September 2014

Southeastern States
Draft Resource Management Plan and Environmental Impact Statement

BLM

Southeastern States Field Office

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Volume 1 of 3

Mission Statement

It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

BLM/ES/PL-14/001+1610

Cover Photos: Background – Meadowood Special Recreation Management Area, Fairfax County, Virginia. Foreground from top to bottom – Tidal Lagoon Overlook, Great Egret, Jupiter Inlet Lighthouse Outstanding Natural Area, Palm Beach County, Florida; Phosphate Operations, Polk County, Florida; Big Saline Bayou Special Recreation Management Area, Rapides Parish, Louisiana.

Southeastern States

DRAFT
RESOURCE MANAGEMENT PLAN

DRAFT ENVIRONMENTAL
IMPACT STATEMENT

Volume 1 of 3

United States Department of the Interior
Bureau of Land Management
Southeastern States Field Office

September 2014

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United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Eastern States
7450 Boston Boulevard
Springfield, Virginia 22153
http://www.es.blm.gov

In Reply Refer To:

1610 (020)

SEP 1 4 2014

Dear Reader:

Attached for your review and comment is the Southeastern States Draft Resource Management Plan (DRMP) and Draft Environmental Impact Statement (DEIS) for the Bureau of Land Management (BLM), Southeastern States Field Office (SSFO). The purpose of this draft document is to lay out a vision for managing 2,991 acres of public land surface and 1,026,176 acres of Federal mineral ownership in the states of Arkansas, Florida, Georgia, Kentucky, Louisiana, North Carolina, South Carolina, Tennessee, and Virginia. When approved, this RMP will guide the management of public lands administered by the Southeastern States Field Office into the future.

The BLM prepared this document in consultation with other Federal and state agencies, and in accordance with the National Environmental Policy Act of 1969, as amended, the Federal Land Policy and Management Act of 1976, as amended, implementing regulations, the BLM's Land Use Planning Handbook (H-1601-1), and other applicable law and policy.

The BLM encourages the public to provide information and comments pertaining to the proposed decisions and the analysis presented in the Draft RMP/EIS. The draft RMP presents broad goals and objectives for resources associated with these lands, together with alternatives for allowable use and management actions. While BLM responsibility within the planning area is largely for mineral ownership, BLM is also interested in developing a long-term strategy for management of the resources and recreational uses associated with the small public surface tracts in Arkansas, Louisiana, Florida and Virginia. The BLM is committed to working closely with the public to develop a strategy and find solutions that offer opportunities for multiple uses of the public lands, while protecting the natural and cultural resources for future generations.

Your review and comments on the content of the draft RMP/EIS are critical to the success of this planning effort. Your comments will be taken into consideration when the BLM proceeds to the next phase of the planning process, which is development of the Proposed RMP/Final EIS. The decision maker may select various management decisions from each of the alternatives analyzed in the Draft RMP/DEIS for the purpose of creating a management strategy that best meets the needs of the resources and values in this area under the BLM multiple use and sustained yield mandate. As a member of the public, your timely comments on the Southeastern States Draft RMP/DEIS will help formulate the Proposed RMP/Final EIS. Comments will be more helpful if they are as specific as possible and include suggested changes, sources, or methodologies, and

reference a section or page number. Comments will be accepted for ninety (90) calendar days following the Environmental Protection Agency's (EPA) publication of its Notice of Availability in the Federal Register. The BLM can best utilize your comments and resource information submissions if received within the review period.

Comments may be submitted electronically at: BLM_ES_SSFO_RMP@blm.gov. Comments may also be submitted by mail to: SSFO RMP Comments, 411 Briarwood Drive, Suite 404, Jackson, Mississippi 39206. To facilitate analysis of comments and information submitted, we strongly encourage you to submit comments in an electronic format.

Before including your address, phone number, email address, or other personal identifying information in your comment, be advised that your entire comment - including your personal identifying information - may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

Public meetings to provide an overview of the document, respond to questions, and take public comments will be announced by local media, website, and/or public mailings at least 15 days in advance.

Copies of the Draft RMP/DEIS have been sent to affected Federal, state and local government agencies and tribal governments. Copies of the Draft RMP/DEIS are available on the BLM website at:
http://www.blm.gov/es/st/en/fo/Jackson_Home_Page/planning/southeastern_rmp.html. Copies are also available for public inspection at the following BLM location:

Bureau of Land Management
Southeastern States Field Office
411 Briarwood Drive, Suite 404
Jackson, Mississippi 39206

Thank you for your interest in the Southeastern States Draft RMP/EIS. We appreciate the information and suggestions you contribute to the planning process. For additional information or clarification regarding this document or the planning process, please contact Gary Taylor, Planning and Environmental Coordinator, at (601) 977-5400.

Sincerely,

John F. Ruhs
State Director
Eastern States

Draft Environmental Impact Statement for the Southeastern States Resource Management Plan

Lead Agency: U.S. Department of the Interior, Bureau of Land Management

Type of Action: Administrative

Jurisdiction: Portions of the States of Arkansas, Florida, Georgia, Kentucky, Louisiana, North Carolina, South Carolina, Tennessee, and Virginia.

Abstract: This Draft Resource Management Plan (RMP) and Environmental Impact Statement (EIS) document describes and analyzes a reasonable range of management alternatives for the public lands and resources administered by the Bureau of Land Management (BLM). Within the planning area, the decision-making scope of the RMP is limited to the decision area. The decision area includes 2,991 acres of BLM-administered surface land. In addition to BLM-administered surface land, BLM is generally responsible for administration of Federal mineral estate, including mineral estate underlying other Federal agencies. Within the planning area there is approximately 19 million acres of Federal land ownership, including approximately 10.3 million acres administered by the U.S. Forest Service (USFS), 3.7 million acres by the National Park Service (NPS), 2.4 million acres by the U.S. Fish and Wildlife Service (USFWS), and 2.5 million acres by the Department of Defense (DOD). NPS and USFWS lands, however, are excluded from mineral leasing unless it is determined that oil or gas is being drained by wells drilled on adjacent lands. Therefore, the RMP will not include mineral leasing decisions for NPS and USFWS lands, except to say that any lands being drained would be available for lease. The RMP will also not make mineral leasing decisions for USFS lands, except to say that leasing of mineral estate underlying National Forests would be conducted by BLM consistent with USFS land use plans and leasing analyses. Within the planning area there are 28 National Forests, all of which are covered by existing Forest Plans. Four alternatives are analyzed in detail, including the Preferred Alternative. The management alternatives evaluated in this Draft RMP-EIS were developed to meet management goals and objectives and minimize adverse impacts to cultural and natural resources while providing for compatible resource use and development opportunities consistent with current laws, regulations, and policies.

Review Period: Comments on this Draft RMP-EIS will be accepted for 90 days following the date that the Environmental Protection Agency (EPA) publishes the notice of filing this Draft EIS in the Federal Register. Further information regarding this Draft EIS can be obtained from:

Gary Taylor
BLM Planning Coordinator
411 Briarwood Drive, Suite 404
Jackson, Mississippi 39206

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EXECUTIVE SUMMARY

INTRODUCTION

This Draft Resource Management Plan (RMP) and Environmental Impact Statement (EIS) describe and analyze a reasonable range of management alternatives for public lands in Arkansas, Florida, Georgia, Kentucky, Louisiana, North Carolina, South Carolina, Tennessee, and Virginia. The *planning area* boundary includes all lands in these states, regardless of ownership or administrative jurisdiction. The *decision area* for the RMP, however, includes only Bureau of Land Management (BLM) surface land and federal subsurface mineral estate where BLM has authority to make land use and management decisions. In addition, some areas of mineral estate are excluded from the decision area because, while BLM has minerals management authority, no mineral development is expected.

Most of the land within the decision area is mineral-estate, where the surface is either managed by a federal agency other than BLM or is in non-federal ownership. In total, there are more than one million acres of federal mineral ownership in the decision area, including 742,505 acres where the surface is managed by other federal agencies and 280,680 acres where the surface is in non-federal ownership. There are also 2,991 acres of public domain surface tracts where BLM manages both the surface and mineral resources. The above categories of federal mineral estate are collectively referred to in this document as "federal mineral ownership." Finally, there are 7,290 acres of lands with uncertain title. These are public domain lands, according to General Land Office records, but may have private claims of ownership. The RMP does not make resource management decisions on these lands, but they will be available for disposal to qualified applicants under the Color-of-Title Act.

The above categories of BLM-administered land ownership are listed and described in Table 1-1 of Chapter 1. For the surface tracts, the RMP alternatives cover management of both surface and mineral resources. For the remaining federal mineral ownership, the alternatives address only minerals management decisions.

PLANNING ISSUES

In addition to the major planning issues identified below, this Draft RMP/EIS includes decisions on a wide range of other resource management concerns, including air quality, soil resources, water resources, vegetation, fish and wildlife, special status species, wildland fire, cultural and paleontological resources, visual resources, recreation, and travel management.

Energy and Minerals

Foremost among planning issues is the future management of the federal mineral estate in the southeast. The basic challenge is to protect resources such as air quality, water quality, wetlands, sensitive species habitats, and historic properties, while allowing oil and gas development and mining.

Planning questions related to mineral management are as follows:

- Which areas should be open to mineral development subject to special constraints such as seasonal restrictions (in addition to the standard terms and conditions of existing regulations)?
- Which areas should be open subject to major constraints such as no surface occupancy (NSO)?
- Which areas should be closed to mineral leasing?
- What areas should be given further consideration for the leasing of coal?

The preliminary planning consideration for mineral management is—

- Make public lands available for the orderly and efficient development of mineral resources.

Land Ownership Adjustments

The workload and cost to manage lands within the *planning area* are high because of the scattered land ownership pattern. Some parcels of public land are less than 40 acres in size. Land tenure adjustments have the potential to provide greater efficiencies in management and reduce workloads and costs. Some of the lands may be suitable for disposal under a variety of authorities. Some may be retained in public ownership and possibly transferred to other agencies.

Planning questions for land tenure adjustments—

- What opportunities exist to make adjustments to public land ownership that would result in greater management, efficiency, and increased public and natural resource benefits?
- What opportunities are there for BLM or other agencies to manage surface tract resources and uses, such as cultural resources, recreation, sensitive species, or wildlife habitat?

Preliminary planning considerations for land tenure adjustments are as follows—

- Comply with BLM disposal authorities such as Sections 203 and 206 of FLPMA and the Federal Land Exchange Facilitation Act of 1988
- Comply with resource management guidance, including laws for resource protection such as the National Historic Preservation Act (NHPA) and the Endangered Species Act (ESA).

For any lands that are retained, there will be additional planning questions relating to management of cultural resources, sensitive species, recreation, and other resources. The decisions made in the Southeastern States RMP will be designed to resolve the issues identified above. In addition, Appendix C of the *BLM Land Use Planning Handbook (H-1610-1)* will be used as a guide for identifying a comprehensive set of resource management decisions to include in the Southeastern States RMP. Some parts of the guidance in Appendix C will not be applicable to this planning effort, and other parts will require modification to fit the management situation.

