Florida

REASONABLY FORESEEABLE DEVELOPMENT SCENARIO FOR FLUID MINERALS

Prepared for:

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
EASTERN STATES
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April 2008

The Bureau of Land Management is responsible for the stewardship of our public lands. It is committed to manage, protect, and improve these lands in a manner to serve the needs of the American people for all times. Management is based on the principles of multiple use and sustained yield of our nation's resources within a framework of environmental responsibility and scientific technology. These resources include air, fish and wildlife, minerals, paleontological relics, recreation, rangelands, scenic scientific and cultural values, timber; water, and wilderness.

BLM/ES/PL-08/XXX

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ACRONYMS

ACEC	Area of Critical Environmental Concern
APD	Application for Permit to Drill
AU	Assessment Units
BCF	billion cubic feet
BLM	Bureau of Land Management
BOPD	barrels of oil per day
CBNG	Coal Bed Natural Gas
EIS	Environmental Impact Statement
EOR	Enhanced Oil Recovery
ESA	Endangered Species Act
EIS	Environmental Impact Statement
JFO	Jackson Field Office
MMBO	million barrels of oil
ROD	Record of Decision
RMP	Resource Management Plan
SMA	Surface Management Agency
TCF	trillion cubic feet
TPS	Total Petroleum Systems
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	U.S. Geological Survey

Summary

1.0 INTRODUCTION

The Bureau of Land Management's Jackson Field Office is located in Jackson, Mississippi, and is responsible for 11 southern states: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia. The Jackson Field Office manages approximately 34.25 million acres of federal mineral estate in the eastern portion of the United State. Of this approximately 3.26 million mineral estate acres are located in Florida.

The Reasonable Foreseeable Development Scenario (RFDS) forecasts fluid mineral exploration, development, and production for the planning area for the next 10 years. The RFDS assumes a baseline scenario in which no new policies are introduced and all areas not currently closed to leasing and development are opened for oil and gas activity.

Interagency Reference Guide - Reasonably Foreseeable Development Scenarios and Cumulative Effects Analysis for Oil and Gas Activities on Federal Lands in the Greater Rocky Mountain Region" (USDI 2002), "Policy for Reasonably Foreseeable Development Scenario (RFD) for Oil and Gas (BLM WO IM No. 2004-089) and Planning for Fluid Minerals Supplemental Program Guidance (BLM Handbook H-1624-1) guided the criteria and analyses methods used in this RFD.

1.1 Discussion of Determining Oil and Gas Resource Potential

Potential accumulations of oil and gas are described in Section 2. Non-BLM land within the state may be included in this section when it provides a better understanding of resource potential on BLM property. These determinations were made using the geologic criteria provided by reference in Section 2. Also contained in Section 2 are descriptions of stratigraphy, structure, historic oil and gas activities, as well as relevant studies done in the area. Potential reservoir rocks, source rocks, and existing stratigraphic and structural traps are discussed in detail.

1.2 Methodology for Predicting Future Oil and Gas Exploration and Development Activity

Section 7 predicts the type and intensity of future oil and gas exploration and development activities. These forecasts are determined by an area's geology, and historical and present activity, as well as factors such as economics, technological advances, access to oil and gas areas, transportation, and access to processing facilities. Economics, technology, and other factors may be hard to predict because of their complex nature and rapid rate of change. Projections of oil and gas activities are based upon present knowledge. Future changes in global oil and gas markets, infrastructure and transportation, or technological advancements, may affect future oil and gas exploration and development activities within the state.

1.3 Relating the Potential for Resource Occurrence to Potential for Activity

Predicted oil and gas activity does not necessarily correlate with geologic potential for the presence of hydrocarbons. Although the geology of an area may suggest the possibility of oil and gas resources, actual exploration and development may be restricted by high exploration costs, low oil and gas prices, or difficulty accessing the area due to lease stipulations. Thus a small area may have a high resource potential, yet have a low exploration and development potential due to severe restrictions on access. Conversely, technological advancements or an increase in oil and gas prices could result in oil and gas activities in areas regarded as having low potential for occurrence.

2.0 DESCRIPTION OF THE GEOLOGY OF FLORIDA

Strata at the surface and in the subsurface are the product of a continuing interaction between sands and clays being shed south from the emergent continent and the abundant carbonates being generated along the coastal areas of the state. As the coastline has fluctuated shoreward or seaward and the continent risen and fell, varying volumes of terrigenous clastics have diluted the accumulating carbonates. At widely scattered places in the state, oil and gas has accumulated in the Jurassic and Cretaceous strata.

2.1 Regional Geology

Rocks at the surface of the Florida peninsula consist primarily of Tertiary and Quaternary units and consist of marine carbonates or coastal clastics (Figure 1). The oldest sedimentary units exposed at the surface in Florida are Middle Eocene carbonates of the Avon Park Formation which out crop in west-central Florida along a lengthy northwest-to-southeast trending structural platform that extends along the west central part of the peninsula (Scott, T.M., 2001). Progressively younger units are exposed as one moves away from the crestal portion of this feature on the peninsula with much of the rest of the state being covered by Pliocene to Holocene sediments that were deposited during numerous sea level fluctuations of the Tertiary and Quaternary.

Structurally, Florida is different from other states that border the Gulf of Mexico; Florida has a comparatively thin sedimentary section that has been influenced by basement-involved elements rather than salt dispirism. Major structural elements that are present within the state include the Chattahoochee Anticline, the Gulf Trough, the Ocala Platform (Peninsula Arch), the Okeechobee Basin, the Osceola Low, the St. John Platform, the Sanford High, the Brevard Platform and the Nassau Nose (Scott, T.M., 2001). The approximate locations of these features are shown in Figure 2.

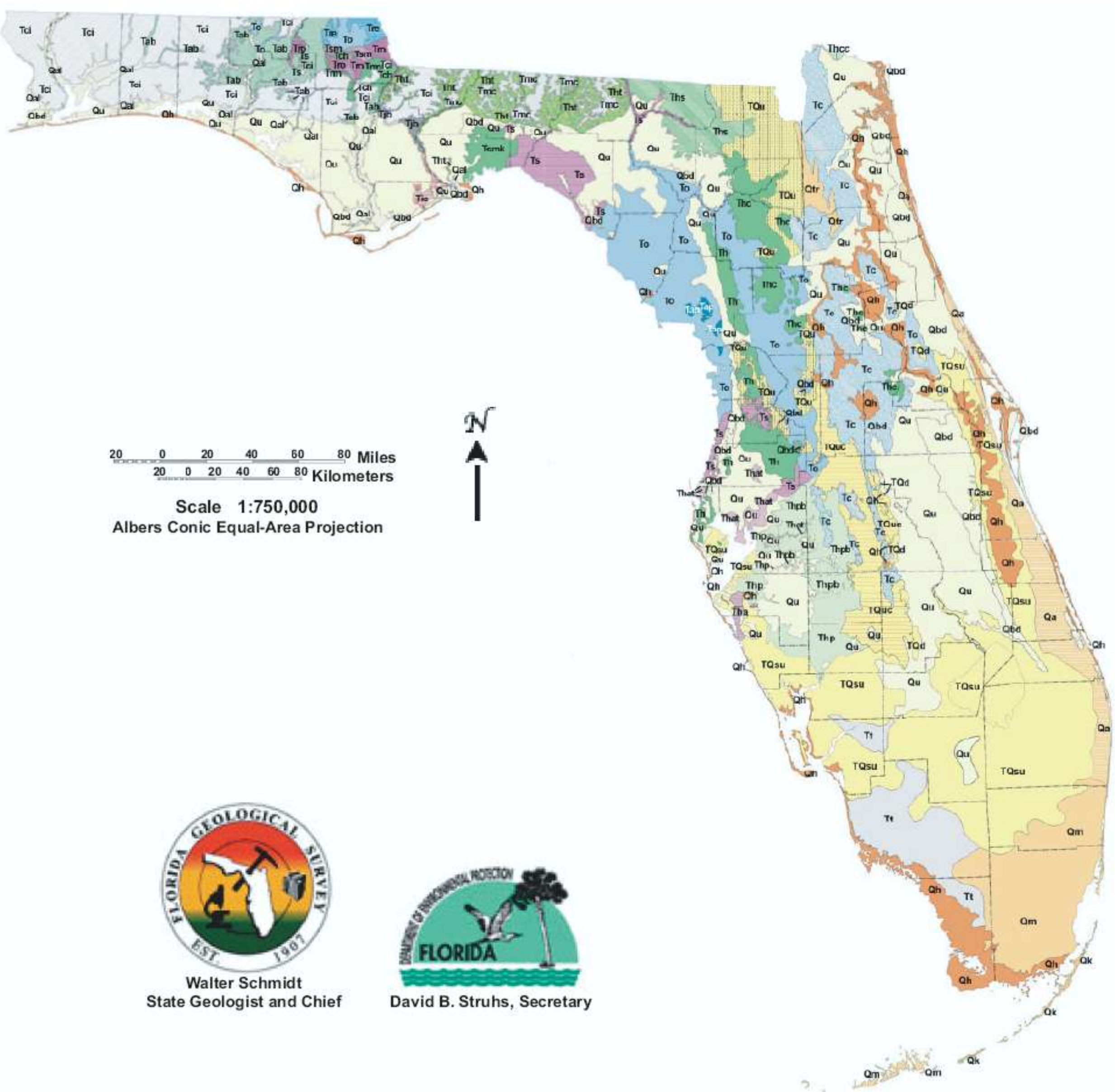
A thick sequence of mid-Jurassic to Holocence sediments (unlithified to well lithified) lies unconformably upon the eroded surface of the basement rocks. Carbonate sedimentation predominate from mid-Jurassic until at least mid-Oligocene on most of the Florida platform. In response to renewed uplift and erosion in the Appalachian highlands to the north and sea-level fluctuations, siliciclastic sediments began to encroach upon the carbonate-depositing environments of the Florida Platform. Deposition of siliciclastic-bearing carbonates and siliciclastic sediments predominated from mid-Oligocene to the Holocene over much of the platform. Numerous disconformities that formed in response to nondeposition and erosion resulting from sea-level fluctuations occur within the stratigraphic section.

Only the Ocala Platform on the central peninsula and the Chattahoochee Anticline and Gulf Trough of the panhandle region have exerted any influence on the surface or near surface distribution of Cenozoic sediments, or mark areas of significant changes in sediment type (Scott, T.M., 2001). Generally areas north and west of the Gulf Trough are dominated by clastic sediment while the area of the peninsula is largely dominated by deposition related to marine carbonate environments.

