

INTRODUCTION TO PLAY NARRATIVES

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For this assessment the country was divided into eight regions, and the regions were subdivided into provinces. The provinces were further subdivided into plays, the basic unit of the assessment. A play is defined for this assessment as a set of known or postulated accumulations of oil and (or) gas that occur in a limited area and have similar ages and geologic settings. We assessed only those plays considered to contain accumulations greater than 1 million barrels of oil or 6 billion cubic feet of nonassociated gas (1 MMBO or 6 BCFG). The following narratives are structured in the same way-- by region, province, and play. Each of the brief region reports includes an introduction to its region and a map that locates the contained provinces. Each province report, in turn, contains a list of plays followed by discussions of the plays.

Although the provinces are numbered from (001) through (072), some provinces were not assessed and others were combined for this study as follows:

Hawaii is considered to offer no prospect for oil and gas. No province number was assigned.

Province (006), Klamath-Sierra Nevada, an area of crystalline rocks, is considered to offer no prospect for oil and gas. There are no plays or play narratives for this province.

Province (015), San Diego-Oceanside, an area in which most of the hydrocarbon potential is offshore, is to be assessed by the Minerals Management Service in conjunction with the assessment of Federal waters.

Province (030), Central Montana, was merged into North-Central Montana Province (028). We no longer retain a Central Montana Province.

Province (059), Sedgwick Basin, is discussed with the Salina Basin Province (054), although the two provinces were not formally merged. There is no separate narrative for the Sedgwick Basin Province.

Province (048), East Texas Basin, is discussed with the Louisiana-Mississippi Salt Basins Province (049). There is no separate narrative for the East Texas Basin Province.

The Blue Ridge Thrust Belt Province (068), Piedmont Province (069), Atlantic Coastal Plain Province (070), Adirondack Uplift Province (071) and New England Province (072) are described together.

A play number is composed of four digits: the first two correspond to the province in which the play occurs, the last two identify the individual play; for example, 5503 is play three in Province (055). During the life of the project, plays have been refined, combined, added, or dropped since the first numerical listings were released. Hence, the play numbering has occasional breaks and may not follow geologic sequence.

The play narratives generally follow an outline that begins with a statement defining the play, continues through discussions of reservoirs, source rocks, timing and migration, traps, and exploration status, and ends with a qualitative statement on resource potential. Sometimes these topics are combined. Each play report includes not only the geologic and map definitions of the play, but also illustrations that further define and illuminate the play, the estimates of play attributes that served as the input to the calculation of results, and the final estimates obtained from the assessment of each play. The plays are discussed numerically within each province except that, regardless of number, the continuous-type (unconventional) plays follow the conventional plays and are followed by coalbed gas plays, if present.

The play descriptions are available to random access. Various menus and other devices are employed to impose whatever structure the user wishes, such as retrieval by geographic area, play numbers, or type of play. Within each province, figure 1 is a generalized province index map and figure 2 is a generalized stratigraphic column. Additional illustrations are available for many plays; most of these illustrations were generated by the use of the data bases described by Gautier in the introduction to this disc. Depending on data availability, these illustrations may include any or all of the following:

1. A table of play results and the data used to generate the results.
2. An exploration history map of either the play or province, depending on the amount of exploration. This map shows the areas of drilling and development as well as the boundary of the play or province under consideration.

To create this exploration development map, the area was divided into cells. Each cell represents a 40-acre area in which exploration has taken place. Data for these maps were summarized from the June 1993 version of the Well History Control System (WHCS) of Petroleum Information Corporation, Houston, Tex., using a system developed by R.F. Mast and D.H. Root. The completeness of the data provided in the WHCS files varies with the geographic area mapped. Oil production, gas production, oil and gas production, and explored areas that have yielded no production are shown.

Because of insufficient data for Appalachian Basin Province (067), the author of that province report has included information from additional fields to enhance the maps for plays 6740 through 6743.

Characteristics of data retrieval affect some of the maps shown. For exploration and production cell maps, the penetrations and production shown are usually for all reservoirs of age similar to those contained in the play, whether within or without the play area. Consequently, some production may be shown which is not specific to the play. In most regions, exploration and production maps show drilling activity in the area surrounding the play as well as within the play area itself. In other regions, the maps have been clipped to show production and wells only within the discrete plays.

3. Statistical graphics. The statistical graphics were produced separately by a staff of methods and computer graphics experts, working in an iterative process involving the province geologist. These graphics depend upon the type, completeness and accuracy of data contained in the databases accessed. Because of this and the fact that the graphics are drawn from various separate and independent data bases and sources, some occasional discrepancies will be noted. For instance, seeming inconsistencies may result from discovery wells not being reported in one or another data base; moreover, production, accumulation depth, or wildcat wells may be lacking in the data base. Some graphs were not created because the production data used for play assessment is confidential. These plots are available only for confirmed (proven) plays:

- a. Oil and (or) gas volume versus number of exploratory wells (with a time axis).
- b. Cumulative number of oil and (or) gas accumulations versus number of exploratory wells.
- c. Cumulative number of oil and (or) gas accumulations versus year of discovery.
- d. Cumulative oil and (or) gas volumes versus number of exploratory wells
- e. Cumulative oil and (or) gas volumes versus year of discovery.
- f. Oil and(or) gas accumulation depth (shallowest reservoir) versus year of discovery.
- g. Size frequency histograms of oil and (or) gas volumes.