OVERVIEW OF THE ALTERNATIVES

Four alternatives, including the Preferred Alternative, are analyzed in the RMP/EIS. These alternatives were developed to meet management goals and objectives and minimize adverse impacts on cultural and natural resources, while providing for resource use and development opportunities consistent with current laws, regulations, and policies. Each alternative represents a direction to guide future management of BLM-administered public lands and resources. Alternative B was selected as the Preferred Alternative because it would best provide for mineral development while protecting sensitive resources, and would improve management of the surface tracts.

Highlights of each of the alternatives are summarized below. The management prescriptions for each alternative are described in Chapter 2.

Alternative A (No Action)

The No Action Alternative is the continuation of current management. Allowable uses and management actions for this alternative were compiled from several existing BLM land use planning documents and RMPs, including the *Arkansas Planning Analysis of 2002*, the *Louisiana Planning Analysis of 2002*, the *Meadowood Farm Planning Analysis of 2002*, and the *Florida RMP of 1995*.

A total of 1,025,286 acres of federal mineral ownership would be available for fluid mineral leasing. Stipulations to protect sensitive resources would be developed as specific lease proposals are evaluated. In Florida, the stipulations from the 1995 RMP would continue to be used. A total of 890 acres would be closed to leasing, including the Jupiter Inlet Lighthouse Outstanding Natural Area in Florida and the Meadowood Special Recreation Management Area in Virginia.

Within the area of high potential for phosphate development, which includes FMO in portions of the Florida counties of Desoto, Hardee, Hillsborough, Manatee, and Polk, there would be 5,657 acres of FMO available for lease. Leasing constraints would apply to 3,739 acres and 1,918 acres would be available for lease under standard terms.

Within the area of high potential for coal development in eastern Kentucky, 79,282 acres of federal mineral ownership would be available for further consideration for coal leasing by underground methods.

A total of 2,830 acres of surface tracts would be retained by BLM, while 161 acres would be available for disposal or transfer to other federal agencies. Surface management would focus on the following special management areas:

- Areas of Critical Environmental Concern
  - Jupiter Inlet Lighthouse Outstanding Natural Area, Florida (54 acres as previously designated by the Florida RMP and located within the 86-acre Outstanding Natural Area established by the Consolidated Natural Resources Act of 2008 [P.L. 110-229, Sec.202])
- Special Recreation Management Areas
  - Meadowood, Virginia (804 acres)
  - Big Saline Bayou, Louisiana (158 acres)
- Habitat Management Areas
  - Lathrop Bayou, Florida (185 acres).

Alternative B (Preferred Alternative)

Alternative B is BLM's preferred alternative. It provides opportunities to use and develop resources within the *decision area* while providing protection of natural resources.

Under this alternative, the availability of federal mineral ownership for fluid mineral leasing would be as follows:

- 301,843 acres open to leasing subject to standard terms and conditions
- 112,276 acres open to leasing subject to moderate constraints (controlled surface use)
- 610,927 acres open to leasing subject to major constraints (no surface occupancy)
- 1,130 acres closed to leasing, including Meadowood Special Recreation Management Area, Jupiter Inlet Lighthouse Outstanding Natural Area, and the Lathrop Bayou and Egmont Key Areas of Critical Environmental Concern.

Within the area of high potential for phosphate development, which includes FMO in portions of the Florida counties of Desoto, Hardee, Hillsborough, Manatee, and Polk, there would be 5,657 acres of FMO available for lease. Leasing constraints would apply to 3,739 acres, and 1,918 acres would be available for lease under standard terms.

Management of coal leasing would be the same as Alternative A.

A total of 2,776 acres of surface tracts would be retained for management by BLM, while 215 acres would be available for disposal or transfer to other federal agencies. The priority for BLM surface management would be the following special management areas:

- Areas of Critical Environmental Concern
  - Jupiter Inlet Lighthouse Outstanding Natural Area, Florida (86 acres)
  - Lathrop Bayou, Florida (185 acres)
  - Egmont Key, Florida (55 acres)
- Special Recreation Management Areas
  - Meadowood, Virginia (804 acres)
  - Big Saline Bayou, Louisiana (158 acres)
- Habitat Management Areas
  - Ozark Highlands, Arkansas (890 acres).

Alternative C

Under this alternative, the availability of federal mineral ownership for fluid mineral leasing would be as follows:

- 238,805 acres open to leasing subject to standard terms and conditions
- 94,049 acres open to leasing subject to moderate constraints (controlled surface use)
- 692,192 acres open to leasing subject to major constraints (no surface occupancy)
- 1,130 acres closed to leasing, including Meadowood Special Recreation Management Area, Jupiter Inlet Lighthouse Outstanding Natural Area, and the Lathrop Bayou and Egmont Key Areas of Critical Environmental Concern.

Within the area of high potential for phosphate development, which includes FMO in portions of the Florida counties of Desoto, Hardee, Hillsborough, Manatee, and Polk, there would be 5,657 acres of FMO available for lease. Leasing constraints would apply to 4,265 acres, and 1,392 acres would be available for lease under standard terms.

Management of coal leasing would be the same as Alternative A.

A total of 2,836 acres of surface tracts would be retained for management by BLM, while 155 acres would be available for disposal or transfer to other federal agencies. The priority for BLM surface management would be the following special management areas:

- Areas of Critical Environmental Concern
  - Jupiter Inlet Lighthouse Outstanding Natural Area, Florida (86 acres)
  - Lathrop Bayou, Florida (185 acres)
  - Egmont Key, Florida (55 acres)
- Special Recreation Management Areas
  - Meadowood, Virginia (804 acres)
  - Big Saline Bayou, Louisiana (23 acres)

- Habitat Management Areas
  - Ozark Highlands, Arkansas (950 acres).

Alternative D

Under this alternative, the availability of federal mineral ownership for fluid mineral leasing would be as follows:

- 353,036 acres open to leasing subject to standard terms and conditions
- 136,465 acres open to leasing subject to moderate constraints (controlled surface use)
- 535,730 acres open to leasing subject to major constraints (no surface occupancy)
- 945 acres closed to leasing, including Meadowood Special Recreation Management Area, Jupiter Inlet Lighthouse Outstanding Natural Area, and Egmont Key.

Within the area of high potential for phosphate development, which includes FMO in portions of the Florida counties of Desoto, Hardee, Hillsborough, Manatee, and Polk, there would be 5,657 acres of FMO available for lease. Leasing constraints would apply to 2,355 acres, and 3,302 acres would be available for lease under standard terms.

Management of coal leasing would be the same as Alternative A.

A total of 1,833 acres of surface tracts would be retained by BLM, while 1,158 acres would be available for disposal or transfer to other federal agencies. Surface management would be focused on the following special management areas:

- Areas of Critical Environmental Concern
  - Jupiter Inlet Lighthouse Outstanding Natural Area, Florida (86 acres)
- Special Recreation Management Areas
  - Meadowood, Virginia (804 acres)
- Habitat Management Areas
  - Lathrop Bayou, Florida (185 acres).

ENVIRONMENTAL CONSEQUENCES

Chapter 4 describes, and compares, the environmental consequences that may result from the implementation of the 4 proposed alternatives presented in Chapter 2. A summary of impacts is provided in Chapter 2 (Table 2-17).

In terms of complying with the NEPA, the specific purpose of Chapter 4 is to present the analyses of the alternative management actions, and to disclose the potential impacts of the federal action on the human environment. For this Draft RMP/EIS, the federal action is the BLM's selection of an alternative, which will serve as the framework for future land use and management direction and use of the BLM-administered public lands within the planning area.

In Chapter 4, the potential environmental consequences, or impacts, of each alternative are addressed in the same order of resource topics as was presented in Chapter 3. This parallel organization helps readers compare existing resource conditions (Chapter 3) to potential impacts (Chapter 4) for the same resource. A summary of impacts is provided in Chapter 2 (Table 2-17). Chapter 4 concludes with an analysis of cumulative effects, which are defined as the impacts that result from the incremental impact of an action when added to other past, present, or reasonably foreseeable future actions.

CONSULTATION AND COORDINATION

Consultation, coordination, and public involvement were undertaken by BLM throughout the process of developing this Draft RMP/EIS and are described in Chapter 5. In summary, BLM consulted and coordinated with federal and state agencies and Native American tribes in developing this Draft RMP/EIS, including with the U.S. Fish and Wildlife Service to obtain a species list and develop best management practices and oil and gas leasing stipulations for the alternatives. BLM also coordinated on the state level by contacting county supervisors and commissioners and the governors of each state to inform them of the RMP planning process. In addition, BLM contacted federally recognized Native American tribes, inviting them to participate in the planning process. A meeting to coordinate with Native American tribes was held in Fort Smith, Arkansas, on October 21, 2008.

Public Involvement

Public participation in the RMP/EIS process includes a variety of efforts to identify and address public concerns and needs. The public involvement process assists BLM in broadening the information base for decisionmaking, informing the public about the RMP/EIS and the potential impacts associated with various management decisions, and ensuring that public needs and viewpoints are understood by BLM.

Public scoping was initiated with publication of a Notice of Intent in the *Federal Register* on October 8, 2008. In October and November of 2008, 10 public workshops were held over a 4-week period, including at least one meeting in each of the six states where development is expected. During the scoping process, a number of written comments were received, all of them pertaining to recreation uses at Meadowood Special Recreation Management Area in Virginia. In all, there were approximately 170 comments from 130 individuals.

Cooperating Agencies

The states of Arkansas, Florida, Georgia, Kentucky, Louisiana, North Carolina, South Carolina, Tennessee and Virginia were invited to be involved in the planning process as cooperating agencies. Several federal agencies, including surface managing agencies, were also invited to be cooperating agencies. Of those invited, only the U.S. Forest Service agreed to be a cooperating agency.

CHAPTER 1—PURPOSE AND NEED

1.1 INTRODUCTION

This Draft Resource Management Plan (RMP) and Environmental Impact Statement (EIS) describe and analyze a reasonable range of alternatives for the management of a portion of the public lands and federal minerals administered by the Southeastern States Field Office (SSFO) of the Bureau of Land Management (BLM). The SSFO covers 11 states, including Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia. Alabama and Mississippi are already covered by an RMP that was approved in 2009. This RMP addresses the remaining nine states.

1.2 PURPOSE AND NEED FOR THE PLAN

The purpose of the Southeastern States RMP is to prepare a land use plan that will enable BLM to respond to mineral leasing proposals and efficiently address the long-term management of the scattered surface tracts across nine southeastern states. Although there is federal mineral estate in all nine states, there is surface ownership in only four—Arkansas, Florida, Louisiana, and Virginia. The Southeastern States RMP will provide the SSFO with a comprehensive framework for managing BLM-administered land and minerals within these states. Previous approved land use plans in the area include the *Florida RMP* (1995), the *Arkansas Planning Analysis* (2002), the *Louisiana Planning Analysis* (2002), and the *Meadowood Farm (Virginia) Planning Analysis* (2003). The Southeastern States RMP will replace these plans.