2.2 Subsurface Stratigraphy and Structure

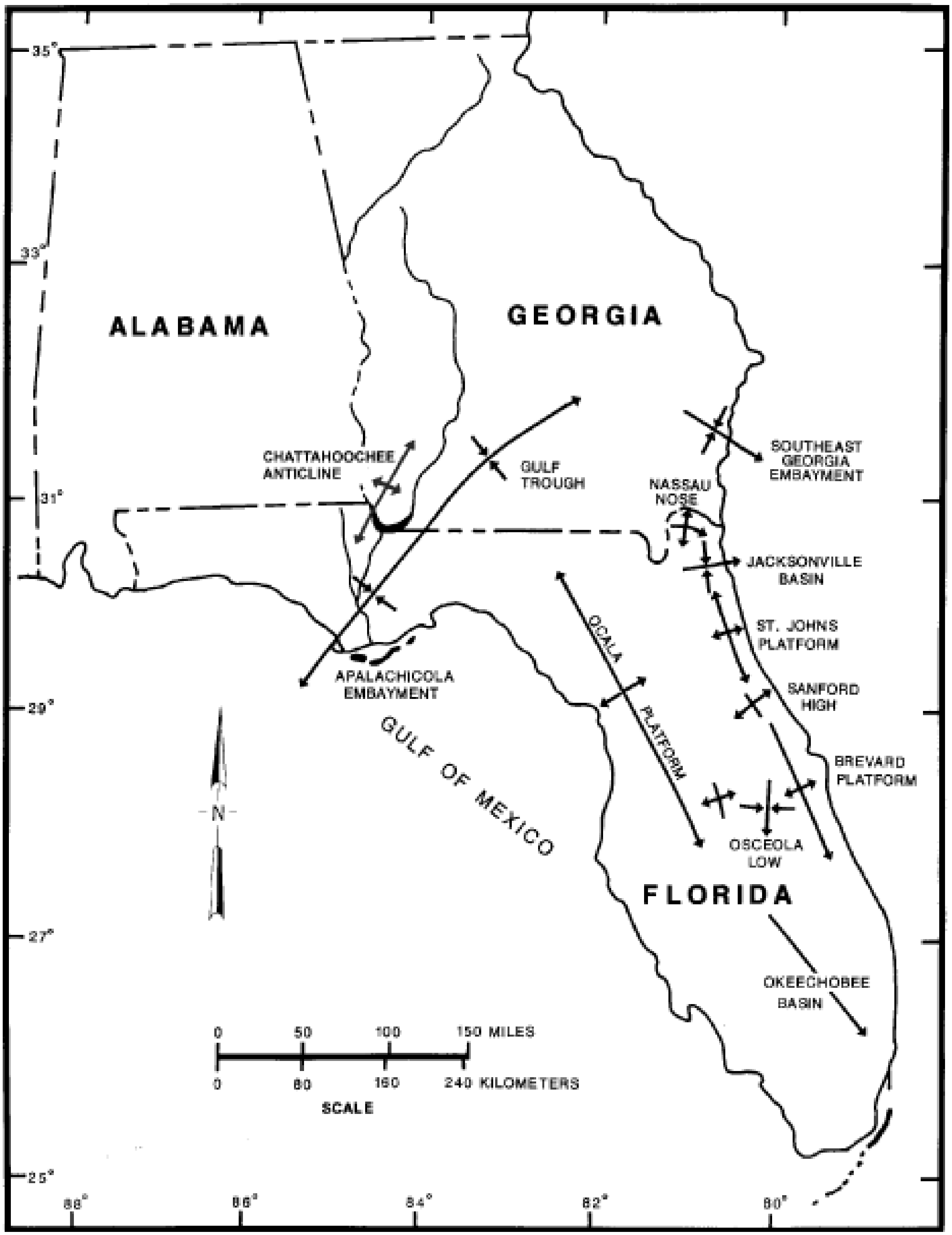
Figures 3 and 4 list the important stratigraphic units present in the subsurface of Florida. Beyond the depth of most oil and gas drilling is the less than 1,000 feet of Louann Salt that lies upon the basement across the state. Overlying the salt is the Norphlet Formation of Jurassic age is an eolian sandstone of variable porosity less than 500 feet thick, although it may not be present everywhere (Emery and Robinson, 1993). The Smackover consists of less

Figure 1: Geologic Map of Florida



Source: FGS, 2006 SOFIA – http://sofia.usgs.gov

Figure 2: Major Structural Elements of the State of Florida



Source: Scott, 1988

Figure 3: Generalized Stratigraphic Column for Florida Panhandle (Middle Jurassic to Lower Cretaceous)

Era	System	Stage	Groups and Formations
Mesozoic	**Lower Cretaceous**	Berriasian	Cotton Valley Group
	Upper Jurassic	Tithonian	
		Upper Kimmeridgian	Haynesville Formation
		Lower Kimmeridgian	(Buckner Member) Lower Haynesville Formation
		Oxfordian	Smackover ●☼
			Norphlet Formation ●☼
	Middle Jurassic	Callovian	Louann Salt

Source: USGS, 2001

Figure 4: Generalized Stratigraphic Column for Florida Peninsula (Upper Jurassic to Lower Cretaceous)

Era	System	Stage	Groups and Formations		
Mesozoic	**Lower Cretaceous**	Aptian	Ocean Group	Rattlesnake Hammock Fm.	
				Lake Trafford Formation	
				Sunniland Formation ●☼	
			Glades Group	Punta Gorda Anhydrite	
				Lehigh Acres Formation	Able Member
					Twelve Mile Member
					West Felda Shale
			Pumpkin Bay Formation		
		Barremian	Bone Island Formation		
		Hauterivian			
		Valanginian			
		Berriasian			
	Jurassic	Tithonian	Wood River Formation		

Source: USGS, 2001

than 500 feet of Jurassic carbonates and scattered clastics in the upper portion and organic mudstones in the lower Smackover (USGS, 2001). Overlying the Smackover are the mixed clastics and carbonates of the Haynesville and Cotton Valley Formations. In the Florida Peninsula, the Sunniland is the most important stratigraphic unit in terms of oil and gas occurrence and potential, the Sunniland is Early Cretaceous in age, slightly younger than the Cotton Valley.

The depositional environment during the Lower Cretaceous in south Florida was one of a shallow sea with a very slowly subsiding sea bottom. The time interval was characterized by numerous transgressions and regressions of the sea over the land, which created the carbonate-evaporite sequence of geologic formations shown on. The Sunniland "reefs" are not true patch reefs but were localized mounds of marine animals and debris on the sea floor. The primary mound-builders found in the Sunniland limestone were rudistids, oyster-like mollusks that existed only during the Cretaceous. They lived in great profusion and were widely distributed in clear, shallow Cretaceous seas. Other marine life found in the Sunniland patch reefs, or mounds, included calcareous algae, seaweed, foraminifera, and gastropods, such as snails.

Foraminifera, usually quite small, are single-celled animals with external skeletons or tests. Because of their incalculable numbers in the seas, their tests and remains can represent significant amounts of organic debris on the ocean bottom. Pellets and other organic debris also accumulated in these mounds. The remains of the rudistids, other marine life and debris were deposited on the sea floor, forming porous limestones. Porosity within the limestones was enhanced over succeeding eons by the gradual transformation of limestone to dolostone, which resulted in good reservoir rocks to hold the oil.

The porous limestones and dolostones grade laterally into non-porous, chalky lime mudstones. These dense limestones form a barrier to oil migration, thus trapping the oil in the more porous rocks. Research indicates that the dense mudstones are probably the source rocks for the Sunniland oil. The Sunniland Formation, therefore, appears to include its own oil source rocks and some of its own seals. Additional seals are provided by the evaporites of the overlying Lake Trafford Formation (Lane, 1994).

3.0 SUMMARY OF USGS PLAY DESCRIPTIONS FOR THE STATE OF FLORIDA

A series of oil and gas assessments have been conducted for the Florida Peninsula Province and the Florida Panhandle region (province 49) as part of the 1995 USGS National Oil and Gas Assessment (Gautier and others, 1995) and in 2000 using the total-petroleum-system (TPS) method. In each of those assessments for these provinces a number of conventional and unconventional oil and gas plays or TPS assessment units were assessed which might have an impact on oil and gas exploration and production activity in Florida.

The following is a summary of those province assessments and includes only very general information relative to the plays or TPS units. The primary source materials for this summary presentation are the geologic reports for each of the province assessments as published by the USGS and are available at the USGS National Oil and Gas Assessment website (http://energy.cr.usgs.gov/oilgas/noga/). Copies of the province reports (49 and 50) are included in Appendix B.

3.1 Florida Peninsula Province

The assessment of the Florida Peninsula province included all of the state of Florida east of the Apalachicola River and the adjoining State waters (USGS, 1995). The province is approximately 150 miles and about 400 miles long totaling nearly 60,000 square miles. It is bounded to the north by the State boundary with Georgia and to the east, south, and southwest by the boundaries of Florida State waters.

Six conventional hydrocarbon plays were delineated in the peninsula for the purposes of the 1995 USGS National Oil and Gas Assessment (Gautier and others, 1995; Pollastro and Viger, 1998). The Upper Sunniland Tidal Shoal Oil play (5001) and the Lower Sunniland Fractured “Dark Carbonate” Oil play (5002) are confirmed plays. At the time of the 1995 National Oil and Gas Assessment, about 103 million barrels of oil (MMBO) had been produced from these known plays.

The remaining four plays in the 1995 assessment are hypothetical. They are the Dollar Bay Shoal-Reef Dolomite Oil play (5003), the Lower Cretaceous Carbonate Composite Oil play (5004), the Extended Upper Sunniland Tidal Shoal Oil play (5005), and the Wood River Dolomite Deep Gas play (5006).

About 370 MMB of undiscovered oil were estimated in the assessment using a play-based methodology from the five plays of the peninsula; an additional 57.5 billion cubic feet of gas (BCFG) or 10 million barrels of oil equivalent (MMBOE) were estimated as gas in oil fields. Most of the 370 MMBO was from the Lower Cretaceous Sunniland Formation with the two Upper Sunniland Tidal Shoal Oil plays (5001, 5005) estimated to contain 281 million barrels of undiscovered oil.

The 2000 TPS assessment recognized two stacked petroleum systems, each with a single assessment unit. The two TPS’s are separated strati-graphically by a major regional evaporite seal, the Lower Cretaceous Punta Gorda Anhydrite. The younger TPS assessment unit is designated as the South Florida Basin Sunniland–Dollar Bay TPS (USGS code 505001) and corresponding Lower Cretaceous Shoal-Reef Oil assessment unit (50500101). The second and older TPS is the South Florida Basin Pre-Punta Gorda TPS (505002) and corresponding Pre-Punta Gorda Dolomite Gas and Oil hypothetical assessment unit (50500201). The two assessment units are correlatable to the plays defined for the 1995 USGS assessment (Pollastro, 1995). The Lower Cretaceous Shoal-Reef Oil assessment unit corresponds to 1995 USGS assessment plays 5001, 5002, 5003, and 5005. Similarly, the Pre-Punta Gorda Dolomite Gas and Oil hypothetical assessment unit corresponds to plays 5004 and 5006. Full descriptions of these plays and assessment units can be reviewed in Appendix B.

