbl of gas condensate, 1.52 Bcf of casinghead gas, and 4.65 Bcf of gas-well gas. The mean GOR of oil wells was 1,097 SCF/STB, and the mean yield from gas wells was 33.63 Bbl of condensate per MMcf of gas.

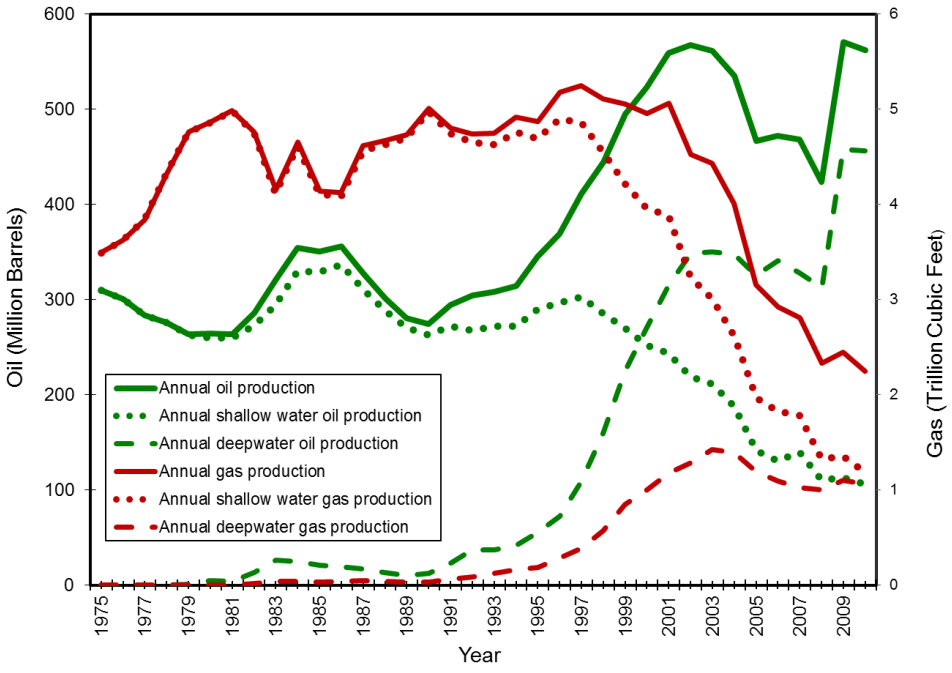


Figure 16. Annual oil and gas production.

# SUMMARY AND CONCLUSIONS

A summary of the Proved plus Probable Reserve estimates for 2010 and a comparison with estimates from the previous year's report (December 31, 2009) are shown in **Table 5**. There were 5 proved fields added during 2010 (2 oil fields and 3 gas fields), which are tabulated and summarized as increases to Original Proved plus Probable Reserves. All five of the proved fields added were discovered prior to 2010.

## Comparison of Proved plus Probable Reserves

A net change in the reserve estimates is a result of combining the discoveries and the revisions. Reserve estimates may increase or decrease with additional information (e.g. additional wells are drilled, leases are added or expire, or reservoirs are depleted). Re-evaluations of existing field studies are conducted based on field development and/or production history. Revisions of Original Proved plus Probable Reserves are presented as changes in **Table 5**. Based on periodic reviews and revisions of field studies conducted since the 2009 report, the reserves revisions have resulted in a slight increase in Original Proved plus Probable Reserves.

The table also demonstrates that the 2010 proved oil and gas discoveries and field revisions did not exceed production, resulting in a net decrease in Proved plus Probable Reserves. The Proved plus Probable Reserves decreased 6.0 percent for oil and decreased 11.3 percent for gas since the 2009 report.