Under the Federal Land Policy and Management Act (FLPMA) and the National Environmental Policy Act (NEPA), before permitting activities on federal lands that may alter the human environment, BLM must prepare a plan that—

- States the likely nature, number, locations, and extent of the proposed activities
- Encourages and considers comments from other federal, state, and local agencies; private entities; and individuals with interests in the proposed activities
- Lists alternatives to the proposed activities that are to be considered (including a “no action” alternative)
- Projects the impacts to be expected from each of the alternatives
- Proposes methods to monitor the effects of the approved activities.

The Southeastern States RMP/EIS will satisfy the environmental documentation and public participation requirements of both FLPMA and NEPA. However, approval of the Southeastern States RMP/EIS does not mean that subsequent projects can be summarily approved without further site-specific review and public disclosure as required by NEPA. An RMP provides the required foundation for the overall land management direction and objectives, limitations, stipulations, and practices. Any specific proposal involving surface disturbing activities or conveyance of rights that serve as a vehicle to possible surface disturbing activities, including oil and gas or coal leasing, drilling or mining, activity plans on a BLM surface tract, land disposal, approval of right-of-way, etc., must go through a comprehensive review to verify conformance with the RMP and compliance with NEPA, as well as other regulatory mandates, internal guidelines, and policies.

1.3 DESCRIPTION OF THE PLANNING AREA, DECISION AREA, AND AREA OF EXPECTED DEVELOPMENT

The *planning area* is the geographic area within which BLM may make decisions during a planning effort and includes all lands regardless of jurisdiction. The *planning area* for the Southeastern States RMP, as shown on Map 1-1, includes the following nine states in their entirety: Arkansas, Florida, Georgia, Kentucky, Louisiana, North Carolina, South Carolina, Tennessee, and Virginia. The *planning area* does not include the states of Mississippi and Alabama because they are covered under a separate RMP. Within the *planning area*, the decisionmaking scope of the RMP is limited to the *decision area*, which includes only lands for which BLM has authority to make planning decisions.

The *decision area* for the RMP includes all lands in the *planning area* where BLM is responsible for managing both the surface and mineral estates. In this document, these lands are referred to as surface tracts. The *decision area* also includes a portion of the federal mineral ownership (FMO) for which BLM has authority to make minerals management related land use decisions but does not have surface management responsibility. On these lands, the surface is either in private or state ownership or is managed by a federal agency other than BLM. The *planning area* and the *decision area* are depicted by county in Map 1-1. A full description of the lands included in the *decision area* is provided below.

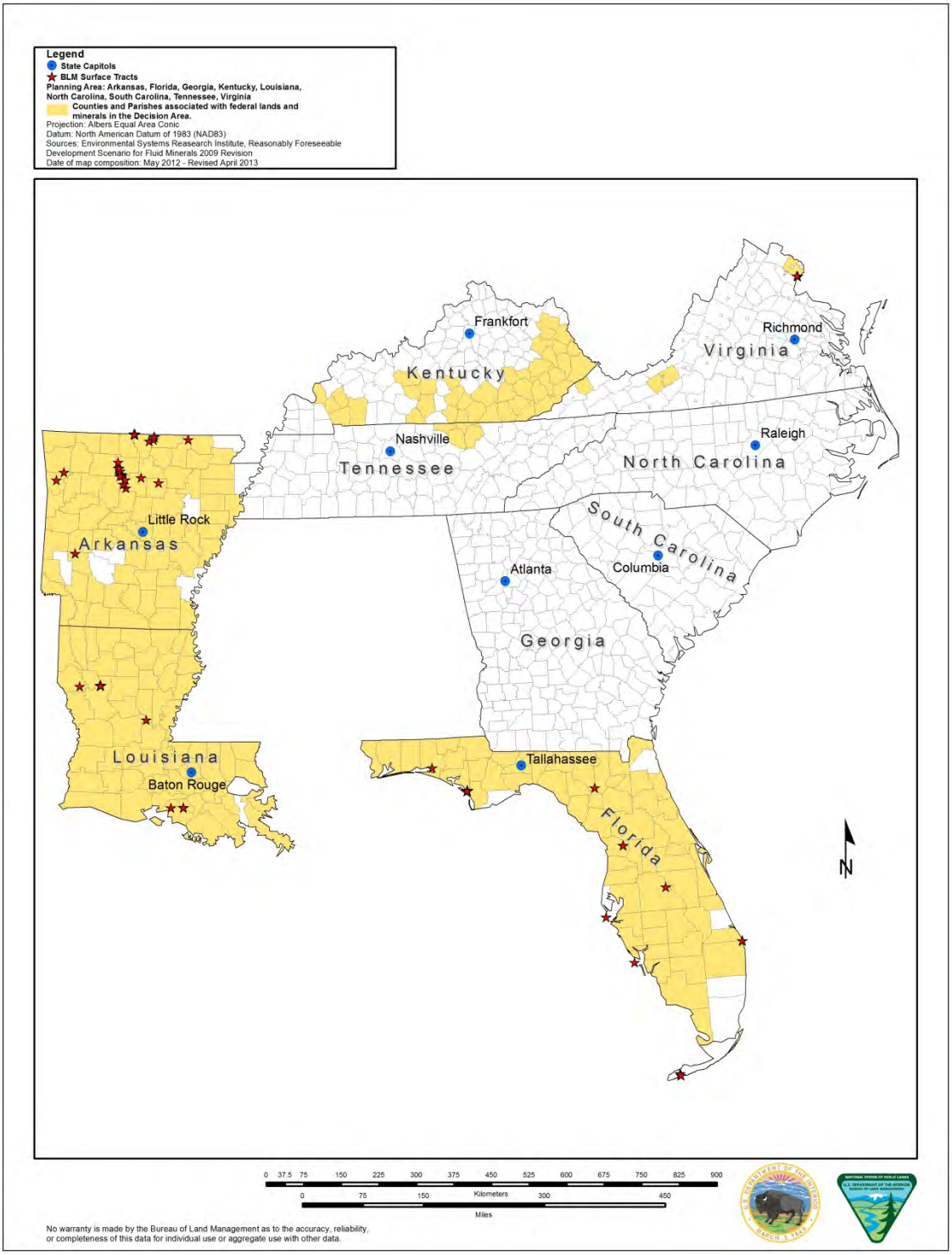
Within the *planning area*, BLM manages surface tracts in Arkansas, Florida, Louisiana, and Virginia. These surface tracts are in the *decision area* and have a total area of 2,991.11 acres. For these tracts, BLM has a mandate to promote multiple-use management of lands and resources. In these states, there are also 7,290 acres of lands with uncertain title. These are public domain lands, according to General Land Office records, but may have private claims of ownership. The RMP will not make resource management decisions on these lands, but they will be available for disposal to qualified Color-of-Title Act applicants.

BLM is also responsible for management of the minerals on FMO where (1) the minerals are federally owned but the surface is in private or state ownership, or (2) the surface and minerals are federally owned but the surface is managed by a federal agency other than BLM.

In the first category above, the *decision area* includes 280,680 acres of FMO where the surface estate is in private or state surface ownership and the minerals are in whole or part federally owned. This type of FMO is known as “split-estate.”

In the second category, BLM has responsibility for FMO where the surface is managed by other federal agencies. It is estimated that there are approximately 19 million acres of such federal land in the planning area. The majority of these federal lands are on national forests, reservoirs, and military reservations managed by the U.S. Forest Service (USFS), the Army Corps of Engineers, and the Department of Defense, respectively. The FMO on many of these lands qualify for inclusion in the decision area but there are some exclusions as follows. BLM has the responsibility for lease issuance and post-lease administration on approximately 10.3 million acres of USFS lands in the planning area, but land use planning level decisions are made through USFS Forest Plans rather than BLM RMPs. BLM serves as a cooperating agency for the preparation of Forest Plans, mainly with regard to minerals management issues. Federal minerals underlying lands administered by the National Park Service (NPS), approximately 3.7 million acres, and the U.S. Fish and Wildlife Service (USFWS), approximately 2.5 million acres, are not included in the decision area because federal regulations exclude these lands from being leased for oil and gas, except in the case where oil and gas is being drained by producing wells on adjacent land. Federal lands owned by Native American tribes and administered by the Bureau of Indian Affairs are also excluded from the decision area, because Native American tribes control their own mineral leasing programs.

Map 1-1. Planning Area and Decision Area



For the purpose of this RMP, as it pertains to FMO where the surface is managed by other agencies, the term *decision area* is further limited to only those FMO where there is reasonably foreseeable mineral development (RFD). RFD scenarios were prepared for this RMP during the pre-public scoping process to forecast the locations and intensity of federal mineral development over approximately a 10-year period for each state in the *planning area*. The RFDs did not project any mineral development on FMO in North Carolina, South Carolina, or Georgia, nor are there any BLM-managed surface tracts in those states. As a result, for the purpose of analysis in this RMP, BLM excludes these states from the *decision area* and only considers BLM-managed public lands and federal minerals in Arkansas, Florida, Kentucky, Louisiana, Tennessee, and Virginia. In these remaining six states, there are 742,505 acres of FMO that meet the criteria to be included in the *decision area*, where the surface is managed by other federal agencies. Several major properties that are included are shown on maps in Chapter 3 and are listed in Appendix L.

Although BLM has a management responsibility for leasing and approval/oversight of mineral operations for FMO on lands of other federal surface managing agencies (SMA), any proposed leasing is subject to consultation and/or consent. In the case of state-owned surface, consultation with the state SMA is required. Through these processes, the SMA is able to recommend or stipulate whether a lease should or should not be approved, and if so, under what terms. The terms are attached to a lease as special stipulations. If the FMO were leased on such federal property and results in proposed operations, such operations would also be considered in close coordination with the SMA. In addition, leasing and operations are subject to full review and public disclosure as required by NEPA, and compliance with all pertinent rules, regulations, and guidelines.

The term *area of expected development* is also used in this RMP with respect to phosphate and oil and gas development. The *area of expected development* for each of these resources is the collective FMO within the counties and parishes where development is not only possible, but expected to occur within the next 10 years, based on the RFDs and other available information or analysis. Narrowing the geographic scope of the RMP for oil and gas and phosphate analysis to areas where development is actually expected provides a means of focusing the analysis of the associated impacts. The *area of expected development* for oil and gas is depicted by county in Map 1-2, and the *area of expected development* for phosphate is shown in Map 1-3.