3.2 Florida Panhandle Area

The assessment of the Florida Panhandle region is housed in the Louisiana-Mississippi Salt Basins Province (Cotton Valley Group 49) report prepared by the USGS in 2002. Three Jurassic natural gas trends can be delineated in southwestern Alabama and the Florida panhandle area. These include a deep natural gas trend, a natural gas and condensate trend, and an oil and associated natural gas trend. Trends are recognized by hydrocarbon types, basinal positions, and relationships to regional structural features. Within these natural gas trends, eight distinct natural gas plays have been identified.

The deep natural gas trend includes the Mobile Bay area play that is characterized by structural hydrocarbon traps associated with salt tectonism and Norphlet sandstone reservoirs at depths exceeding 20,000 feet.

The natural gas and condensate trend includes the Mississippi interior salt basin play, the Mobile graben play, the Wiggins arch complex play, and the Pollard fault system play. The Mississippi interior salt basin play is typified by salt-related structural and combination hydrocarbon traps and Smackover dolomitized oolitic, oncolitic, and peloidal grainstone and packstone reservoirs at depths of approximately 16,000 feet. The Mobile graben play is exemplified by salt-induced structural hydrocarbon traps and Smackover dolostone and Norphlet sandstone reservoirs at depths ranging from 12,400 to 18,400 feet. The Wiggins arch complex play is characterized by structural and combination hydrocarbon traps associated with stratigraphic pinch-outs and salt flow. These traps are salt-related and occur along the flanks of paleohighs associated with the Wiggins arch complex. Smackover dolostone reservoirs at depths ranging from 16,100 to 18,400 feet are typical of this play. The Pollard fault system play is typified by salt-induced structural hydrocarbon traps and reservoirs at depths of approximately 15,000 feet. These reservoirs are Smackover dolomitized oolitic and peloidal grainstones and packstones and Norphlet sandstones.

The oil and associated natural gas trend includes the Gilbertown and West Bend fault systems play, the Foshee fault system play, and the basement ridge play. The Gilbertown and West Bend fault systems play is exemplified by salt-related structural or combination traps and Smackover dolomitized oolitic, oncolitic, and peloidal grainstone and packstone reservoirs and Norphlet sandstone reservoirs at depths ranging from 11,000 to 14,000 feet. The Foshee fault system play is characterized by structural and combination hydrocarbon traps related to salt movement and Smackover dolomitized peloidal grainstone and packstone and Norphlet sandstone reservoirs at depths of approximately 15,000 feet. The basement ridge play, which is typified by structural and combination traps associated with the Conecuh and Pensacola-Decatur ridge complexes and Smackover oolitic and peloidal grainstone and packstone and algal boundstone and Haynesville sandstone reservoirs at depths ranging from 11,800 to 15,500 feet, has potential for significant undiscovered natural gas. Appendix B contains copies of the play assessment reports.

4.0 Past and Present Oil and Gas Exploration Activity

4.1 Geophysical and Geochemical Surveys

No extensive geophysical or geochemical surveys have been undertaken in Florida in recent years other than individual seismic operations targeted at specific exploration targets generated off of surface or subsurface geologic studies (Taylor, 2008).

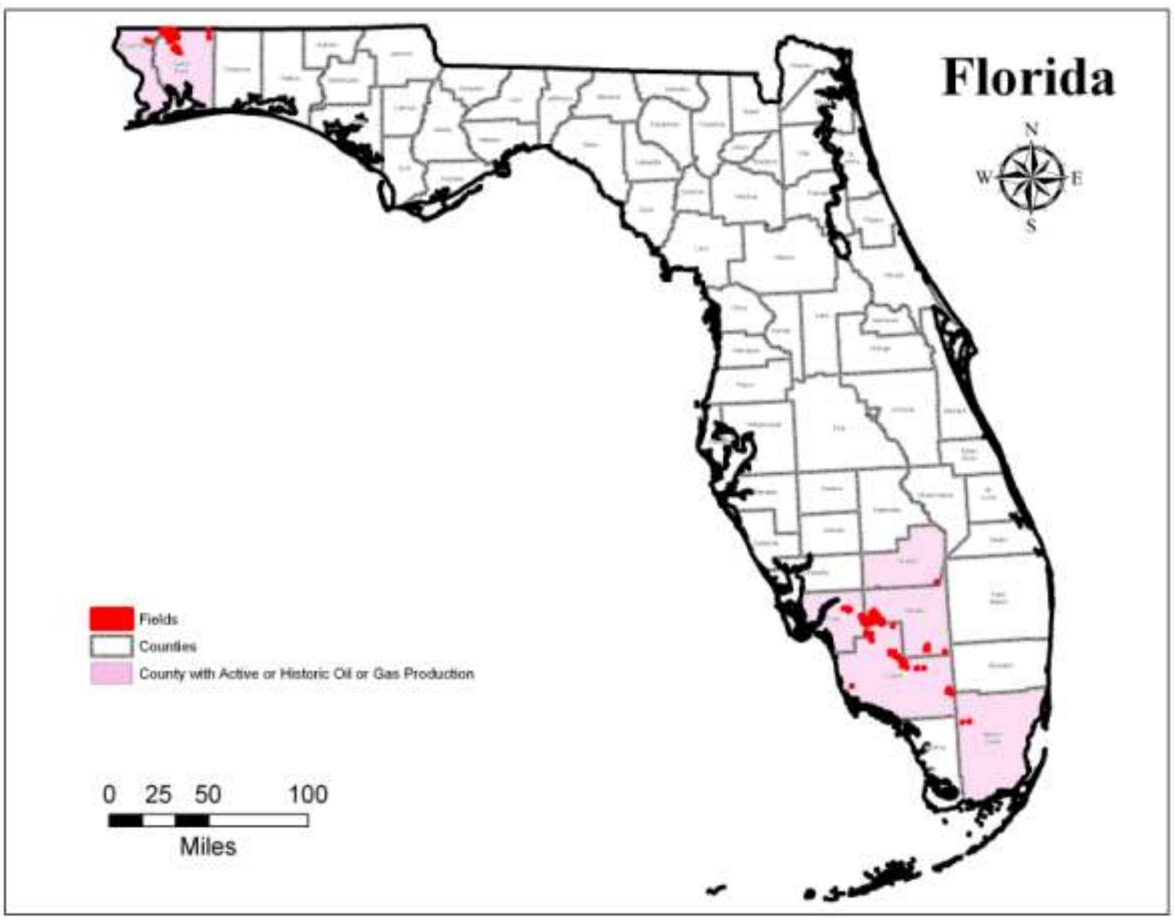
4.2 Exploratory Drilling and Success Rates

The success rates are difficult to statistically confirm because there have only been 33 application for permit to drill for onshore sites issued since 1995. Of these 33 APDs 20 were for infill drilling and 13 were for wildcat locations. Only 14 of the infill wells were ever drilled and all became producers. With regards to the wildcat wells, eight were never drilled, four were drilled and abandoned and one had the application denied. Therefore, the average success rate over the last 13 years for infill and wildcat wells drilled is 77 percent (Garrett, 2008)

4.3 New Field and Reservoirs

There have been no new fields or reservoirs discovered in either the panhandle or peninsula since 1988 when the McDavid field was drilled. Figure 5 shows the historical production by county.

Figure 5: Counties with Active or Historic Production



Source: FDEP, 2008

5.0 OIL AND GAS ACTIVITY IN FLORIDA

This section deals with the current status of oil and gas activity in Florida based on information provided by both public and private sources. Information includes; leasing activity, well spacing requirements, drilling permits by county, drilling practices, production statistics, oil and gas characteristics, oil and gas prices, operational costs (drilling and completion), conflicts with other mineral development, and gas storage fields.

5.1 Leasing Activity

Leasing activity in Florida has ceased in the past decade (Taylor, 2008).

5.2 Well Spacing Requirements

Well spacing requirements for oil and gas wells drilled in Florida are subject to the rules and regulations of the Florida DEP Bureau of Mines and Mineral Regulation. Spacing requirements fall under those set by specific field rules issued by the DEP under Conservation of Oil and Gas Permitting under Chapter 62c-26.

The specific DEP regulation which deals with spacing requirements not covered under established field rules is general spacing rule 62C-26.004 (6). The complete text of this rule is attached in Appendix B. While there are certain exceptions available under specific conditions Table 1 shown below summarizes the standard requirements for unit size, spacing and setbacks as outlined in Rule 62C-26.004.

Table 1: Summary of Well Spacing Requirements Florida Conservation of Oil and Gas Permitting 62C-26.004

Well Type	Well Depth	Unit Size	Minimum Distance of Bottom Hole to Nearest Drilling Unit Boundary
Oil	< 7,000 Ft	40 Acres	No closer than 460 Ft
Oil	>7,000 Ft	160 Acres	No closer than 920 Ft
Gas	All depths	640 Acres	No closer than 1,320 Ft
Associated Drilling Units	> 7,000 Ft	160 Acres	No closer than 1,840 Ft
Horizontal Wells		160 Acres	No closer than 1,840 Ft

5.3 Drilling and Completion Statistics

5.3.1 Drilling Practices

The majority of the recent drilling operations (~past 15 years) in Florida are standard vertical tests drilled with mud rotary equipment that vary in depth from 11,000 feet to 16,800 feet. This range is based on the drill site's elevation and general position on regional structural features. The majority of wells drilled and produced in this period have been completed at approximately 11,500 feet (West Felda, Raccooon Point and Jay Fields) The deepest vertical test drilled to date reached a depth of approximately 14,953 feet but was a dry hole. As of late 2007 no horizontal wells have been added to the database (Florida Geological Survey database 2008).

5.3.2 Drilling and Completion Costs

Drilling costs and well completion costs vary by depth, reservoir, and completion practice for the specific reservoir to be produced. Very generalized costs associated with oil production areas in the state suggest that well costs for deep (>10,000 fbs) are in the order of approximately $1,500,000 to 2,500,000 for drilling costs and $500,000 to $1,000,000 for completion costs (Spencer, 2008).

5.4 Production Statistics

5.4.1 Crude Oil

Hydrocarbon production has a long history in Florida; Table 2 lists the active fields, their discovery date, reservoir, and depth. No new oil and gas fields have been discovered in the state since 1988 and existing fields are in decline across the state. The latest figures show that the Florida Peninsula is averaging approximately 48,000 bbl of oil per year per well and the Panhandle averages 49,000 bbl per year per well. Current commodity prices mean that each producing well has a gross income of approximately $5.0 million per year. Table 3 shows the production from 1999 through 2007.