Table 5. Summary and comparison of GOM Proved plus Probable oil and gas reserves as of December 31, 2009 and December 31, 2010.

| | Oil (Bbbl) | Gas (Tcf) | BOE (Bbbl) |
|---|---|---|---|
| **Original Proved plus Probable reserves:** | | | |
| **Previous estimates, as of 12/31/2009*** | **21.20** | **190.2** | **55.03** |
| Discoveries | 0.01 | 0.1 | 0.02 |
| Revisions | 0.29 | 0.8 | 0.45 |
| **Estimate, as of 12/31/2010 (this report)** | **21.50** | **191.1** | **55.50** |
| **Cumulative production:** | | | |
| **Previous estimates, as of 12/31/2009*** | **16.53** | **176.8** | **47.99** |
| Revisions | 0.02 | 0.3 | 0.06 |
| Production during | 0.56 | 2.2 | 0.96 |
| **Estimate, as of 12/31/2010 (this report)** | **17.11** | **179.3** | **49.01** |
| **Proved plus Probable reserves:** | | | |
| **Previous estimates, as of 12/31/2009*** | **4.67** | **13.3** | **7.04** |
| Discoveries | 0.01 | 0.1 | 0.02 |
| Revisions | 0.27 | 0.6 | 0.39 |
| Production during | -0.56 | -2.2 | -0.96 |
| **Estimate, as of 12/31/2010 (this report)** | **4.39** | **11.8** | **6.49** |

*Maclay et.al., 2013

**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.

Table 6. Proved plus Probable oil and gas reserves and cumulative production at end of year, 1975-2010.

*"Oil" includes crude oil and condensate; "gas" includes associated and nonassociated gas. Proved plus Probable reserves estimated as of December 31 each year.*