In summary, the *planning area* for this RMP includes the states of Arkansas, Florida, Georgia, Kentucky, Louisiana, North Carolina, South Carolina, Tennessee, and Virginia, as shown on Map 1-1. The *decision area* includes BLM-managed surface tracts and FMO in Arkansas, Florida, Kentucky, Louisiana, Tennessee, and Virginia, as depicted by county in Map 1-1. The various categories of land and mineral ownership in the decision area are summarized in Table 1-1. The *area of expected development* is a subset of the *decision area* and is the geographic area where oil and gas and phosphate development on FMO is expected in the next 10 years, as depicted in Map 1-2 and Map 1-3, respectively. The surface tracts have been named for convenience, and are refered to by name throughout this document. The names and general locations of tracts are shown in Map 1-4 (Arkansas), Map 1-5 (Florida), Map 1-6 (Louisiana), and Map 1-7 (Virginia). A detailed map of each surface tract is available in Appendix B.

Table 1-1. Land and Mineral Ownership and Administrative Jurisdictions within the RMP Decision Area

Jurisdiction	Acres[1]
Areas covered by the Draft RMP/EIS	
A. BLM surface land—Federal minerals[2]	2,991.11
B. Non-Federal surface land—Federal minerals[3]	280,680
C. Other surface managing agency —Federal minerals[4]	742,505
Total BLM-administered federal land surface to be covered by RMP decisions	**2,991.11**
Total BLM-administered federal mineral estate to be covered by RMP decisions	**1,026,176**

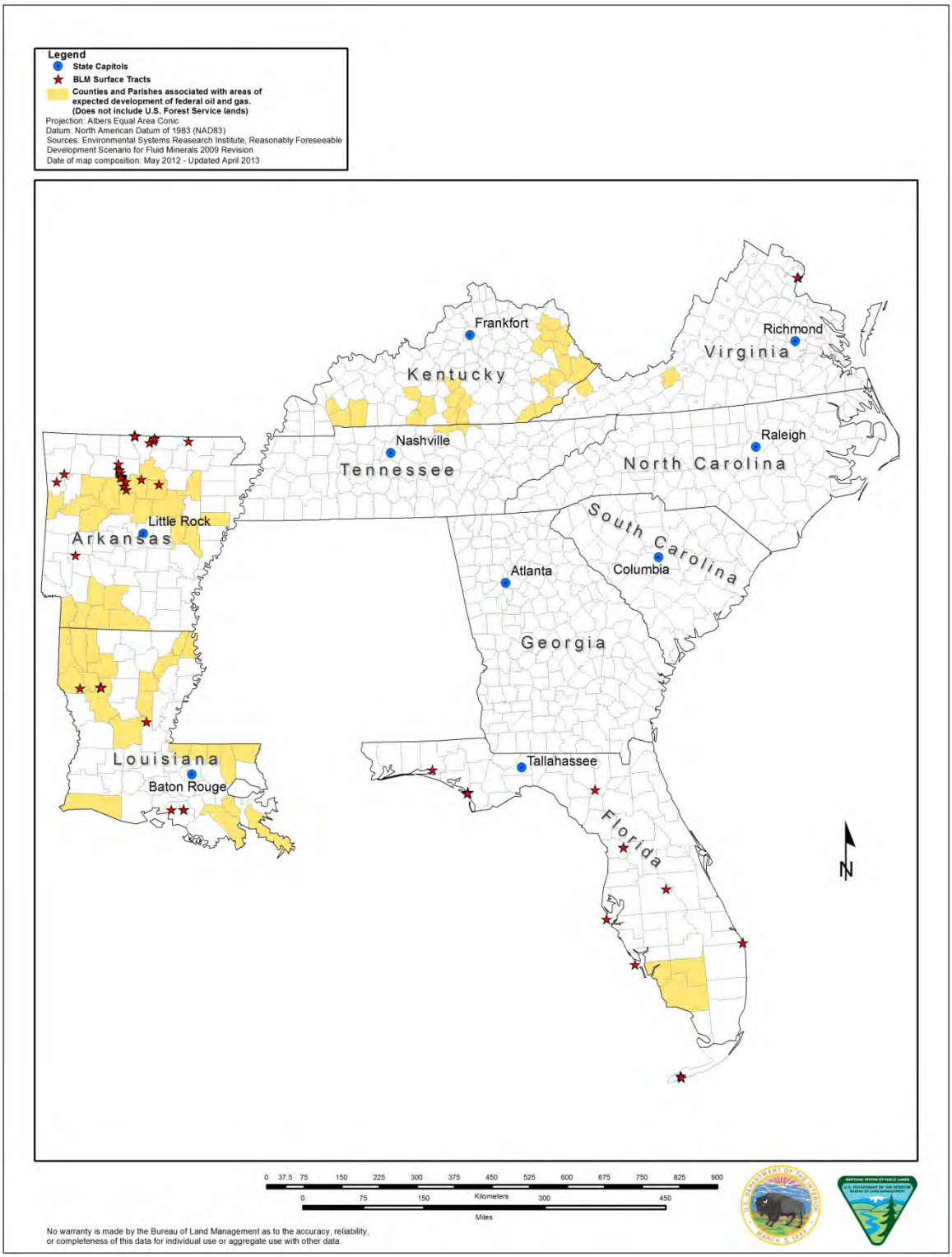
1 Where one or more mineral resource categories are federally owned, the acreage is listed as if all minerals were federally owned. Where mixed minerals ownership occurs (for example, privately owned coal interest overlapping with federally owned oil and gas interest), minerals planning and management decisions in the RMP will pertain only to the federally owned mineral interests. Data includes lands described by aliquot parts, metes and bounds, or lot number. In the case of metes and bounds and lot number descriptions, the acreage is considered “nominal acreage” and is based on the average number of acres for nominal sections within each state.

2 In those areas where the federal land surface and federal mineral estate are both administered by BLM, the RMP decisions will cover both the land surface and the mineral estate.

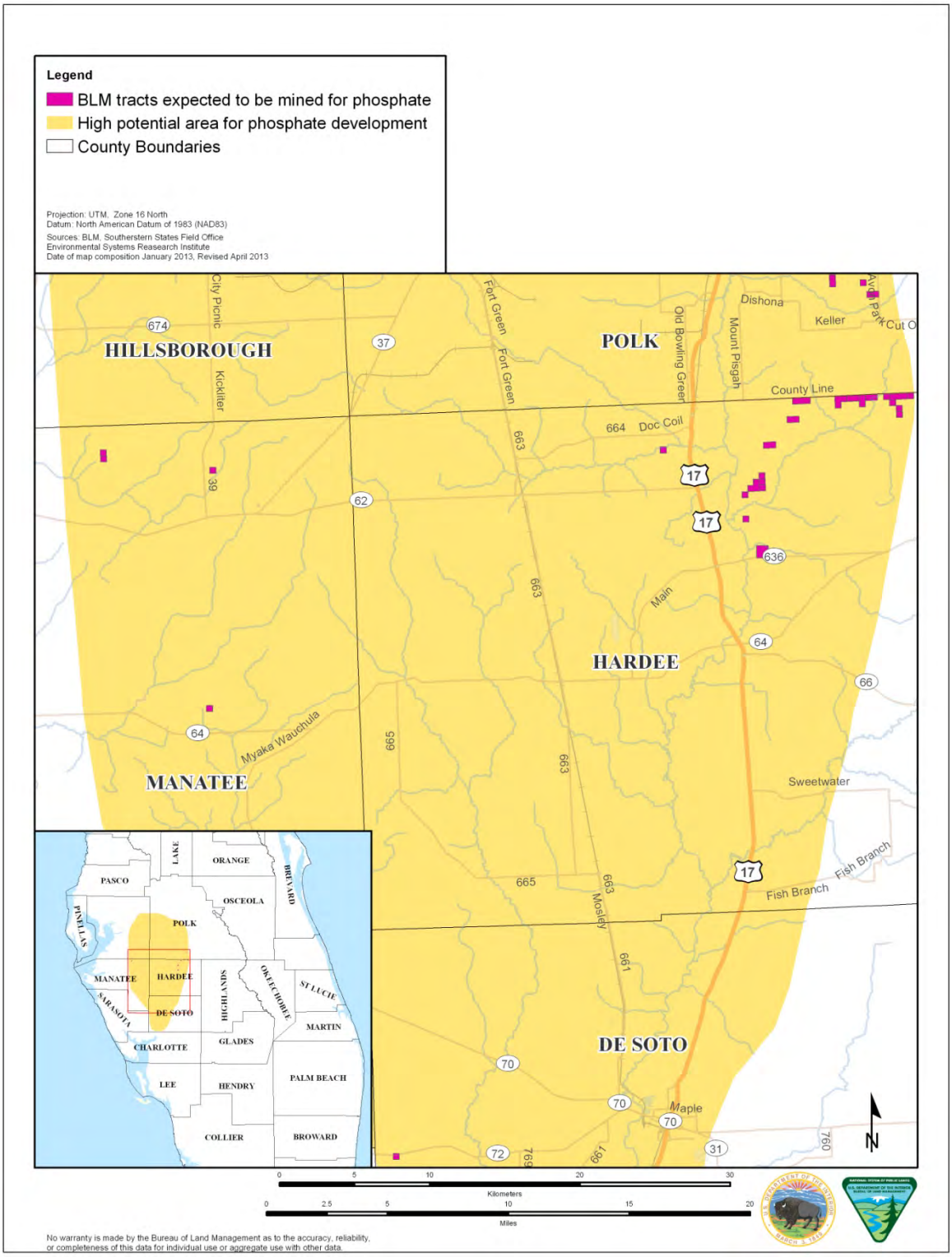
3 In those areas where (1) the land surface is privately owned or owned by a non-federal government jurisdiction and (2) the minerals are federally owned, the RMP decisions will cover only the BLM-administered federal mineral estate. Although the land and resource uses and values on the non-federal surface will be taken into account and will affect development of the federal mineral management decisions, these decisions will pertain only to the federally owned minerals.

4 In those areas where (1) the land surface is administered by an agency other than BLM or USFS (e.g., the Department of Defense, the U.S. Army Corp of Engineers and various state agencies), and (2) the federal mineral estate is administered by BLM, land management decisions for surface uses are the responsibility of the surface managing agency. BLM RMP decisions will cover only minerals management. However, consultation with state surface managing agencies would be required prior to lease of federal minerals and in the case of federal agencies, the lease of the federal minerals would be subject to management as directed by the federal surface managing agency.