This production decline trend is not expected to be significantly altered as most of the oil production located in both the panhandle and peninsula is categorized as very mature production that is dependent on infill and trend development drilling as well as secondary recovery operations for generally sustaining this rate (Garrett, 2008).

5.4.2 Natural Gas

Annual natural gas production in Florida for the years 1999 through 2007 is shown in Table 4. Like oil production, natural gas production has generally been on the decline since 2000 when annual production stood at 7,205,410 Mcf of gas for the year. Since that year annual production has generally fallen each year through which there is data available with 2007 annual production reaching 1,930,989 Mcf or a 73.2% decrease in production over that which was reported in 2000. This decrease in production is undoubtedly because of the decrease in drilling operations and discoveries in West Felda, Lehigh, Raccoon Point and Jay fields.

5.5 Oil and Natural Gas Characteristics

5.5.1 Natural Gas

Natural gas produced from oil and gas fields in the panhandle are typically wet gas depending on the individual reservoir with <¼ grain H_2S. The natural gas from the fields has as a general average heating value of >1,000 Btu per cubic foot with >3% CO_2 or nitrogen content being reported (Foss, 2004).

Table 2: Oil and Natural Gas Fields of Florida

Field	County	Date of Discovery	Reservoir (s)	Approx. Depth
Florida Peninsula Fields				
Sunniland	Collier	9-26-43	Sunniland	11,625
40 Mile Bend	Dade	9-1-54	Sunniland	11,555
Sunoco-Felda	Hendry	77-22-64	Sunniland	11,485
West Felda	Hendry	8-2-66	Sunniland	11,675
Lake Trafford	Collier	3-30-69	Sunniland	11,985
Bear Island	Collier	12-5-72	Sunniland	11,815
Seminole	Hendry	11-14-73	Sunniland	11,650
Lehigh Park	Lee	7-30-74	Sunniland	11,630
Baxter Island	Collier	8-11-77	Sunniland	11,820
Mid-Felda	Hendry	10-13-77	Sunniland	11,685
Raccoon Point	Collier	6-20-78	Sunniland	11,655
Pepper Hammock	Collier	9-28-78	Sunniland	11,895
Townsend Canal	Hendry	6-27-82	Sunniland	11,460
Corkscrew	Collier	11-10-85	Sunniland	11,565
Florida Panhandle Fields				
Jay	Santa Rosa	6-15-70	Smackover & Norphlet	15,985
Mt. Carmel	Santa Rosa	12-19-71	Smackover & Norphlet	15,400
Blackjack Creek	Santa Rosa	2-14-72	Smackover & Norphlet	16,235
Sweetwater Creek	Santa Rosa	4-22-77	Smackover	14,610
Bluff Springs	Escambia	3-25-82	Smackover	16,800
Mc Lellan	Santa Rosa	2-19-86	Smackover	14,475
Coldwater Creek	Santa Rosa	6-4-88	Smackover	15,400
Mc David	Escambia	6-14-88	Smackover	16,800

Source: Lane, 1994)

Table 3: Annual Oil Production by Region and Field

Region	Field (discovery date)	Oil 1000's bbls								
		1999	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Florida Peninsula	Sunniland (1943)			10	9	8	9	12	12	7
	West Felda (1966)	284	270	278	282	282	262	240	261	211
	Lake Trafford (1969)	1	1	4	3	1	0	0	<1	1
	Bear Island (1972)	30	85	179	165	139	104	135	122	90
	Lehigh Park (1974)	45	41	23	35	19	32	21	33	32
	Mid-Felda (1977)			0	0	0	0	0	0	0
	Raccoon Point (1978)	746	598	625	630	545	445	428	396	371
	Corkscrew (1985)	23	51	59	47	38	30	30	29	27
	Total	**1,129**	**1,046**	**1,178**	**1,171**	**1,032**	**881**	**866**	**853**	**739**
Florida Panhandle	Jay (1970)	3,540	3,386	3,107	2,466	2,230	1,948	1,632	1,403	1,245
	Blackjack Creek (1972)	208	179	131	14	0	46	87	104	94
	McLellan (1986)	13	14	9	5	0	0	0	<1	0
	Total	**3,761**	**3,579**	**3,248**	**2,486**	**2,230**	**1,994**	**1,719**	**1,504**	**1,338**

Source: FGS, 2008

Table 4: Annual Gas Production by Region and Field

Region	Field (discovery date)	Gas MCF 1999	2000	2001	2002	2003	2004	2005	2006	2007
Florida Peninsula	Sunniland (1943)	0	0	896	833	730	842	1,082	1,102	679
	West Felda (1966)	27,829	24,243	24,929	25,198	25,080	22,637	21,436	20,891	18,766
	Lake Trafford (1969)	0	0	0	0	0	0	0	0	0
	Bear Island (1972)	3,458	8,290	19,313	17,617	15,183	9,851	25,960	12,519	9,315
	Lehigh Park (1974)	5,980	5,046	2,850	4,222	2,270	3,862	2,510	4,016	3,903
	Mid-Felda (1977)	0	0	0	0	0	0	0	0	0
	Raccoon Point (1978)	89,632	75,610	78,902	80,587	69,778	56,512	54,830	50,721	47,280
	Corkscrew (1985)	0	0	0	298	0	0	0	0	0
	Total	**126,899**	**113,189**	**126,890**	**128,755**	**113,041**	**93,704**	**105,818**	**89,249**	**79,943**
Florida Panhandle	Jay (1970)	6,026,604	6,686,994	5,957,677	3,632,118	3,380,265	3,249,324	2,619,304	2,574,165	1,662,710
	Blackjack Creek (1972)	583,023	514,542	395,459	44,036	0	201,494	244,547	286,176	268,279
	McLellan (1986)	1,871	3,874	961	346	3	0	0	0	0
	Total	**6,611,498**	**7,205,410**	**6,354,097**	**3,676,500**	**3,380,268**	**3,450,818**	**2,863,851**	**2,949,590**	**1,930,989**

Source: FGS, 2008

5.5.2 Crude Oil

Crude oil produced in Florida varies in color and in odor by area and by individual reservoir; however the overall quality of the oil does not appreciably vary across geographic regions or reservoirs and is considered to be consistent Pennsylvanian. Crude oils consistent with “Pennsylvania grade crude” oil are thermally stable and generally have a high viscosity index. Only very limited specific information as to the gravity of crude oil by region is available. The crude oil gravity for panhandle production is 47-51 while peninsula produced oil is 22-26 (Taylor, 2008)

5.6 Oil and Gas Prices

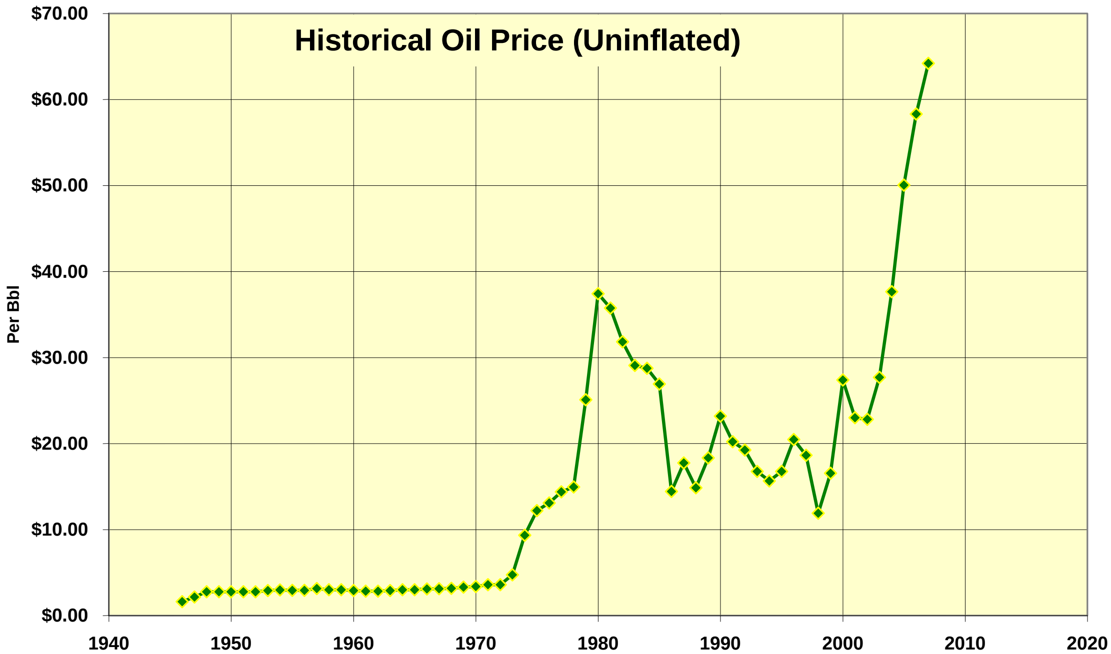
Figure 6 plots the domestic price of oil over the past 60 years. Increases have been dramatic, especially during the past ten years; this rise in price has fueled the increases in exploration and production. Current price of oil and gas and the resultant economics are certainly attractive to operators but no new Florida production has been brought on line in over 20 years. Both crude oil and natural gas prices are generally expected to remain strong for the foreseeable future.

5.7 Conflicts with Other Mineral Development

Mineral development in Florida is extensive and involves in addition to oil and gas a number of different mineral resources. Florida ranks fifth in the nation with an industrial mineral production value of $1.92 billion. Mineral resources produced in Florida fall into six broad categories and include: Clay, Limestone, Sand and Gravel, Heavy Minerals, Phosphate and Peat. Information contain in this mineral summary is from the USGS 2004 Mineral Yearbook and from the Florida Department of Evironmental Protection.

Clay - Fuller's Earth, common clay, and kaolin are mined in few locations in Florida. Fuller's earth (montmorillonite) is typically used as an absorbent material, while kaolin is used in the manufacture of paper and refractories. Common clay, mined in small quantities from various locations

Figure 6: Increasing Domestic Oil Price



Source: IOGA, 2008

throughout the state, is used in the manufacture of brick, cement and lightweight aggregate.

Limestone - Florida ranks second nationally in production and fourth in consumption of crushed stone (limestone and dolostone). Most of the stone that is mined in Florida is used for road construction. Limestone of high purity can undergo calcination (heating) and, together with other ingredients, be used to manufacture portland and masonry cement. Florida ranks in the top five states in production and consumption of portland cement and is first in the production and consumption of masonry cement.

Sand and Gravel - Florida ranks approximately 15th in the country in sand and gravel used or produced. Sand and gravel is subdivided into construction and industrial sand, the bulk of which is, in Florida, construction grade.

Heavy Minerals - Two of the five companies that mine heavy minerals in the Unites States are located in Florida. A variety of minerals are located in the Florida heavy mineral sand deposits including ilmenite, rutile, zircon, and leucoxene. Ilmenite and rutile are primary ingredients in the manufacture of titanium dioxide pigments, used in the manufacture of paint, varnish and lacquers, plastics, and paper.