| Year | Number of fields included | Original Proved plus Probable Reserves | | | Historical Cumulative Production | | | Proved plus Probable Reserves | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Oil (Bbbl) | Gas (Tcf) | BOE (Bbbl) | Oil (Bbbl) | Gas (Tcf) | BOE (Bbbl) | Oil (Bbbl) | Gas (Tcf) | BOE (Bbbl) |
| 1975 | 255 | 6.61 | 59.9 | 17.27 | 3.82 | 27.2 | 8.66 | 2.79 | 32.7 | 8.61 |
| 1976 | 306 | 6.86 | 65.5 | 18.51 | 4.12 | 30.8 | 9.60 | 2.74 | 34.7 | 8.91 |
| 1977 | 334 | 7.18 | 69.2 | 19.49 | 4.47 | 35.0 | 10.70 | 2.71 | 34.2 | 8.80 |
| 1978 | 385 | 7.52 | 76.2 | 21.08 | 4.76 | 39.0 | 11.70 | 2.76 | 37.2 | 9.38 |
| 1979 * | 417 | 7.71 | 82.2 | 22.34 | 4.83 | 44.2 | 12.69 | 2.88 | 38.0 | 9.64 |
| 1980 | 435 | 8.04 | 88.9 | 23.86 | 4.99 | 48.7 | 13.66 | 3.05 | 40.2 | 10.20 |
| 1981 | 461 | 8.17 | 93.4 | 24.79 | 5.27 | 53.6 | 14.81 | 2.90 | 39.8 | 9.98 |
| 1982 | 484 | 8.56 | 98.1 | 26.02 | 5.58 | 58.3 | 15.95 | 2.98 | 39.8 | 10.06 |
| 1983 | 521 | 9.31 | 106.2 | 28.21 | 5.90 | 62.5 | 17.02 | 3.41 | 43.7 | 11.19 |
| 1984 | 551 | 9.91 | 111.6 | 29.77 | 6.24 | 67.1 | 18.18 | 3.67 | 44.5 | 11.59 |
| 1985 | 575 | 10.63 | 116.7 | 31.40 | 6.58 | 71.1 | 19.23 | 4.05 | 45.6 | 12.16 |
| 1986 | 645 | 10.81 | 121.0 | 32.34 | 6.93 | 75.2 | 20.31 | 3.88 | 45.8 | 12.03 |
| 1987 | 704 | 10.76 | 122.1 | 32.49 | 7.26 | 79.7 | 21.44 | 3.50 | 42.4 | 11.04 |
| 1988 † | 678 | 10.95 | 126.7 | 33.49 | 7.56 | 84.3 | 22.56 | 3.39 | 42.4 | 10.93 |
| 1989 | 739 | 10.87 | 129.1 | 33.84 | 7.84 | 88.9 | 23.66 | 3.03 | 40.2 | 10.18 |
| 1990 | 782 | 10.64 | 129.9 | 33.75 | 8.11 | 93.8 | 24.80 | 2.53 | 36.1 | 8.95 |
| 1991 | 819 | 10.74 | 130.5 | 33.96 | 8.41 | 98.5 | 25.94 | 2.33 | 32.0 | 8.02 |
| 1992 | 835 | 11.08 | 132.7 | 34.69 | 8.71 | 103.2 | 27.07 | 2.37 | 29.5 | 7.62 |
| 1993 | 849 | 11.15 | 136.8 | 35.49 | 9.01 | 107.7 | 28.17 | 2.14 | 29.1 | 7.32 |
| 1994 | 876 | 11.86 | 141.9 | 37.11 | 9.34 | 112.6 | 29.38 | 2.52 | 29.3 | 7.73 |
| 1995 | 899 | 12.01 | 144.9 | 37.79 | 9.68 | 117.4 | 30.57 | 2.33 | 27.5 | 7.22 |
| 1996 | 920 | 12.79 | 151.9 | 39.82 | 10.05 | 122.5 | 31.85 | 2.74 | 29.4 | 7.97 |
| 1997 | 957 | 13.67 | 158.4 | 41.86 | 10.46 | 127.6 | 33.17 | 3.21 | 30.8 | 8.69 |
| 1998 | 984 | 14.27 | 162.7 | 43.22 | 10.91 | 132.7 | 34.52 | 3.36 | 30.0 | 8.70 |
| 1999 | 1,003 | 14.38 | 161.3 | 43.08 | 11.40 | 137.7 | 35.90 | 2.98 | 23.6 | 7.18 |
| 2000 | 1,050 | 14.93 | 167.3 | 44.70 | 11.93 | 142.7 | 37.32 | 3.00 | 24.6 | 7.38 |
| 2001 | 1,086 | 16.51 | 172.0 | 47.11 | 12.48 | 147.7 | 38.77 | 4.03 | 24.3 | 8.35 |
| 2002 | 1,112 | 18.75 | 176.8 | 50.21 | 13.05 | 152.3 | 40.15 | 5.71 | 24.6 | 10.09 |
| 2003 | 1,141 | 18.48 | 178.2 | 50.19 | 13.61 | 156.7 | 41.49 | 4.87 | 21.5 | 8.70 |
| 2004 | 1,172 | 18.96 | 178.4 | 50.70 | 14.14 | 160.7 | 42.73 | 4.82 | 17.7 | 7.97 |
| 2005 | 1,196 | 19.80 | 181.8 | 52.15 | 14.61 | 163.9 | 43.77 | 5.19 | 17.9 | 8.38 |
| 2006 | 1,229 | 20.30 | 183.6 | 52.97 | 15.08 | 166.7 | 44.74 | 5.22 | 16.9 | 8.23 |
| 2007 | 1,251 | 20.43 | 184.6 | 53.28 | 15.55 | 169.5 | 45.71 | 4.88 | 15.1 | 7.57 |
| 2008 | 1,270 | 21.24 | 188.4 | 54.76 | 15.96 | 171.8 | 46.53 | 5.28 | 16.6 | 8.23 |
| 2009 ** | 1,278 | 21.20 | 190.2 | 55.03 | 16.53 | 176.8 | 47.99 | 4.67 | 13.3 | 7.04 |
| 2010 | 1,282 | 21.50 | 191.1 | 55.50 | 17.11 | 179.3 | 49.01 | 4.39 | 11.8 | 6.49 |

* Gas plant liquids dropped from system
\+ Basis of reserves changed from demonstrated to SPE proved.
** Conversion of historical gas production to 14.73 pressure base.