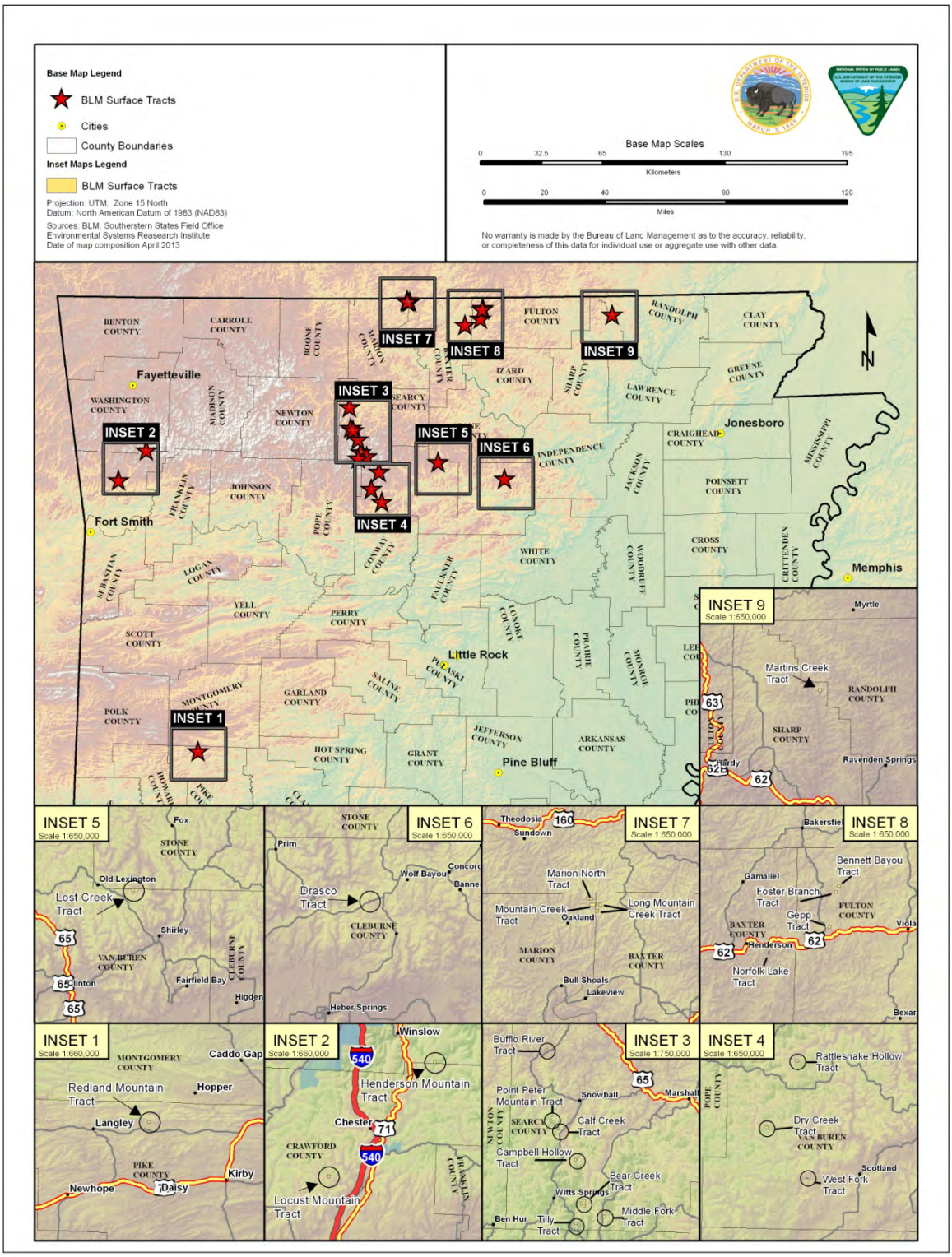
Map 1-2. Area of Expected Development of Oil and Gas



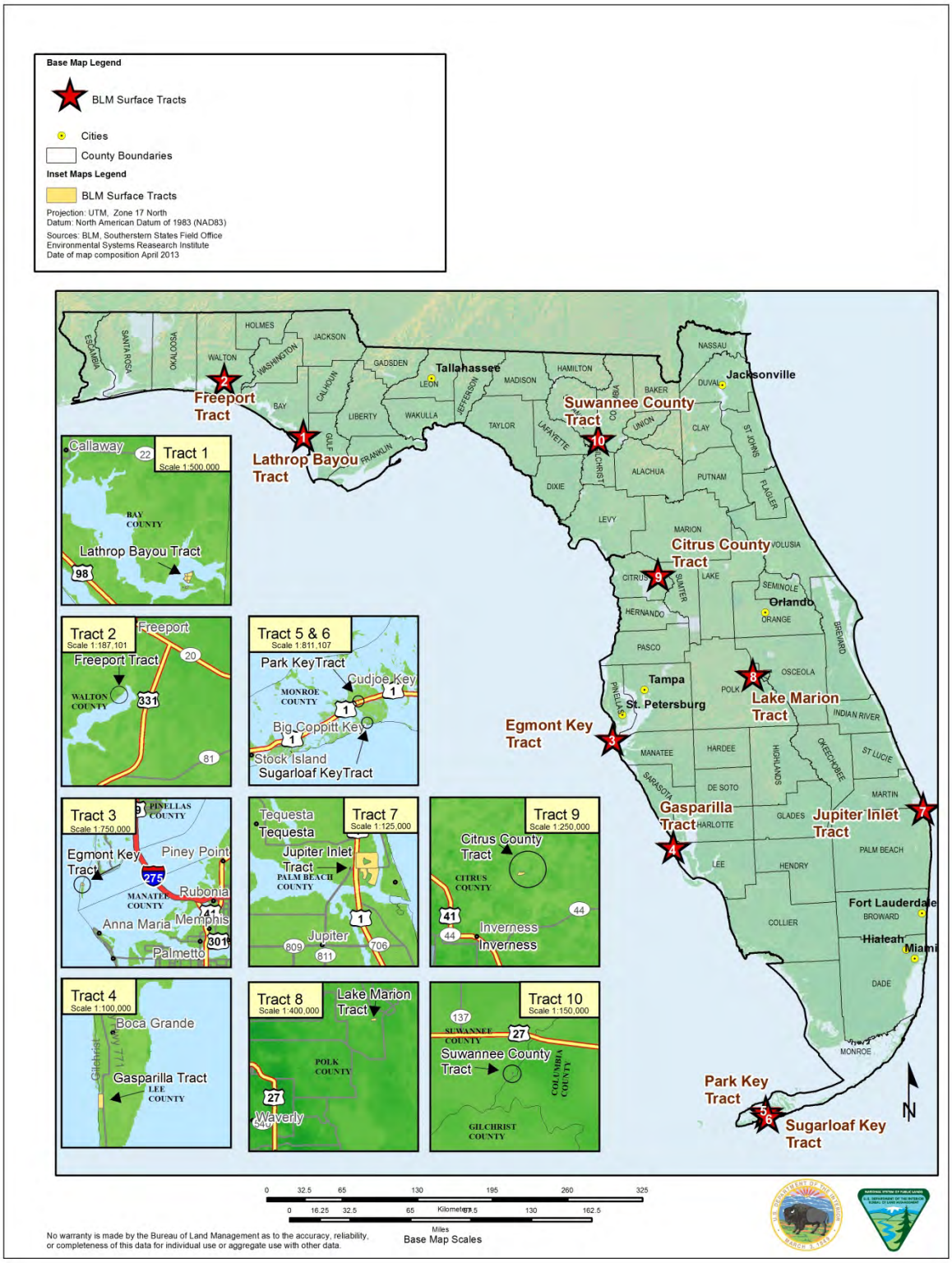
Map 1-3. FMO Tracts Expected to be Mined for Phosphate