Phosphate - Florida producers supplied approximately one-quarter of the world's phosphate needs and three-quarters of US domestic needs. Nearly all of the rock that is mined in Florida, 28.6 million metric tons in 2000, was used to manufacture fertilizer which, in turn, was used for agricultural purposes. What was not used in the manufacture of fertilizer was used in a number of products including feed supplements, vitamins, soft drinks, and toothpaste. In 2000, $1.13 billion dollars worth of fertilizer was exported from Florida making it another one of Florida's leading export commodities.

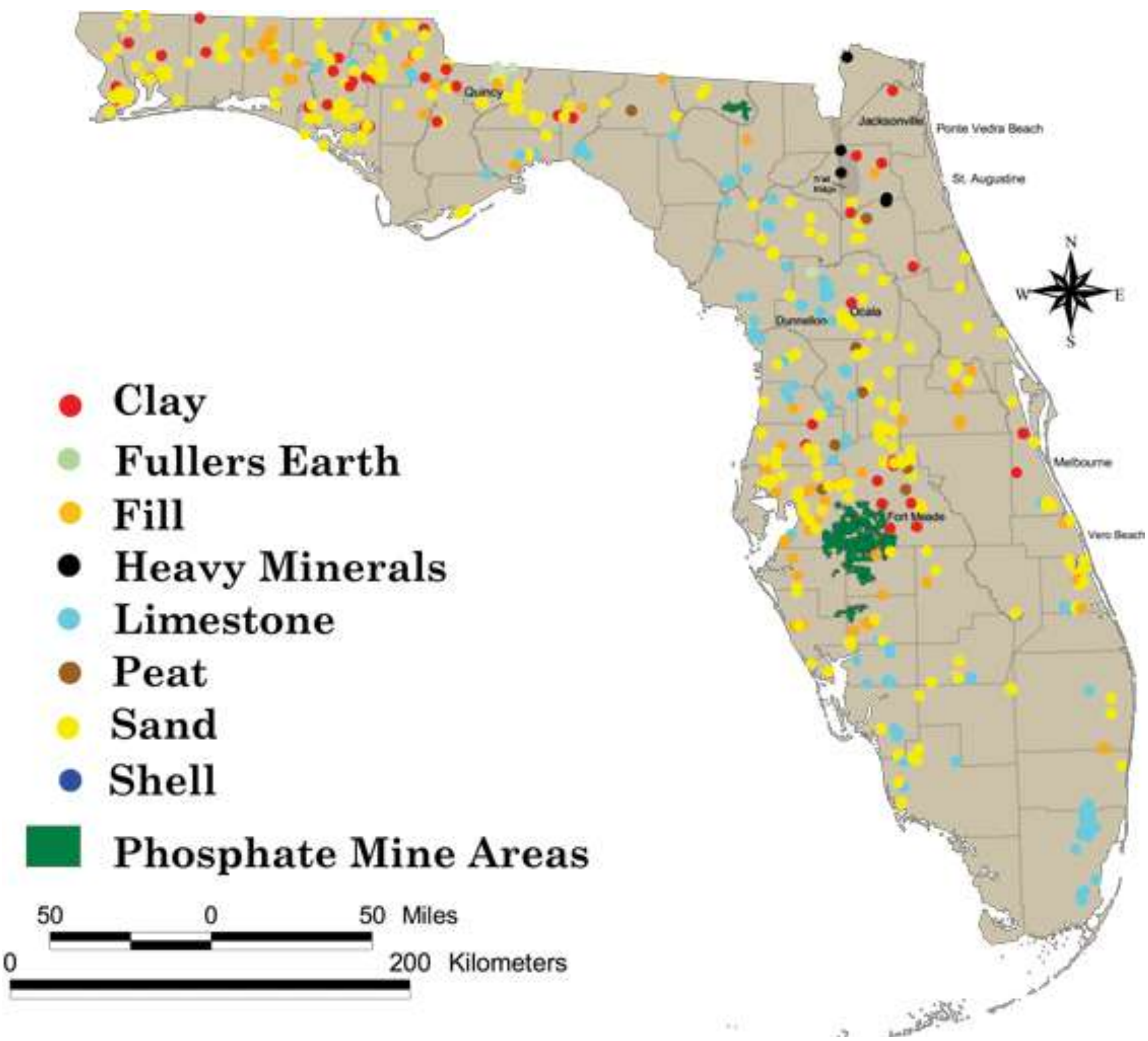
Peat - An organic-rich accumulation of decaying plant material. Florida ranks in the top five states nationally in the production of horticultural peat.

Based on interviews with personnel from the FDEP there appears to be little or no conflicts between oil and gas operations and on-going mineral development (Garrett, 2008 and Taylor 2008). A map of the mineral extraction actives is presented in Figure 7.

5.8 Gas Storage Fields

EIA gas storage data for 2006 indicates that there are no active gas storage fields operating in the State of Florida (EIA website, Natural Gas Storage, Form EIA-191 Data, 2007).

Figure 7: Active Mineral Extraction Locations



6.0 OIL AND GAS OCCURRENCE POTENTIAL

6.1 Existing oil and gas production

There are two areas in Florida that to date have been found to be productive of oil and natural gas. They include an area in southern Florida on the peninsula and an area in the western panhandle of the state. Both areas contain oil and natural gas fields that are productive in reservoirs of the Upper Jurassic or the Lower Cretaceous. Table 5 is a listing of all oil and natural gas wells by fields in the state. The occurrence of hydrocarbons in the peninsula and panhandle portions of the state is best discussed separately.

There are two oil and gas producing areas in Florida; Florida Peninsula, with 8 producing fields, and the Panhandle, with three producing fields as listed in Table 5. The Jay Field, located in the panhandle is by far the largest oil field in the state, and was discovered in 1970. The Sunniland Field in south Florida is the oldest in the state, having been discovered in 1943 (Lane, 1994). All of Florida's oil and gas fields are declining in production and in number of producing wells.

Table 5: Active Producing Wells by Region and Field

Region	Field (discovery date)	Producing Wells								
		1999	2000	2001	2002	2003	2004	2005	2006	2007
Florida Peninsula	Sunniland (1943)			1	1	1	1	1	1	1
	West Felda (1966)	4	3	3	4	4	4	4	4	3
	Lake Trafford (1969)	1		0	1	1	1	1	1	1
	Bear Island (1972)	4	3	4	4	3	3	4	4	3
	Lehigh Park (1974)	1	1	1	1	1	1	1	1	1
	Mid-Felda (1977)			0	0	0	0	0	0	0
	Raccoon Point (1978)	3	6	5	6	6	4	5	5	5
	Corkscrew (1985)	2	3	3	3	2	1	2	2	2
	Total	**15**	**16**	**17**	**20**	**18**	**15**	**18**	**18**	**16**
Florida Panhandle	Jay (1970)	43	40	40	27	31	29	28	28	33
	Blackjack Creek (1972)	10	12	0	0	0	7	7	7	7
	McLellan (1986)	2	2	2	2	0	0	0	0	0
	Total	**55**	**54**	**42**	**29**	**31**	**36**	**35**	**35**	**40**

Source: FGS, 2008

6.2 Florida Panhandle

Far western Florida is the site of the largest field in the state – Jay Field and nearby smaller accumulations discovered. Production in the western panhandle began with the discovery of Jay field in June 1970. Jay is the largest oil field discovered in North America since the discovery on the Alaskan North Slope of the giant Prudhoe Bay field in 1968. Since then, an additional six oil fields have been discovered in the western panhandle of Florida. These fields' pay zones are from about 14,500 to 16,800 feet below land surface and vary in thickness from about 5 to 259 feet. North Florida has dominated Florida oil production since the discovery of Jay field. North Florida oil fields account for 83 percent of the state's cumulative production through January 1988. Jay field alone is responsible for 71 percent of the state's cumulative production (Lane, 1994).

Jay field is located within the "Jay trend" of Escambia and Santa Rosa Counties in Florida, and Escambia County, Alabama. The Jay trend produce oil from Jurassic-age Smackover Formation carbonates and Norphlet Sandstone sands (See Figure 8). In Florida, the Jay fields include Jay, Mt. Carmel, Coldwater Creek, and Blackjack Creek. The Jay trend fields in Florida and Alabama are associated with a normal fault complex which rims the Gulf Coast and is believed to extend to the south-southwest into the Gulf of Mexico.

The other panhandle oil fields are Bluff Springs, McLellan, Sweetwater Creek, and McDavid. Bluff Springs field probably formed as the result of a small structure created by movement of the underlying Louann Salt. McLellan and Sweetwater Creek may also be associated with small salt structures or with the stratigraphic pinchout of the Smackover Formation.

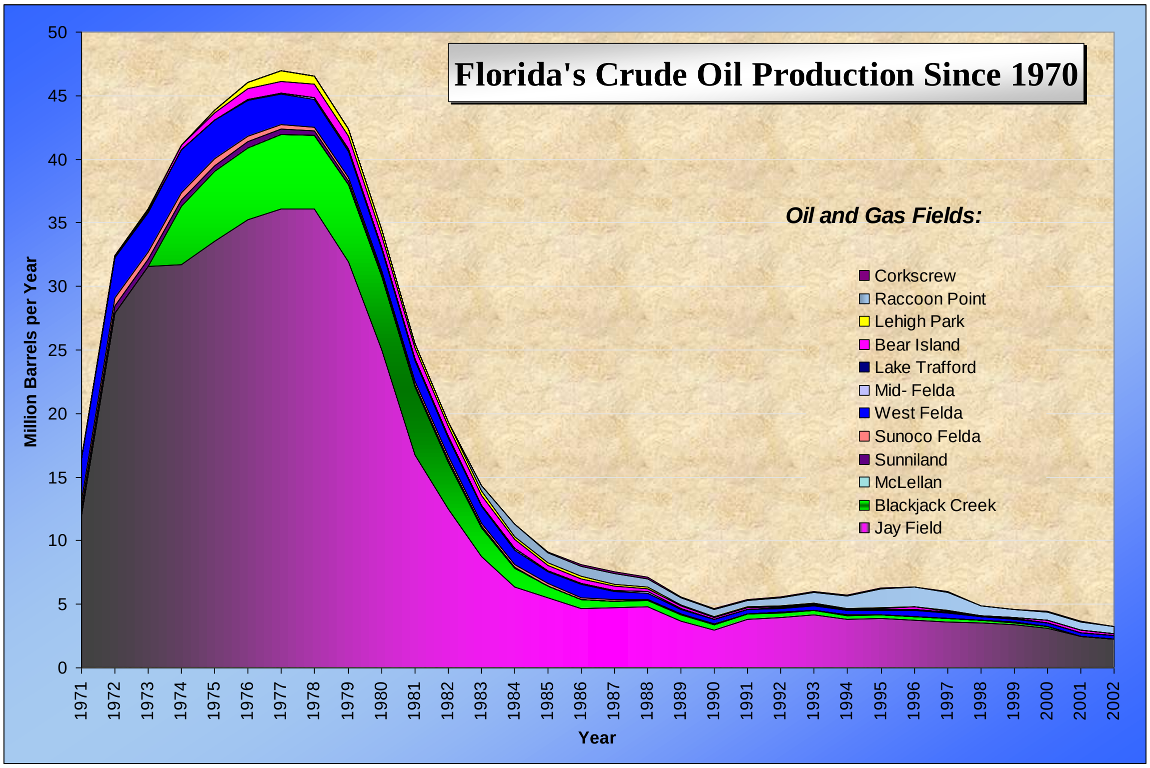
Production for all of the panhandle oil fields, except Mt. Carmel, is from Jurassic-age Smackover dolostones and limestones. Mt. Carmel field produces from both the Smackover and the underlying Jurassic-age Norphlet Sandstone. Although a mixture of carbonates and clastics can be found within the Smackover, in the western panhandle producing area, it is almost purely a sequence of dolostones and limestones. The underlying Norphlet Sandstone is primarily an arkosic sandstone. The Norphlet is underlain by the Louann Salt. The Smackover Formation is overlain by the Buckner Member of the Haynesville Formation. The Buckner is composed of anhydrite, and other evaporites, and forms the seal to some of the Smackover producing zones.