## Conclusions

As of December 31, 2010, the 1,282 proved oil and gas fields in the federally regulated part of the Gulf of Mexico Outer Continental Shelf (GOM OCS) contained Original Proved plus Probable Reserves estimated to be 21.50 billion barrels of oil (BBO) and 191.1 trillion cubic feet (Tcf) of gas. Cumulative Production from the proved fields accounts for 17.11 BBO and 179.3 Tcf of gas. Proved plus Probable Reserves are estimated to be 4.39 BBO and 11.8 Tcf of gas for the 828 proved active fields. Proved plus Probable oil reserves have decreased 6.0 percent and the Proved plus Probable gas reserves have decreased 11.3 percent from the 2009 report. Reserves Justified for Development in the federally regulated part of the GOM OCS are estimated to be 0.28 BBO and 1.1 Tcf of gas.

Additionally, the Contingent Resources are an estimated 5.33 BBO and 12.6 Tcf of gas. These resources can be found in oil and gas fields where the lessee has not made a formal commitment to develop the project; in leases that have not yet qualified and have not been placed in a field; and in fields that expired, relinquished, or terminated without production. As additional drilling and development occur, additional hydrocarbon volumes may become reportable.

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# APPENDIX A: Definitions of Field, Resource and Reserves Terms

The following definitions as used in this report have been modified from SPE-PRMS and other sources where necessary to conform to requirements of the BOEM Reserves Inventory Program.

**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 BOEM pursuant to the requirements of Title 30 Code of Federal Regulations (CFR) 550.115/116, Determination of Well Producibility (*Federal Register, 2012*). A field is usually named after the area and block on which the discovery well is located. Field names and/or field boundaries may be changed when additional geologic and/or production data initiate such a change. Using geological criteria, BOEM designates a new producible lease as a new field or assigns it to an existing field. http://www.boem.gov/BOEM-Newsroom/Offshore-Stats-and-Facts/Gulf-of-Mexico-Region/Field-Naming-Handbook---March-1996.aspx.

**Project**

A *Project* represents the link between the petroleum accumulation and the decision-making process, including budget allocation. A project, for BOEM's classification of Resources and Reserves, is the Field (see also Field).

**Resources**

*Resources* encompass all quantities of petroleum (recoverable and unrecoverable) naturally occurring on or within the Earth's crust, discovered and undiscovered, plus those quantities already produced. Further, it includes all types of petroleum whether currently considered conventional or unconventional.

Undiscovered Resources

Resources postulated, on the basis of geologic knowledge and theory, to exist outside of known fields or accumulations. Included also are resources from undiscovered pools within known fields to the extent that they occur within separate plays. BOEM assesses two types of undiscovered resources, *Undiscovered Technically Recoverable Resources (UTRR)* and *Undiscovered Economically Recoverable Resources (UERR)*.

Discovered Resources

Hydrocarbons whose location and quantity are known or estimated from specific geologic evidence are *Discovered Resources*. Included are *Contingent Resources* and *Reserves* depending upon economic, technical, contractual, or regulatory criteria.

Contingent Resources

Those quantities of petroleum estimated, as of a given date, to be potentially recoverable from known accumulations by application of development projects but which are not currently considered to be commercially recoverable due to one or more contingencies.

Unrecoverable

The portion of discovered or undiscovered petroleum-initially-in-place quantities which are estimated, as of a given date, not to be recoverable. A portion of these quantities may become recoverable in the future as commercial circumstances change, technological developments occur, or additional data are acquired.