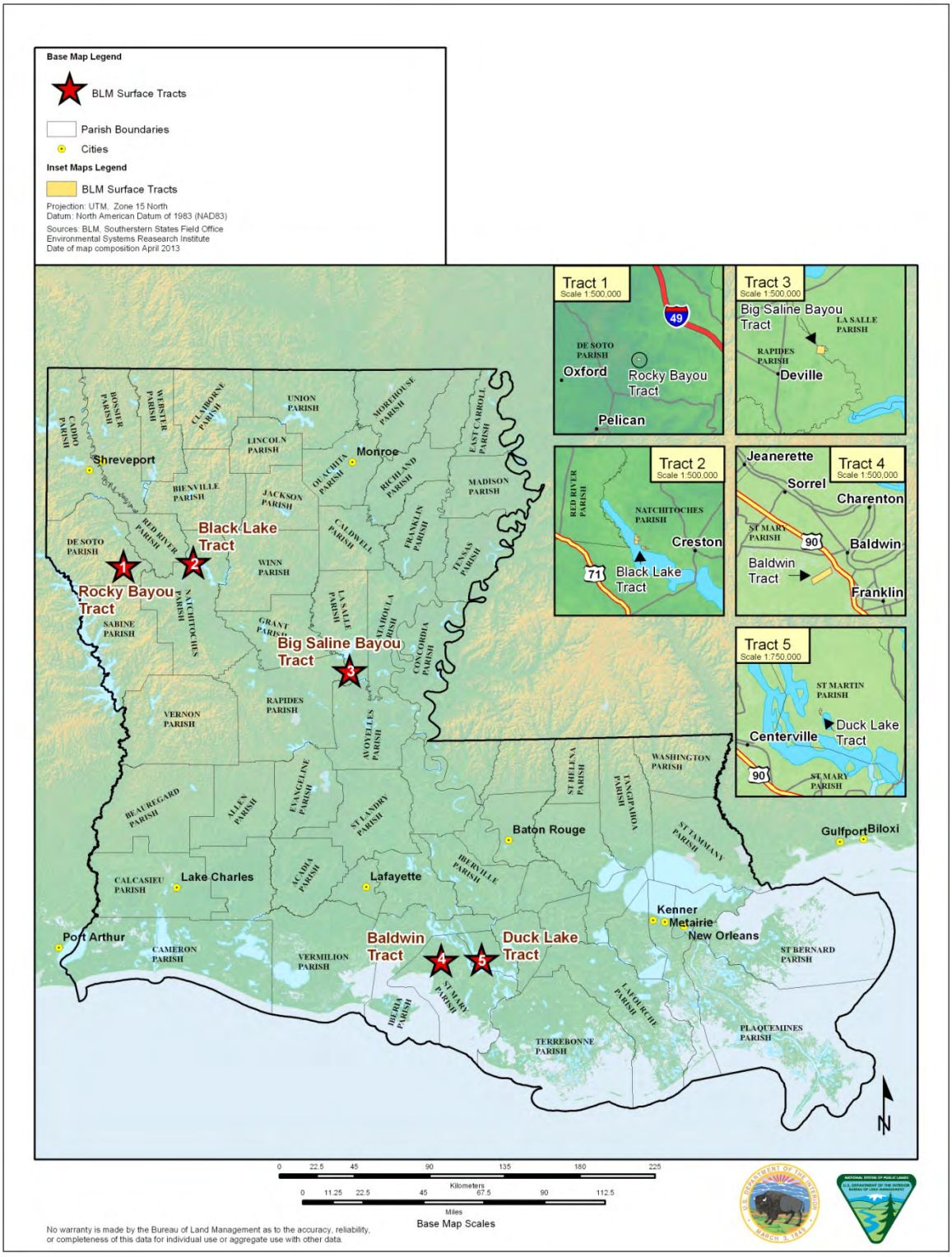
Map 1-4. Surface Tracts in Arkansas



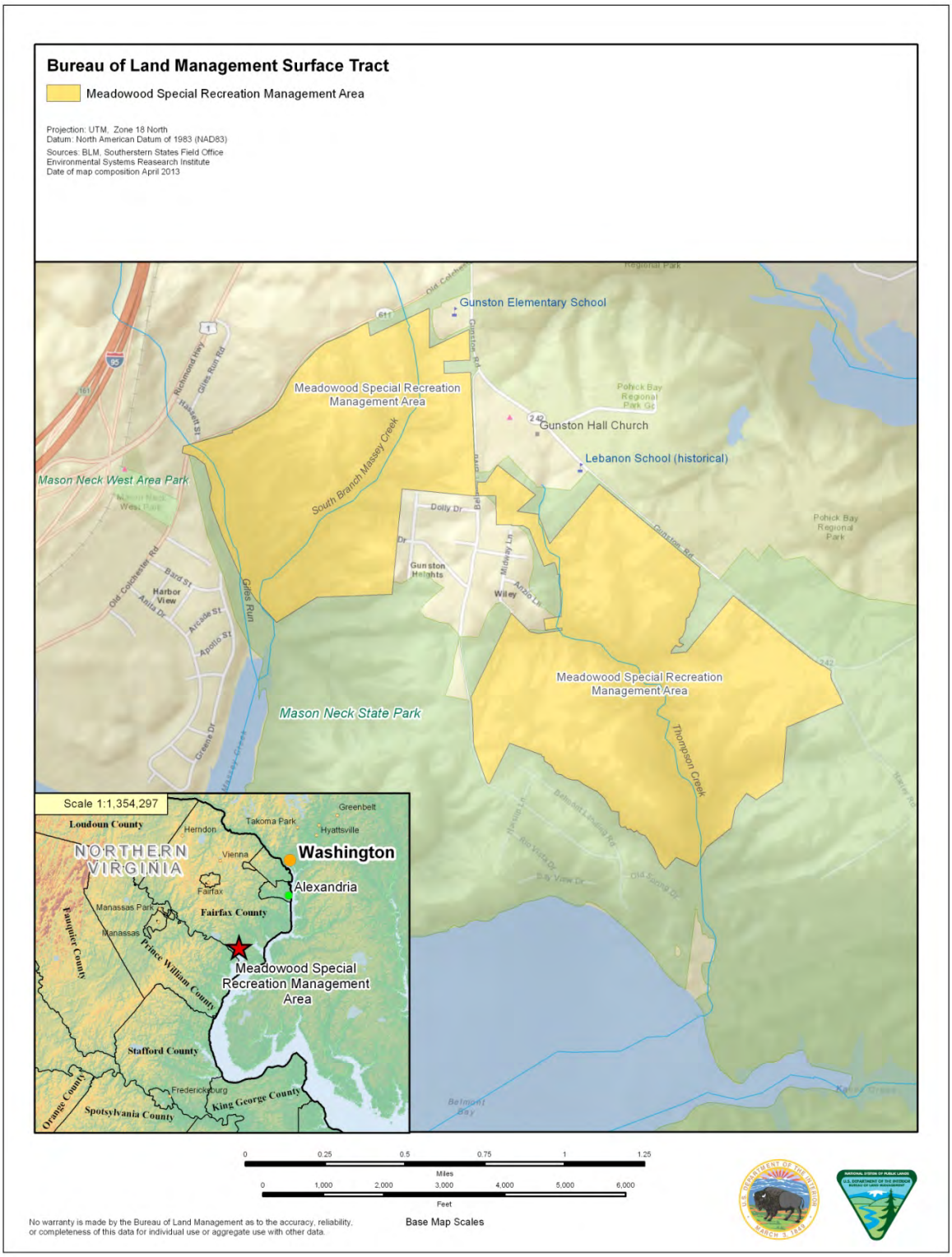
Map 1-5. Surface Tracts in Florida



Map 1-6. Surface Tracts in Louisiana



Map 1-7. Surface Tract in Virginia



1.4 PLANNING ISSUES

In addition to the major planning issues identified below, this Draft RMP/EIS includes decisions on a wide range of other resource management concerns, including air quality, soil resources, water resources, vegetation, fish and wildlife, special status species, wildland fire, cultural and paleontological resources, visual resources, recreation, and travel management.

1.4.1 Energy and Minerals

Foremost among planning issues is the future management of the federal mineral estate in the southeast. The basic challenge is to protect resources such as air quality, water quality, wetlands, sensitive species habitats, and historic properties, while allowing oil and gas development and mining.

Planning questions related to mineral management are as follows:

- Which areas should be open to mineral development subject to special constraints such as seasonal restrictions (in addition to the standard terms and conditions of existing regulations)?
- Which areas should be open subject to major constraints such as no surface occupancy (NSO)?
- Which areas should be closed to mineral leasing?
- What areas should be given further consideration for the leasing of coal?

The preliminary planning consideration for mineral management is—

- Make public lands available for the orderly and efficient development of mineral resources.

1.4.2 Land Ownership Adjustments

The workload and cost to manage lands within the *planning area* are high because of the scattered land ownership pattern. Some parcels of public land are less than 40 acres in size. Land tenure adjustments have the potential to provide greater efficiencies in management and reduce workloads and costs. Some of the lands may be suitable for disposal under a variety of authorities. Some may be retained in public ownership and possibly transferred to other agencies.

Planning questions for land tenure adjustments—

- What opportunities exist to make adjustments to public land ownership that would result in greater management, efficiency, and increased public and natural resource benefits?
- What opportunities are there for BLM or other agencies to manage surface tract resources and uses, such as cultural resources, recreation, sensitive species, or wildlife habitat?

Preliminary planning considerations for land tenure adjustments are as follows—

- Comply with BLM disposal authorities such as Sections 203 and 206 of FLPMA and the Federal Land Exchange Facilitation Act of 1988
- Comply with resource management guidance, including laws for resource protection such as the National Historic Preservation Act (NHPA) and the Endangered Species Act (ESA).

For any lands that are retained, there will be additional planning questions relating to management of cultural resources, sensitive species, recreation, and other resources. The decisions made in the Southeastern States RMP will be designed to resolve the issues identified above. In addition, Appendix C

of the *BLM Land Use Planning Handbook (H-1610-1)* will be used as a guide for identifying a comprehensive set of resource management decisions to include in the Southeastern States RMP. Some parts of the guidance in Appendix C will not be applicable to this planning effort, and other parts will require modification to fit the management situation.

1.5 PLANNING CRITERIA

Planning criteria are constraints or ground rules that guide development of BLM land use plans. These criteria ensure that the planning team focuses on relevant uses and collects applicable data for analysis. The criteria include applicable federal laws, regulations, executive orders (EO), and policies. As identified in the *Southeastern States Resource Management Plan Preparation Plan*, the following criteria were developed to guide the preparation of the RMP—

1. BLM will not make any recommendations or decisions that affect federal mineral estate beyond its explicit authority under the Mineral Leasing Act of 1920, the Mineral Leasing Act for Acquired Lands of 1947, the FLPMA, and other guidance.

2. Decisions that remain valid from previous BLM land use plans, including the *Florida RMP* (1995), the *Arkansas Planning Analysis* (2002), the *Louisiana Planning Analysis* (2002), and the *Meadowood Farm (Virginia) Planning Analysis* (2003), will be incorporated into the No Action Alternative for the Southeastern States RMP. After being analyzed in the No Action alternative, decisions that are still valid will be incorporated into the new RMP.

3. Tracts of BLM surface and subsurface minerals will be mapped and listed by legal description. Lands of uncertain title will also be listed; these lands could potentially be available for disposal under the Color-of-Title Act.

4. For oil and gas and other minerals, RFD scenarios will be prepared.

5. Identification of any lands for further consideration for coal leasing will be limited to any areas with development potential, based on the RFD.

6. Broad-based public participation will be an integral part of the planning and EIS process; the planning team will work cooperatively and collaboratively with cooperating agencies and all other interested groups, agencies, and individuals.

7. Decisions in the plan will strive to be compatible with the existing plans and policies of adjacent local, state, federal, and tribal agencies as long as the decisions are consistent with the purposes, policies, and programs of federal law, and regulations applicable to public lands.

1.6 OVERVIEW OF THE PLANNING PROCESS

The BLM planning process is detailed in the *BLM Land Use Planning Handbook* (H-1601-1), which provides guidance to BLM employees for implementing BLM land use planning requirements established by Section 202 of the FLPMA and the regulations in 43 Code of Federal Regulations (CFR) 1610. The process for preparing an EIS is determined by federal regulations implementing NEPA (40 CFR 1500-1508). The major steps in the BLM planning process are shown in Figure 1-1 and are further described below.

Preparation Plan. BLM developed a preparation plan to outline anticipated planning issues and management concerns, preliminary planning criteria, data needs, process participants, plan format, schedule, and public involvement.

Notice of Intent. BLM published a Notice of Intent (NOI) in the *Federal Register* on October 8, 2008, to announce its intention to prepare an RMP and EIS. The NOI also solicited coal information for BLM-administered coal and identified planning criteria to guide the preparation of the RMP.

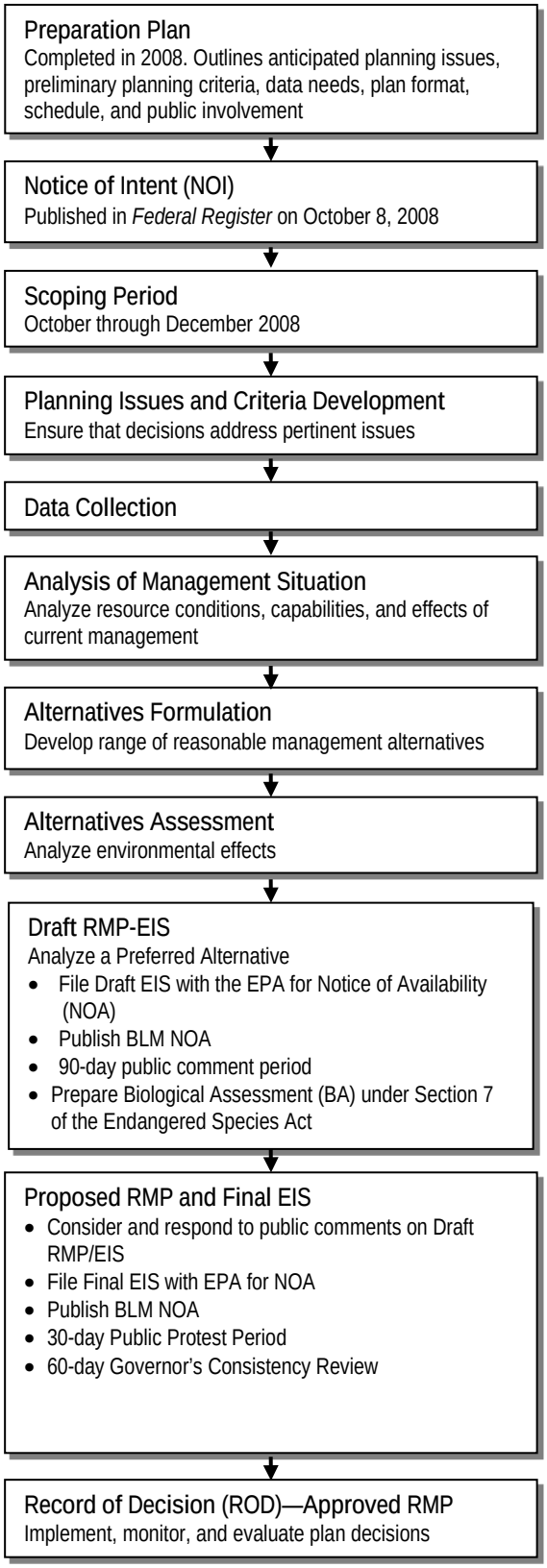
Scoping Period. Public scoping was conducted from October through December 2008. The objectives of scoping were to involve the public in the planning process and to comply with FLPMA and NEPA. Scoping is a process of soliciting public input and identifying concerns regarding management of public lands and FMO in the *planning area*. Scoping consisted of public notification through the *Federal Register* (i.e., publication of the NOI) and by letter and e-mail. Letters of invitation to participate as cooperating agencies were sent to government agencies. BLM also notified local, state, and federal agencies, and Native American tribes during this period.