6.3 Florida Peninsula

The South Florida fields are located in Lee, Hendry, Collier, and Dade Counties. Florida's first oil field, the Sunniland field, in Collier County, was discovered in 1943. It has since produced over 18 million barrels of oil. Subsequently, 13 more field discoveries were found to lie along the northwest-southeast trend. Although these fields are relatively small, production is significant. Together, the three Felda fields (West Felda, Mid-Felda, and Sunoco Felda) in Hendry County have produced over 54 million barrels of oil (Lane, 1994).

South Florida fields produce oil from small "patch reefs" within the Lower Cretaceous Sunniland Formation (See Figure 5), from between 11,500 and 12,000 feet below land surface. While both oil and gas are found productive the area is generally considered more oil prone. The hydrocarbon accumulations in these fields are localized build ups of marine debris resulting in carbonate pay sections in the order of 5 to 30 feet thick that are encased in nonporous mudstones of the Sunniland formation and further sealed by overlying evaporates of the Trafford lake formation (Lane, 1994).

Figure 8: Historical Oil Production



Source: FGS, 2008

7.0 OIL AND GAS DEVELOPMENT POTENTIAL

7.1 Relative Oil and Gas Development Potential

It can be expected that there is a significant potential for new drilling and development in the state of Florida. It can further be expected that new drilling will be located near existing oil and gas fields. Despite the presence of existing, economically attractive production, new oil and gas development has not kept pace with the recent increases in oil and natural prices. Since 1999, oil prices have more than doubled but only four producing wells and three dry holes have been completed in Florida (FGS, 2008). It can be expected that only a very few wells will be drilled in the next ten years stepping out from established production. More drilling may, however, be connected to the exploration plays described under each region. Drilling forecasts are constructed below for each productive region.

The oil and gas potential of the peninsula and panhandle are plotted on Figure 9; the rationale behind these rankings are discussed under each region.

7.2 Drilling Development

7.2.1 Florida Peninsula

The USGS in their latest assessment of hydrocarbon potential of the Florida Peninsula (USGS, 2001), list several significant plays in the area as summarized in Table 6. Two of the plays consist of Sunniland strata. Three plays consist of strata below the Sunniland and below the Punta Gorda anhydrites.

The USGS plays described above form the basis of BLM estimates totaling 74 MMbbls of liquids and 325 BCF of natural gas to be discovered in the Florida Peninsula in the Phase II inventory of onshore oil and gas resources (BLM, 2006). The inventory, frequently referred to as “EPCA II” is required by the Federal Energy Policy and Conservation Act of 2000. This document discovered that within the prospective area in Figure 9, a total of 1.98 million acres of federal surface is included. Of that total, 0.0 percent is accessible under standard BLM leases and 6 percent is accessible with additional restrictions. Therefore 94% is not accessible under any terms. Although these numbers could change by way of federal legislation driven by national oil and gas shortages and demands for energy, however, that eventuality is not foreseen at this time.

Table 7 summarizes the projected total number of new wells to be drilled in the Florida Peninsula region. The active oil and gas fields are listed with the number of active wells in each field as of the last summary by the state. For this report it is assumed that each active field will be the site of one step-out well every year for the next ten years; these wells would be drilled adjacent to the active fields shown on Figure 9. While this level of activity is much higher than the past six years, it can be assumed that the extremely high prices for oil and gas will cause new wells to be drilled.

A total of eight new wells are expected to be drilled each year in pursuit of the oil and gas plays described in Table 6. The three plays listed as having high potential by the EPCA II report are expected to have two new wells drilled each year. Those two plays listed as moderate potential are expected to have one well drilled each year. Table 7 totals 14 new wells to be drilled in the Florida Peninsula each year. This level of drilling is much more than has been experienced in the region since 1999 but the extremely high prices for oil and gas as recently seen can be expected to drive high levels of oil and gas development. Furthermore, if any of the new wells are successful, then more new drilling would be expected.

Figure 9: Oil and Gas Potential Ranking

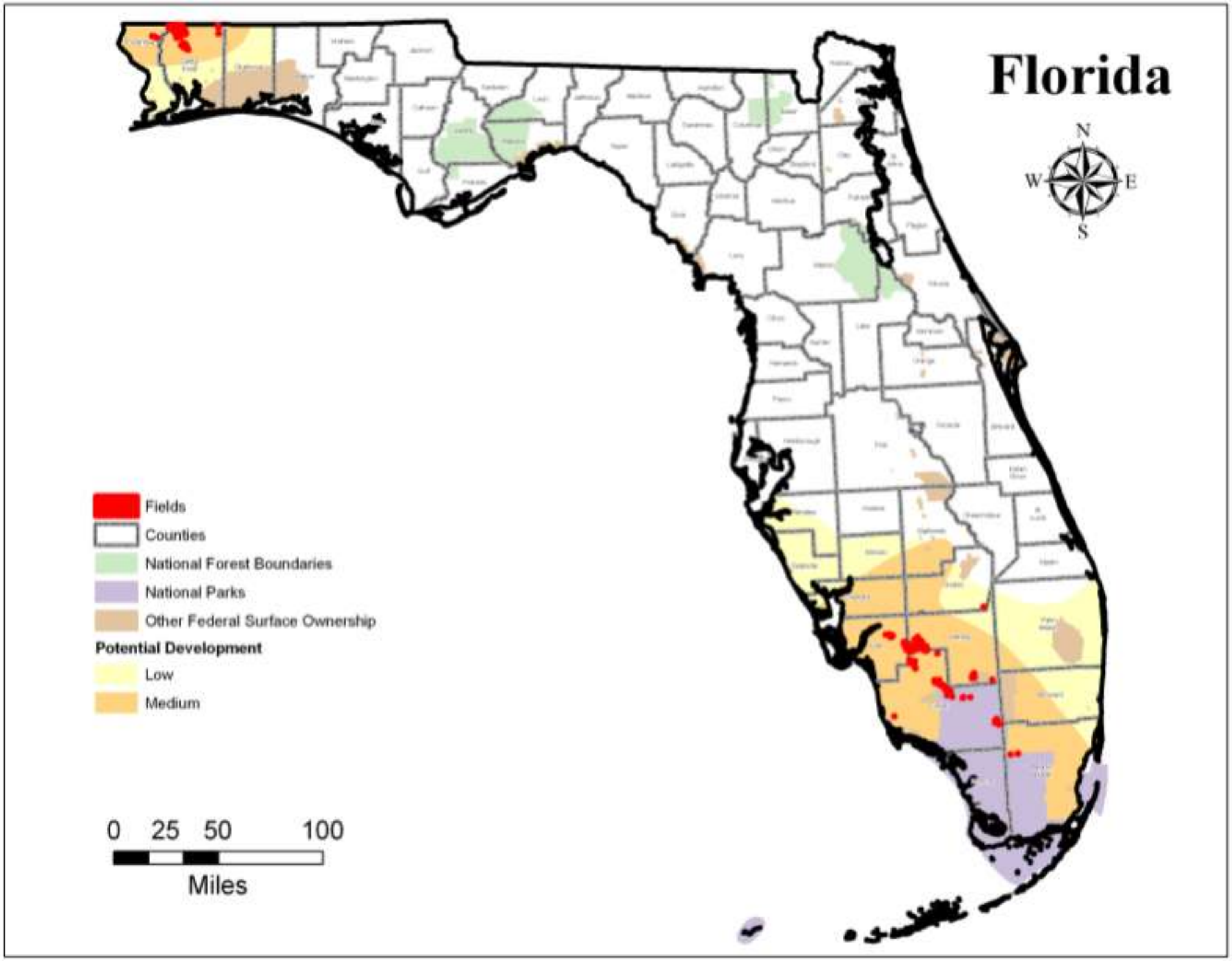


Table 6: Potential Hydrocarbon Plays in the Florida Peninsula

Play	Reservoir	Trap/Seal	Source Rock	Potential
Conventional Oil and Gas Plays				
Shallow Water Sunniland Formation Plays				
5001 UPPER SUNNILAND TIDAL SHOAL OIL (this play extends offshore to the east and south under the Keys)	Skeletal grainstones of the Upper Sunniland	Stratigraphic traps on small structural highs, sealed by micrites and anhydrites of the Sunniland	Dark carbonates of the Lower Sunniland	Moderate
5002 LOWER SUNNILAND DARK CARBONATE OIL	"Rubble Zone" member of the Sunniland Dark Carbonate	Stratigraphic traps, sealed by micrites of the Dark Carbonate	Dark algal laminated micritic carbonates of the Lower Sunniland	High
Pre-Punta Gorda Anhydrites Plays				
5003 DOLLAR BAY REEF DOLOMITE OIL	Biohermal limestones and dolomites from the Dollar Bay	Stratigraphic traps, sealed by the micrites and anhydrites of the Dollar Bay	Micrites of the Dollar Bay	High
5004 LEHIGH ACRES – PUMPKIN BAY OIL	Porous dolomites of the Lehigh Acres and Pumpkin Bay Formations	Stratigraphic traps, sealed by internal tite micrites	Organic-rich micrites of the Pumpkin Bay	High
5006 WOOD RIVER DOLOMITE DEEP GAS	Carbonates of the Wood River Formation	Stratigraphic traps, perhaps on structural highs, sealed by internal micrites	Micrites in the Wood River	Moderate

Source: USGS, 2001

Table 7: Ten-Year Forecast of Oil and Gas Wells – Florida Peninsula

Field	2007 Wells	Forecasted Annual Wells					
		Dark Carbonate Play	Tidal Shoal Play	Dollar Bay Reef	Pumpkin Bay Play	Wood River Play	Step-outs
Sunniland	1	2	1	2	2	1	1
West Felda	3						1
Lake Trafford	1						1
Bear Island	3						1
Lehigh Park	1						1
Mid-Felda	0						
Raccoon Point	5						1
Corkscrew	2						1
Total	**16**	**2**	**1**	**2**	**2**	**1**	**6**

7.2.2 Florida Panhandle

The USGS lists three plays that are applicable to the Florida Panhandle; these are summarized in Table 8 (USGS, 2001). Two of the plays consist of Smackover strata and the third consists of the overlying Haynesville strata. All three plays are listed by the USGS as having a high potential. These plays are centered around the existing production in the panhandle. The approximate locations of the medium and low potential are shown on Figure 9. It can be expected that two wells will be drilled at each play each year for the next ten years. This level of drilling is much more than has been experienced in the region since 1999 but the extremely high prices for oil and gas as recently seen can be expected to drive high levels of oil and gas development.