4. Table of Truncated Shifted Pareto (TSP) distributions. The use of this table is described in the chapter by Gautier and Dolton, entitled "Methodology of assessment of conventional plays."

Unconventional plays are discussed in several places. In addition to the discussions of individual plays in the province reports, two general reports give descriptions of continuous-type accumulations (James W. Schmoker, "Continuous-type play narratives") and coalbed methane plays (Dudley D. Rice, "Geologic framework and description of coalbed gas plays"). (Although coalbed methane plays are included in the appropriate province reports, this last report contains not only enhanced discussions of all coalbed gas plays assessed, but also the references Rice used in his work.) Elsewhere these same authors describe methods of assessment for these two types of unconventional plays (Schmoker, "Method for assessing continuous-type hydrocarbon accumulations," and Rice and others, "Methodology for assessment of potential additions to reserves of coalbed gas"). Chapters also are included on gas hydrates, heavy oil, and deep gas (Timothy S. Collett, "Gas hydrate resources of the United States"; Mark Pawlewicz, "Heavy oil resources of the United States"; T. S. Dyman and others "Deep natural gas reservoirs and conventional plays in the United States").

There are obvious differences in presentation and treatment between this report and many other U. S. Geological Survey (USGS) reports. The CD-ROM was chosen because of the large volume of data to be included as well as the low cost of duplication. An exemption from formal review of geologic names was requested and received because this is not a stratigraphic study, and many terms approved for use by the USGS are not used by the oil and gas industry. In the play narratives, only English units, rather than metric, are reported. The data bases described by Gautier in the introduction to this disc are not cited in the play narratives because these data bases are proprietary or contain confidential information; however, they were used throughout the study.

The following abbreviations and definitions are used:

<u>Abbreviation or term</u>	<u>Meaning</u>
API	American Petroleum Institute
bb1	Barrel
BB	Billion barrels
BBO	Billion barrels of oil
BCF	Billion cubic feet
BCFG	Billion cubic feet of gas

BLPMMCF	Barrels of liquid per million cubic feet
BNGL	Barrels of natural gas liquids
BNGLPD	Barrels of natural gas liquids per day
BO, MBO, MMBO	Barrel of oil, thousand and million barrels of oil
BOE	Barrels of oil equivalent (6000 cubic feet of gas equal 1 barrel of oil)
BOPD	Barrels of oil per day
BTU	British Thermal Units
BOPD, MBOPD, MMBOPD	Barrels of oil per day, thousand and million barrels of oil per day
BWPD	Barrels of water per day
CAI	Conodont alteration index --indicates thermal maturity with respect to hydrocarbons
CF	Cubic feet
CFPD	Cubic feet per day
CFGPD	Cubic feet of gas per day
DST	Drill stem test
EUR	Estimated ultimate recovery or production plus measured (proved) reserves
GOR	Gas/Oil ratio usually expressed as CFG/BO
Grown volume	Accumulation or resource size adjusted for future growth beyond cumulative production plus measured (proved) reserves. The sum of production, measured reserves, and inferred reserves.
Known volume	Accumulation or resource size, representing cumulative production plus measured (proved) reserves.

M...	A prefix meaning "thousand" in abbreviations such as MBNGL, MBNGLPD, MBO, MCF
Ma	Millions of years before the present
mD	Millidarcies (measurement of permeability)
MM...	A prefix meaning "million" in abbreviations such as MMBNGL, MMBO, MMBOE, MMCF, and MMCFPD
NGL	Natural gas liquids
MBNGL, MMBNGL and MBNGLPD, MMBNGLPD	Thousands and millions of barrels of natural gas liquids: thousand barrels NGL per day, million barrels NGL per day
NGL/Gas	NGL/Gas ratio. usually expressed as bbl/MMCFG (barrels of natural gas liquids per million cubic feet of gas)
OM	Organic matter
psi	Pounds per square inch
psi/ft	Pounds per square inch per foot, a pressure gradient
R _o , R _m	Vitrinite reflectance measurements which indicate thermal maturity with respect to hydrocarbon generation
Scf/t	Standard cubic feet per ton
TAI	Thermal alteration index--a maturity indicator used in source-rock evaluation
TCF	Trillion cubic feet
TCFG	Trillion cubic feet of gas
TD	Total depth of well
TDS	Total dissolved solids
T _{max}	Maximum temperature reached by source rocks as

	measured in Rock-Eval analysis
TOC	Total organic carbon
TSP	Truncated Shifted Pareto (distribution)
TVD	Total vertical depth
Types I, II, and III organic matter or kerogen	The types have different chemistry and different petroleum potential. They indicate the environment of deposition of the source rocks and the kind of hydrocarbon expected.
Window	The range of thermal maturity in which hydrocarbons are generated. The "oil window" and the "gas window" represent different ranges of maturity.