**Reserves**

*Reserves* are those quantities of petroleum anticipated to be commercially recoverable by application of development projects to known accumulations from a given date forward

under defined conditions. *Reserves* must further satisfy four criteria: They must be discovered, recoverable, commercial, and remaining (as of a given date) based on the development project(s) applied. *Reserves* are further sub-classified based on economic certainty.

| | |
|---|---|
| Original Proved plus Probable Reserves | *Original Proved plus Probable Reserves* are the total of the *Cumulative Production* and *Proved plus Probable Reserves*, as of a specified date. |
| Reserves Justified for Development | The lowest level of reserves certainty. Implementation of the development project is justified on the basis of reasonable forecast commercial conditions at the time of reporting and that there are reasonable expectations that all necessary approvals/contracts will be obtained. |
| Probable Reserves | *Probable Reserves* are those additional Reserves which analysis of geoscience and engineering data indicate are less likely to be recovered than Proved Reserves but more certain to be recovered than Possible Reserves. |
| Proved Undeveloped Reserves | *Proved Undeveloped Reserves* are those *Proved Reserves* that are expected to be recovered from future wells and facilities, including future improved recovery projects which are anticipated with a high degree of certainty in reservoirs which have previously shown favorable response to improved recovery projects. |
| Proved plus Probable Reserves | The sum of the estimated Proved Reserves and any additional Probable Reserves (2P). See the separate definitions for Proved Reserves and Probable Reserves. |
| Proved *Reserves* | *Proved Reserves* are those quantities of petroleum which, by analysis of geoscience and engineering data, can be estimated with reasonable certainty to be commercially recoverable, from a given date forward, from known reservoirs and under defined economic conditions, operating methods, and government regulations. *Proved Reserves* are classified as *Proved Undeveloped Reserves* or *Proved Developed Reserves*. |
| Proved Developed Reserves | *Proved Developed Reserves* can be expected to be recovered through existing wells and facilities and by existing operating methods. Improved recovery reserves can be considered as *Proved Developed Reserves* only after an improved recovery project has been installed and favorable response has occurred or is expected with a reasonable degree of certainty. Developed reserves are expected to be recovered from existing wells, including reserves behind pipe. Improved recovery reserves are considered developed only after the necessary equipment has been installed, or when the costs to do so are relatively minor. *Proved Developed Reserves* may be sub-categorized as *Producing* or *Non-producing*. |
| Proved Developed Non-producing Reserves | *Proved Developed Non-producing Reserves* are precluded from producing due to being *shut-in* or *behind-pipe*. *Shut-in* includes (1) completion intervals which are open at the time of the estimate, but which have not started producing, (2) wells which were shut-in for market conditions or pipeline connections, or (3) wells not capable of production for mechanical reasons. *Behind-pipe* refers to zones in existing wells which will require additional completion work or future re-completion prior to the start of production. In both cases, production can be initiated or restored with relatively low expenditure compared to the cost of drilling a new well. |

Proved Developed Producing Reserves

*Proved Developed Producing Reserves* are expected to be recovered from completion intervals that are open and producing at the time of the estimate. Improved recovery reserves are considered producing only after the improved recovery project is in operation.

**Cumulative Production**

*Cumulative Production* is the sum of all produced volumes of oil and gas prior to a specified date.

# Notice

This report, *Estimated Oil and Gas Reserves, Gulf of Mexico OCS Region, December 31, 2010,* 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, Donald M. Maclay, at (504) 736-2891 at the Bureau of Ocean Energy Management, 1201 Elmwood Park Boulevard, MS GM773E, New Orleans, Louisiana 70123-2394, to communicate your ideas for consideration in our next report. An overview of the Reserves Inventory Program is available on BOEM's Website.

For free publication and digital data, visit the Gulf of Mexico 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 9.0. Digital data used to create the tables and figures presented in the document are also accessible 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.

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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 communities.

## The Bureau of Ocean Energy Management

The Bureau of Ocean Energy Management (BOEM) works to manage the exploration and development of the nation's offshore resources in a way that appropriately balances economic development, energy independence, and environmental protection through oil and gas leases, renewable energy development and environmental reviews and studies.