In addition to the plays listed above, it can be expected that higher levels of activity will lead to the drilling of one step-out well per year at each of the three active fields in the panhandle these wells would be drilled adjacent to the active fields shown on Figure 9. Table 9 lists the projected number of new wells to be drilled in the Florida Panhandle region. A total of nine new wells are expected to be drilled in pursuit of the oil and gas plays described in Table 8. This rate of drilling is several times the drilling seen each year since 1999 but the increase in oil price may drive development activity to new levels. Table 9 totals nine new wells to be drilled in the Florida Panhandle each year.

Table 8: Potential Hydrocarbon Plays in the Florida Panhandle

Play	Reservoir	Trap/Seal	Source Rock	Potential
Conventional Oil and Gas Plays				
4910 SMACKOVER ALABAMA/FLORIDA PERIPHERAL FAULT ZONE PLAY	Smackover carbonates	Structural Traps, sealed by overlying Buckner Anhydrite	Smackover	High
4911 SMACKOVER ALABAMA/FLORIDA UPDIP PLAY	Smackover carbonates	Structural Traps, sealed by overlying Haynesville	mackover	High
4919 HAYNESVILLE ALABAMA/FLORIDA UPDIP PLAY	Haynesville marginal marine sands	Structural traps sealed by Haynesville shales	Smackover	High

Source: USGS, 2001

Table 9: Ten-Year Forecast of Oil and Gas Wells – Florida Panhandle

Field	2007 Wells	Forecasted Annual Wells			
		Smackover Periperal Faultzone Play	Haynesville Play	Up-Dip Smackover Play	Step-outs
Jay	33	2			1
Blackjack Creek	7		2		1
McLellan	0			2	1
Total	**40**	**2**	**2**	**2**	**3**

7.2.3 Forecast Federal Wells

Total acreage and total Federal surface acreage in each of the medium ranked areas of the state. Only that area ranked as having at least medium potential was included in the analysis. No areas were ranked as high since the level of drilling has been very low since 1999 and the fact remains that no new fields have been found in the state in the past 20 years. If we look to those areas labeled as medium potential, we have tabulated total acreage within those areas and broken this down by ownership as shown in Table 10. Zero percent of the panhandle medium rank area has federal ownership while in the peninsula, 34.8% of the mineral is federally administered. As was pointed out in the EPCA II report, only 6% of the federal acreage in the peninsula is accessible for drilling. Even with very optimistic estimates of future drilling, the forecast is for less than one well per year on federal surface in the Florida Peninsula.

Table 10: Florida State-wide Forecast – Annual Well Drilling by Region and Mineral Ownership

Region	Total Acres	USFS Acres (%)	Other Federal Acres (%)	State and Fee Acres (%)	Total Wells	USFS Wells	Other Federal Wells	State and Fee Wells
Panhandle (Medium rank)	651,252	0 (0%)	172 (<1%)	651,080 (99.9%)	9	0	0	9
Peninsula (medium rank)	5,746,589	0 (0%)	2,001,380 (34.8%)	3,745,209 (65.2%)	14	0	0.29	14

8.0 REASONABLE FORESEEABLE DEVELOPMENT BASELINE SCENARIO ASSUMPTIONS AND DISCUSSION

This RFD scenario assumes that all potentially productive areas are open under the standard lease terms and conditions except those areas designated as closed to leasing by law, regulation, or executive order. The areas closed to leasing typically include Areas of Critical Environmental Concern (ACECs), Wilderness Study Areas (WSAs) and USFWS Wildlife Refuges. The RFD scenario contains projections for the number or wells and acres disturbed for these counties. This in no way is intended to imply that the BLM are making decisions about the Forest Service lands or the USFWS lands. The predictions are intended to provide the information necessary so that all potential cumulative impacts can be analyzed. The disturbance for each well is based on the typical depth of wells for an area; generally, shallow gas wells disturb fewer acres than deeper oil wells. The assumptions for conventional oil and gas are as follows:

The number of wells was calculated based on historical statistics and data trends as follows:

- Wells drilled to date were taken from the Florida Bureau of Mines and Mineral Regulation annual reports.
- The number of wells drilled to date was statistically analyzed to calculate a median per year wells drilled per county.
- The data trends associated with the last 9 years (1999-2007) represents a more accurate estimate of future development trends than historical data, thus, it is weighted more heavily.
- The data trends from 1992 to present data set are a more accurate estimate of future trends than the complete historical record and were weighted more heavily than the historical record.
- The data trends for the complete historical record represent the least accurate estimate of future development trends and, thus, it was weighted the lightest.
- For each geographic/geologic boundary region and sub region, the calculated estimates for future development were summed to obtain a per year well count.
- Wellhead oil and gas prices are a driving force for well drilling and completion; current prices are historically high and have resulted in increased activity throughout most states. An estimate of activity for the future well development to into consideration this influence. The forecast assumes wellhead oil and gas prices will remain high and development over the next 10 years will continue at an elevated rate.
- Estimates of well counts for the different mineral ownership entities are based on spatial analysis of the percent of mineral ownership within each county times the total number of producing wells anticipated to be developed in that boundary area.
- The average acreage figure (acres per well) for the resource area was used to estimate federal disturbed acres.
- The RFD projections have a 10-year life.
- The number of dry holes was determined based on historic analysis of dry holes in the geologic boundary areas.

The assumptions were used to calculate the number of wells to be drilled, the number of in-field compressors, and the number of sales compressors required.

9.0 SURFACE DISTURBANCE DUE TO OIL AND GAS ACTIVITY ON ALL LANDS

9.1 Surface Disturbances

Estimates of the surface disturbances associated with the development of oil and gas on federal minerals within the State of Florida were determined from a variety of resources, including previous oil and gas environmental assessments, discussions with BLM and state oil and gas personnel, discussions with various operators, and document review.

The level of disturbance associated with conventional oil and gas development varies depending on the depth of the well and type of well drilled (horizontal vs. vertical). A shallow oil and gas well (<2,000 feet deep) typically includes a well pad of 2.0 acres, 0.10 miles of gravel road and 0.55 miles of utility lines for a total construction disturbance area of approximately 4.8 acres. Deeper oil and gas wells (5,000 to 12,000 feet below surface) require a greater disturbance area to accommodate the larger amount of equipment necessary to complete drilling. Usually a 3.25 acre well pad, 0.075 miles of gravel road, and 0.475 miles of utility lines for a total of 6.7 disturbed acres during the construction phase. Horizontal wells are typically drilled using a larger well pad estimated at 3.5 acres. However, the total construction disturbance for a horizontal oil and gas well is estimated to be 6.9 acres. This estimate is greater than the disturbance from deep oil and gas wells because the surface disturbance required for construction of both utility and transportation lines will be somewhat more for horizontal wells. Tables 11, and 12 present surface disturbance estimates for conventional shallow and deep oil and gas wells along with their associated support facilities.

The surface disturbances are scaled to a per well disturbance level so that calculation of the total disturbance can be generated at the project, field, or county level by multiplying the number of wells for analysis by the numbers provided in the table. Existing surface disturbances are commensurate with the estimates provided in Table 11 and 12.

9.2 Site Construction

The shortest feasible route is chosen to minimize haulage distances and construction costs while considering environmental factors and the surface owner's wishes. The access roads are typically constructed using bulldozers and graders to connect the existing road or trail and the drill site. In some cases improvements such as cattle guards and culvert crossings are installed because of the terrain.

In the planning area the kind of drill rig and drilling depth varies and is determined by the geologic province and expected product from the well. The extent of surface disturbance necessary for construction depends on the terrain, depth of the well, drill rig size, circulating system, and safety standards. The depth of the drill test determines the size of the work area necessary, the need for all-weather roads, water requirements, and other needs. The terrain influences the construction problems and the amount of surface area to be disturbed. Reserve pit size may vary because of well depth, drill rig size, or circulating system.

Access roads to well sites usually consist of running surfaces 14 to 18 feet wide that are ditched on one or both sides. Many of the roads constructed will follow existing roads or trails. New roads might be necessary because existing roads are not at an acceptable standard. For example, a road may be too steep so that realignment is necessary.

Table 11
Level of Disturbance for Conventional Shallow Oil and Gas Wells and Associated Production Facilities

FACILITIES		Exploratory Well Disturbance (acres/well)	Construction Disturbance (acres/well)	Operation/ Production Disturbance (acres/well)
Well Pad (300-foot by 300-foot pad during drilling and construction, 175-foot by 175-foot pad during operation)		2.07	2.07	0.70
Access Roads to Well Sites	Two-track (12-foot wide by 0.25 miles long)	0.36	N/A	N/A
	Graveled (20-foot wide by 0.10 miles long for construction and operation)	N/A	N/A	0.24
	Bladed (20-foot wide by 0.10 miles for construction and operation)	N/A	0.24	0.0
Utility Lines	Water lines (15-foot by 0.20 miles)	N/A	0.18	0.0
	Overhead Elec. (10-foot by 0.15 miles)	N/A	0.12	0.03
	Underground Elec. (15-foot by 0.20 miles)	N/A	0.36	0.0
Transportation Lines	Intermediate Press. Gas line to and from field compressor (15-foot by 0.1 miles)	N/A	0.18	0.045
	High Press. Gas or Crude Oil Gathering Line (20-foot by 0.25 miles)	NA	0.61	0.15
Processing Areas	Tank Battery (one 0.50-ac tank battery per 20 wells)	N/A	0.025	0.025
	Access Roads (25-foot by 0.05 miles)	N/A	0.15	0.15
	Field Compressor (0.5-acre pad per 20 wells)	N/A	0.025	0.025
	Sales Compressor (2-ac pad for 150 wells)	N/A	0.01	0.01
	Sales Line (20-foot by 5 miles per 200 wells)	N/A	0.061	0.015
Produced Water Management	Produced Water pipeline (15-foot by 0.25 miles)	N/A	0.45	0.11
	Water plant/ Inj well (6 ac site per 20 wells)	N/A	0.3	0.3
Total Disturbance per Conventional Oil or Gas Well (acres)		**2.43**	**4.79**	**1.81**

1. The operation disturbance for utilities assumes all utilities will be completed underground, and the land surface will be reclaimed so that no disturbance should remain except where noted.
2. It is assumed that each conventional oil and gas well will need product pipeline and produced water line from the well. In addition, some wells will need intermediate pipeline run from the field compressor to sales line.