Analysis of Management Situation. As part of preparing the RMP-EIS, BLM analyzed the resource conditions, capabilities, and effects of current management for use as a reference throughout the planning process. As contained in Chapter 3 of the RMP-EIS, this analysis included a description of the physical and biological characteristics and condition of the resources within the *planning area* and how they are being used and/or protected.

Draft RMP/EIS. This Draft RMP/EIS considers public and agency comments received during the scoping period, includes a description of alternatives and the affected environment, and offers an assessment of potential impacts from implementing the alternatives.

Comment Period and Public Meetings. The public and local, state, and federal agencies and Native American tribes will have an opportunity to review and comment on the

Figure 1-1. RMP/EIS Process



Draft RMP-EIS during a 90-day comment period, beginning on the date the Environmental Protection Agency (EPA) publishes their Notice of Availability (NOA) in the *Federal Register*. BLM will hold additional public meetings to receive comments from the public. Opportunities for public involvement are further described in Chapter 5, Consultation and Coordination.

Biological Assessment (BA). Section 7 of the ESA (16 United States Code [U.S.C.] Section 1536(a)(2)) requires all federal agencies to determine whether their actions may affect listed or proposed species and designated and proposed critical habitat. A BA will be prepared for each state to analyze the potential effects of the project on federally listed species and critical habitat to establish and justify an "effect determination." The BAs will be reviewed by the USFWS under the ESA Section 7 consultation requirements.

Proposed RMP and Final EIS. The purpose of the Proposed RMP and Final EIS is for BLM to assess, consider, and respond to public and agency comments received on the Draft RMP-EIS. A NOA will be published in the *Federal Register* by BLM when the Proposed RMP and Final EIS become available. A 30-day public protest period, beginning on the date the EPA publishes its NOA in the *Federal Register*, will follow the release of the Proposed RMP and Final EIS. A 60-day Governors' consistency review will also occur at this time.

Record of Decision (ROD). The ROD is a separate and concise public record that clearly identifies and describes the approved RMP and links BLM's decision to the analysis presented in the EIS. The ROD addresses how environmental impacts and other factors were considered in the decisionmaking process.

This Draft RMP/EIS provides a comprehensive evaluation of BLM's potential management and land tenure adjustment actions for public lands and their natural resources. A comprehensive RMP/EIS that includes all of BLM's management programs is needed to address potential conflict among interrelated management actions. This Draft RMP/EIS also allows for tiering (40 CFR 1505.28) subsequent activity or project-specific EISs or environmental assessments (EA) conducted on public lands. Subsequent lower-level EISs or EAs will reference and adopt relevant information and goals from this broader, multistate RMP/EIS as formal NEPA documentation, thereby avoiding duplication of effort and reducing costs associated with completing future NEPA analyses.

1.7 RELATIONSHIP WITH OTHER PLANS

BLM land use plans and amendments must be consistent with officially approved or adopted resource-related plans of other federal agencies, state and local governments, and Native American tribes to the extent the plans are consistent with federal law and regulations applicable to the public lands. Below is a list of other federal agency plans for neighboring areas or cross-jurisdictional purposes.

- *Revised Land and Resource Management Plan*, Ouachita National Forest, Arkansas and Oklahoma, December 21, 2005
- *Revised Land and Resource Management Plan*, Ozark-St. Francis National Forests, Arkansas, September 2005
- *Revised Land and Resource Management Plan for National Forests in Florida*, February 1999
- *Revised Land and Resource Management Plan*, Daniel Boone National Forest, Kentucky, April 2004
- *Land and Resource Management Plan for Land Between the Lakes National Recreation Area*, Kentucky and Tennessee, December 2004
- *Revised Land and Resource Management Plan for the Kisatchie National Forest*, Louisiana, January 2000

- *Revised Land and Resource Management Plan for the Cherokee National Forest*, Tennessee, January 2004
- *Revised Land and Resource Management Plan for the George Washington National Forest*, Virginia, 1993
- *Revised Land and Resource Management Plan for the Jefferson National Forest*, Virginia, January 2004
- *Land and Resource Management Plan for the Chattahoochee-Oconee National Forest*, Georgia, 2004
- *Land and Resource Management Plan for the Croatan National Forest*, North Carolina, 2003
- *Land and Resource Management Plan* for *the Nantahala-Pisgah National Forest*, North Carolina, 1994
- *Land and Resource Management Plan for the Francis Marion National Forest*, South Carolina, 1996
- *Land and Resource Management Plan for the Sumter National Forest*, South Carolina, 2004.

1.8 COOPERATING AGENCIES

The states of Arkansas, Florida, Georgia, Kentucky, Louisiana, North Carolina, South Carolina, Tennessee, and Virginia were requested to be involved in the planning process as cooperating agencies. Several federal agencies, including surface managing agencies, were also invited to be cooperating agencies. Of all those invited only the USFS agreed to be a cooperating agency.

1.9 TOPICS NOT ADDRESSED IN THIS RESOURCE MANAGEMENT PLAN

Laws, regulations, policies, and EOs require specific resource topics to be examined during the NEPA process. In some instances, initial evaluation reveals topics that are not relevant to the *planning area* or do not require further analysis. These topics that are not addressed in this RMP are listed below.

Wilderness, Wilderness Study Areas, and Land with Wilderness Characteristics. There are no designated or proposed wilderness areas, wilderness study areas, or lands with wilderness characteristics on lands administered by BLM in the *planning area*.

Minerals Underlying USFS Lands. BLM has the responsibility for lease issuance and post-lease administration of mineral estate where the surface is managed by the USFS. However, the RMP will not make decisions on oil and gas leasing of national forest acreage because the Federal Onshore Oil and Gas Reform Act of 1987 requires the USFS to conduct a leasing analysis to make land use planning decisions on oil and gas leasing. This legal requirement does not apply to other federal surface management agencies.

Locatable Minerals and Mineral Materials. There is no historic activity and no expected development of locatable minerals or of mineral materials. As a result, there is no RFD for locatable minerals and mineral material resources; therefore, such resources are not discussed. Types of locatable minerals include gold, silver, and copper. Examples of mineral materials include stone, sand, and gravel.

1.10 READER'S GUIDE TO THIS DOCUMENT

This Draft RMP/EIS is organized according to BLM's land use planning guidance (H-1610-1 and 43 CFR 1601, *et seq*.), the *BLM NEPA Handbook* (H-1790-1), Council on Environmental Quality (CEQ)

guidelines, and federal regulations implementing NEPA (40 CFR, Parts 1500–1508). This Draft RMP/EIS has been developed to address issues, concerns, and conflicts within the *planning area* and to provide guidance for management of BLM-administered lands in the *decision area*. It contains the following major chapter headings and information:

Chapter 1—Purpose and Need. Contains background and introductory material, such as the purpose and need for the Draft RMP/EIS and the BLM planning process.

Chapter 2—Alternatives. Identifies four alternatives in detail for BLM-administered surface tracts and FMO. There are three action alternatives (B, C, and D) and the No Action Alternative (A) for management of the *decision area*.

Chapter 3—Affected Environment. Describes the existing environmental conditions that could potentially be affected by implementing the alternatives detailed in Chapter 2.

Chapter 4—Environmental Consequences. Describes the impacts of the alternatives. This section forms the scientific and analytic basis for the comparison of alternatives presented in Chapter 2.

Chapter 5—Consultation and Coordination. Describes the overall EIS scoping process and other agency consultation and public involvement activities.

Chapter 6—List of Preparers. Lists contributors who were primarily responsible for preparing the Draft RMP/EIS.

List of Abbreviations and Acronyms. Provides an alphabetized list of abbreviations and acronyms used in this Draft RMP/EIS.

Glossary. Provides definitions of terms used in this Draft RMP/EIS.

References. Provides information for all references cited, most of which are available to the public at libraries or on the Internet. Many of the documents cited are available for public review at SSFO.

Appendices. Provide additional supporting information as follows—

- Appendix A—Lands of Uncertain Title
- Appendix B—Legal Descriptions and Descriptions of the Surface Tracts and Management by Alternative
- Appendix C—Stipulations for Fluid Mineral Leasing
- Appendix D—Procedures and Best Management Practices for Oil and Gas Operations
- Appendix E—Land Tenure Adjustments
- Appendix F—Areas of Critical Environmental Concern Evaluation Report
- Appendix G—Route Designation Process
- Appendix H—Recreation and Public Purposes Act Lands
- Appendix I—Birds of Conservation Concern and Game Birds Below Desired Condition
- Appendix J—GIS Tasks and GIS Data Used
- Appendix K—Withdrawn Lands
- Appendix L—Surface Managing Agency Lands
- Appendix M—Constraints for Solid Mineral Leasing

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CHAPTER 2—ALTERNATIVES

2.1 INTRODUCTION

Chapter 2 describes the alternatives for a Resource Management Plan (RMP) that would guide management of Bureau of Land Management (BLM) administered lands in the *decision area* as described in Chapter 1.

The National Environmental Policy Act of 1969 (NEPA) requires development and consideration of a reasonable range of management alternatives, including a No Action Alternative. Alternatives must be viable and reasonable; meet the stated purpose and need for the plan; provide a mix of resource protections, management use, and development; be responsive to issues identified during scoping; and meet established planning criteria (outlined in Chapter 1), as well as federal laws, regulations, and BLM policies. Each management alternative evaluated in the Draft RMP/Environmental Impact Statement (EIS) represents a reasonable approach to managing resources and activities. BLM has the discretion to select an alternative in its entirety or to combine aspects of the various alternatives presented in this draft to develop the Proposed RMP and Final EIS.