Table 12
Level of Disturbance for Conventional Deep Oil and Gas Wells and Associated Production Facilities

FACILITIES		Exploratory Well Disturbance (acres/well)	Construction Disturbance (acres/well)	Operation/ Production Disturbance (acres/well)
Well Pad (375-foot by 375-foot pad during drilling and construction, 200-foot by 200-foot pad during operation)		3.23	3.23	0.92
Access Roads to Well Sites	Two-track (12-foot wide by 0.5 miles long)	0.73	N/A	N/A
	Graveled (20-foot wide by 0.075 miles long for construction and operation)	N/A	N/A	0.18
	Bladed (20-foot wide by 0.075 miles for construction and operation)	N/A	0.18	N/A
Utility Lines	Water lines (12-foot by 0.20 miles)	N/A	0.29	0.0
	Overhead Elec. (10-foot by 0.075 miles)	N/A	0.09	0.023
	Underground Elec. (15-foot by 0.20 miles)	N/A	0.36	0.0
Transportation Lines	Intermediate Press. Gas line to and from field compressor (15-foot by 0.075 miles)	N/A	0.14	0.034
	High Press. Gas or Crude Oil Gathering Line (25-foot by 0.5 miles)	NA	1.21	0.30
Processing Areas	Tank Battery (one 0.50-ac tank battery per 15 wells)	N/A	0.03	0.03
	Access Roads (25-foot by 0.05 miles)	N/A	0.15	0.15
	Field Compressor (0.5-acre pad per 15 wells)	N/A	0.03	0.03
	Sales Compressor (2-ac pad for 150 wells)	N/A	0.01	0.01
	Sales Line (25-foot by 6 miles per 150 wells)	N/A	0.12	0.12
Produced Water Management	Produced Water pipeline (15-foot by 0.25 miles)	N/A	0.45	0.11
	Water plant/ Inj well (6 ac site per 15 wells)	N/A	0.40	0.40
Total Disturbance per Conventional Oil or Gas Well (acres)		**3.96**	**6.71**	**2.24**

1. The operation disturbance for utilities assumes all utilities will be completed underground, and the land surface will be reclaimed so that no disturbance should remain except where noted.
2. It is assumed that each conventional oil and gas well will need product pipeline and produced water line from the well. In addition, some wells will need intermediate pipeline run from the field compressor to sales line.

Roads can be permanent or temporary, depending on the success of the well. The initial construction can be for a temporary road; however, it is designed so that it can become permanent if the well produces. Not all temporary roads constructed are rehabilitated when the drilling stops. A temporary road is often used as access to other drill sites. The main roads and temporary roads, require graveling to be maintained as all-weather roads. This is especially important in the spring. Access roads may be required to cross public lands to a well site located on private or state lands. The portion of the access road on public land would require a BLM right-of-way.

Most conventional wells are drilled from a fixed platform while the majority of CBNG wells are drilled using a truck-mounted rig. Site preparation generally takes about a week before the drill rig is assembled. For moderate depth oil wells drilling generally takes 2 to 4 weeks, although deeper wells may require longer drilling time because of the geologic formations encountered. Wells drilled from a platform require more surface preparation and cause disturbance to a larger area for the ancillary facilities. CBNG wells are usually drilled in under a week and site preparation is typically less than for conventional wells.

Approximately 1 to 4 acres are impacted by well site construction. The area is cleared of large vegetation, boulders, or debris. Then the topsoil is removed and saved for reclamation. A level area from 1 to 4 acres is then constructed for the well site, which includes the reserve pit.

The well pad is constructed by bulldozers and motor scrapers. The well pad is flat (to accommodate the drill rig and support equipment) and large enough to store all the equipment and supplies without restricting safe work areas. The drill rig must be placed on “cut” material rather than on “fill” material to provide a stable foundation for the rig.

The degree of cutting and filling depends on terrain; that is, the flatter the site, the less dirt work is required.

Hillside locations are common, and the amount of dirt work varies with the steepness. A typical well pad will require a cut 10 feet deep against the hill and a fill 8 feet high on the outside. It is normal to have more cut than fill to allow for compaction, and any excess material is then stockpiled. Eventually, when the well is plugged and abandoned, excavated material is put back in its original place.

Reserve pits are normally constructed on the well pad. Usually the reserve pit is excavated in “cut” material on the well pad. The reserve pit is designed to hold drill cuttings and used drilling fluids. The size and number of pits depends on the depth of the well, circulating system and anticipated down hole problems, such as excess water flows.

Reserve pits are generally square or oblong, but may be irregular in shape to conform to terrain. The size of reserve pits for deeper wells can be reduced by the use of steel mud tanks. For truck-mounted drill rigs used in shallow gas fields, a small pit (called the blooie pit) is used. Most or all of the reserve pit is located in the cut location of the drillsite for stability. When the drillsite is completed, the rig and ancillary equipment are moved on location and drilling begins.

The reserve pit can be lined with a synthetic liner to contain pit contents and reduce pit seepage. Not all reserve pits are lined; however, BLM often requires a synthetic liner depending upon factors such as soils, pit locations, ground water and drilling mud constituents. The operator can elect to line the reserve pit without that requirement.

An adequate supply of water is required for drilling operations and other uses. The sources of water can be a well at the drill site or remote sources such as streams, ponds, or wells. The water is transported to the site by truck or pipeline. Pipelines are normally small diameter surface lines. The operator must file for and obtain all necessary permits for water from the state. On public lands an operator must have the BLM's permission before surface water can be used.

9.3 Mitigation Measures

Mitigation measures are restrictions on lease operations, which are intended to minimize or avoid adverse impacts to resources or land uses from oil and gas activities. The mitigation measures would be applied to permits, leases or approvals granted by the land management agency. Mitigation measures would be included as appropriate to address site-specific concerns during all phases of oil, gas and CBNG development.

9.4 Conditions of Approval

An approved application for permit to drill (APD) includes conditions of approval (COA), and Informational Notices which cite the regulatory requirements from the Code of Federal Regulations, Onshore Operating Orders and other guidance. Conditions of approval are mitigation measures which implement lease restrictions to site specific conditions. General guidance for COA are found in the BLM and U.S. Forest Service brochure entitled "Surface Operating Standards for Oil and Gas Exploration and Development" (USDI, BLM 1989) and BLM Manual 9113 entitled "Roads".

9.5 Lease Stipulations

Certain Resources in the planning area require protection from impacts associated with oil and gas development. The specific resources and methods of protection are contained in lease stipulations. Lease stipulations usually consist of no surface occupancy, controlled surface use, or timing limitations. A notice may be included with a leased to provide guidance regarding resources or land use. While actual wording of stipulations may be adjusted at the time of leasing, the protection standard described will be maintained.

9.6 Total Disturbances

The disturbances for the RFD scenario over the next 10 years have been calculated and are displayed in Tables 13 and 14. Table 13 address the disturbances from exploration and construction activities for types of gas and oil wells anticipated to be developed. Estimates for deep gas and oil wells from a single pad have been extrapolated. The total disturbances for all predicted wells are estimated at 1,397 acres. Disturbance from federal mineral development would be 20 acres of which zero acres would be on USFS lands. The remaining federal disturbance (20 acres) would be on military sites, and national park lands. The disturbance to state and fee lands would be 1,168 acres.

Table 12 depicts the residual disturbance by well type remaining after appropriate mitigation measures and site restoration or rehabilitation activities have taken place. The total residual disturbance from anticipated development activities is 397 acres of which 7 would be from federal mineral development. The federal disturbances would affect zero USFS acres and 7 acres of various surface agencies. State and fee residual disturbance would be 390 acres.

The mitigation of initial exploration and construction disturbances would equal nearly 1,001 acres. Mitigation measures would account for remediation of 13 federal acres, and 778 state and fee acres.

Table 13: Predicted Development and Surface Disturbance (Exploration And Construction) for Gas and Oil Wells

Well Type	Total Wells Drilled	Dry Holes	Disturbance per Dry Hole	Total Dry Hole Disturbance	Federal Producing Wells	Disturbance per Federal Well	Total Federal Disturbance	State/Fee Producing Wells	Disturbance per State/Fee Well	Total State/Fee Disturbance	USFS Producing Wells	Disturbance per USFS Well	Total USFS Disturbance	Total Producing wells	Total Disturbance
Panhandle – deep	90	21	3.96	81.97	0	6.71	0	69	6.71	462.99	0	6.71	0	69	544.96
Panhandle – shallow	0	0	2.43	0	0	4.79	0	0	4.79	0	0	4.79	0	0	0
Peninsula – deep	140	32	3.96	127.51	3	6.71	20.13	105	6.71	704.55	0	6.71	0	108	852.19
Peninsula – shallow	0	0	3.43	0	0	6.9	0	0	6.9	0	0	6.9	0	0	0
Total	230	53		209.48	6		20.13	174		1,167.54	0		0	177	1,397.15

Assumptions:

Disturbance per well includes the well pad plus incremental roads, utility lines, transportation lines, processing equipment areas, and produced water management as outlined in Tables 11 and 12 for exploration.

Table 14: Predicted Development and Residual Surface Disturbance (Production) for Gas and Oil Wells

Well Type	Total Wells Drilled	Federal Producing Wells	Disturbance per Federal Well	Total Federal Disturbance	State/Fee Producing Wells	Disturbance per State/Fee Well	Total State/Fee Disturbance	USFS Producing Wells	Disturbance per USFS Well	Total USFS Disturbance	Total Producing wells	Total Disturbance
Panhandle – deep	90	0	2.24	0	69	2.24	154.56	0	2.24	0	69	154.56
Panhandle – shallow	0	0	1.81	0	0	1.81	0	0	1.81	0	0	0.00
Peninsula – deep	140	3	2.24	6.72	105	2.24	235.20	0	2.24	0	108	241.92
Peninsula – shallow	0	0	2.21	0	0	2.21	0	0	2.21	0	0	0.00
Total	230	6		6.72	174		389.76	0		0	177	1000.67

Assumptions:

Disturbance per well is the residual disturbance remaining after the mitigation measures have been implemented.

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Appendix A

Florida GENERAL RULES

Appendix B

USGS Play Descriptions