The management alternatives evaluated in this Draft RMP/EIS were developed to meet resource condition objectives and minimize adverse impacts to cultural and natural resources while providing for resource use and development opportunities consistent with current laws, regulations, and policies.

2.1.1 How to Read This Chapter

This chapter is divided into six sections:

- Introduction (Section 2.1) presents an overview of the development and consideration of management alternatives and describes the organization of this chapter.
- Alternative Components (Section 2.2) describes the categories of decisions considered for each alternative.
- Overview of the Alternatives (Section 2.3) provides highlights of the four alternatives for management of BLM-administered federal mineral ownership (FMO) and surface tracts.
- Alternatives Considered But Eliminated from Detailed Analysis (Section 2.4) presents alternatives considered but dismissed from further review because they were considered unreasonable and/or were not found to be necessary to achieve the management goals of the alternatives or not practical for technical, legal, or policy reasons.
- Alternative Tables by Resource (Section 2.5) present the goals and objectives and management alternatives for each resource, resource use, and special designation.
- Comparison of Impacts (Section 2.6) presents a brief comparison of the impacts for each alternative.

2.2 ALTERNATIVE COMPONENTS

The RMP alternatives described in this chapter represent approaches to addressing key planning issues (presented in Chapter 1) and to managing resources and resource uses in the *planning area*. Each alternative comprises two categories of land use planning decisions: (1) desired outcomes for resource management (goals and objectives) and (2) measures to achieve these goals and objectives (allowable uses and management actions). These two categories are discussed below.

Desired outcomes are expressed in terms of specific goals and objectives. Goals and objectives direct BLM's actions to meet legal mandates, numerous regulatory responsibilities, national policy, and other

resource or social needs. Goals are broad statements that usually are not quantifiable. Objectives identify specific desired outcomes for resources. Objectives may be quantifiable and measurable and may have established timeframes for achievement.

After establishing desired outcomes, allowable uses and management actions for different alternatives are identified. This includes any restrictions on allowable uses or prohibition of uses needed to achieve the goals and objectives. The alternatives also propose administrative designations, such as areas of critical environmental concern (ACEC), and identify areas needing site-specific planning.

2.3 OVERVIEW OF THE ALTERNATIVES

Four alternatives are analyzed in detail, including the Preferred Alternative. The management prescriptions of the four alternatives described in Chapter 2 would guide management of surface tracts and FMO. The management alternatives evaluated in this Draft RMP/EIS were developed to meet management goals and objectives and minimize adverse impacts on cultural and natural resources while providing resource use and development opportunities consistent with current laws, regulations, and policies. Each alternative represents a direction to guide future management of BLM-administered public lands and resources. Alternative B was selected as the Preferred Alternative because it would best provide for mineral development while protecting sensitive resources, and would improve management of the surface tracts.

Highlights of each of the alternatives are summarized below. The management prescriptions for each alternative are described in Section 2.5.

2.3.1 Alternative A (No Action)

The No Action Alternative is the continuation of current management. Allowable uses and management actions for this alternative were compiled from several existing BLM land use planning documents and RMPs, including the *Arkansas Planning Analysis of 2002*, the *Louisiana Planning Analysis of 2002*, the *Meadowood Farm Planning Analysis of 2002*, and the *Florida RMP of 1995*.

Vegetation, wildlife, and special status species management would continue to focus on Jupiter Inlet Lighthouse Outstanding Natural Area (ONA), Lathrop Bayou Habitat Management Area (HMA), and Meadowood Special Recreation Management Area (SRMA).

A total of 1,025,286 acres of FMO would be available for fluid mineral leasing. Stipulations to protect sensitive resources would be developed as specific lease proposals are evaluated. In Florida, the stipulations from the 1995 RMP would continue to be used. A total of 890 acres would be closed to leasing, including the Jupiter Inlet Lighthouse ONA and the Meadowood SRMA.

Within the area of high potential for phosphate development, which includes FMO in portions of the Florida counties of Desoto, Hardee, Hillsborough, Manatee, and Polk, there would be 5,657 acres of FMO available for lease. Leasing constraints would apply to 3,739 acres, and 1,918 acres would be available for lease under standard terms.

Within the area of high potential for coal development in eastern Kentucky, 79,282 acres of federal mineral ownership would be available for further consideration for coal leasing by underground methods.

Management of the Meadowood (804 acres) and Big Saline Bayou (158 acres) surface tracts as SRMAs would continue. The management for these SRMAs would focus on developing existing recreation opportunities according to specific objectives that would apply to each SRMA.

Travel and access management actions would close the Lathrop Bayou surface tract to off-highway vehicle (OHV) use. Jupiter Inlet Lighthouse ONA and Meadowood SRMA would limit OHV use to designated routes. OHV use on the remaining surface tracts would be limited to existing routes of travel.

Lands and realty management actions would make 77 acres available for disposal through sale or exchange, and 84 acres would be identified for transfer to other agencies. Right-of-way (ROW) avoidance areas would be established for 1,152 acres.

This alternative would continue the ACEC designation for 54 acres of the Jupiter Inlet Lighthouse ONA. The management goals, objectives, and allowable uses and management actions for the ACEC are consistent with those of the legislation that established the Jupiter Inlet Lighthouse ONA on May 8, 2008 (Public Law [P.L.] 110-229, Sec. 202).

Two National trails were congressionally designated near the Meadowood SRMA. The management actions for the Potomac National Heritage Scenic Trail and the Washington-Rochambeau Revolutionary Route National Historic Trail would allow these trails to be managed to protect the resource values for which they were designated.

2.3.2 Alternative B (Preferred Alternative)

Alternative B is BLM's preferred alternative. It provides opportunities to use and develop resources within the *decision area* while providing protection of natural resources.

Vegetation, wildlife, and special status species management would be allowed on all retained surface tracts (2,776 acres), with priority given to special management areas, including Jupiter Inlet Lighthouse ONA, Lathrop Bayou and Egmont Key ACECs, Meadowood and Big Saline Bayou SRMAs, and Ozark Highlands HMA, which would include 890 acres.

Under this alternative, the availability of FMO for fluid mineral leasing would be as follows:

- 301,843 acres open to leasing subject to standard terms and conditions
- 112,276 acres open to leasing subject to moderate constraints or controlled surface use (CSU)
- 610,927 acres open to leasing subject to major constraints or no surface occupancy (NSO)
- 1,130 acres closed to leasing (Jupiter Inlet Lighthouse ONA, Lathrop Bayou and Egmont Key ACECs, and Meadowood SRMA).

Within the area of high potential for phosphate development, which includes FMO in portions of the Florida counties of Desoto, Hardee, Hillsborough, Manatee, and Polk, there would be 5,657 acres of FMO available for lease. Leasing constraints would apply to 3,739 acres, and 1,918 acres would be available for lease under standard terms.

Management of coal leasing would be the same as Alternative A.

The recreation management action would identify the Meadowood (804 acres) and Big Saline Bayou (158 acres) surface tracts as SRMAs. The Jupiter Inlet Lighthouse ONA (86 acres) and Egmont Key (55 acres) surface tracts would be extensive recreation management areas (ERMAs). The management for these areas would focus on developing existing recreation opportunities according to specific objectives for each area.

Travel and access management actions would designate surface tracts as limited to designated roads and trails. The roads on surface tracts would be managed as follows:

- 1,191 feet of roads as open
- 3,016 feet of roads as open to limited use
- 8,236 feet of roads as closed.

Lands and realty management actions would make 88 acres available for disposal through sale or exchange, and 127 acres would be identified for transfer to other agencies. All surface tracts would be ROW avoidance areas.

This alternative would designate an additional 32 acres of the Jupiter Inlet Lighthouse ONA as an ACEC, for a total of 86 acres. In addition, the Lathrop Bayou (185 acres) and Egmont Key (55 acres) surface tracts would be designated as new ACECs.

The management actions for the Potomac National Heritage Scenic Trail and the Washington-Rochambeau Revolutionary Route National Historic Trail would limit use to non-motorized uses and would allow for interpretive information at appropriate locations.

2.3.3 Alternative C

Vegetation, wildlife, and special status species management would be allowed on all retained surface tracts (2,836 acres), with priority given to special management areas, including Jupiter Inlet Lighthouse ONA, Lathrop Bayou and Egmont Key ACECs, Meadowood and Big Saline Bayou SRMAs, and Ozark Highlands HMA, which would include 950 acres.

Management actions for fluid mineral leasing would apply stipulations to new oil and gas leases as follows:

- 238,805 acres open to oil and gas leasing subject to standard terms and conditions
- 94,049 acres open to oil and gas leasing subject to moderate constraints (CSU)
- 692,192 acres open to oil and gas leasing subject to major constraints (NSO)
- 1,130 acres closed to leasing (Jupiter Inlet Lighthouse ONA, Lathrop Bayou and Egmont Key ACECs, and Meadowood SRMA).

Within the area of high potential for phosphate development, which includes FMO in portions of the Florida counties of Desoto, Hardee, Hillsborough, Manatee, and Polk, there would be 5,657 acres of FMO available for lease. Leasing constraints would apply to 4,265 acres, and 1,392 acres would be available for lease under standard terms.

Management of coal leasing would be the same as Alternative A.

The recreation management action would be the same as for Alternative B, except the size of the Big Saline Bayou SRMA would be reduced to 23 acres instead of being 158 acres.

Travel and management actions would be the same as for Alternative B.

Lands and realty management actions would make 28 acres available for disposal through sale or exchange, and 127 acres would be identified for transfer to other agencies. All surface tracts would be ROW avoidance areas.

Management of ACECs would be the same as for Alternative B.

The management actions for the Potomac National Heritage Scenic Trail and the Washington-Rochambeau Revolutionary Route National Historic Trail would be the same as for Alternative B.

2.3.4 Alternative D

Vegetation, wildlife, and special status species management would focus on Jupiter Inlet Lighthouse ONA, Lathrop Bayou HMA, and Meadowood SRMA.

Management actions for fluid mineral leasing would apply stipulations to new oil and gas leases as follows:

- 353,036 acres open to oil and gas leasing subject to standard terms and conditions

- 136,465 acres open to oil and gas leasing subject to moderate constraints (CSU)
- 535,730 acres open to oil and gas leasing subject to major constraints (NSO)
- 945 acres closed to leasing (Jupiter Inlet Lighthouse ONA, Meadowood SRMA, and Egmont Key).

Within the area of high potential for phosphate development, which includes FMO in portions of the Florida counties of Desoto, Hardee, Hillsborough, Manatee, and Polk, there would be 5,657 acres of FMO available for lease. Leasing constraints would apply to 2,355 acres, and 3,302 acres would be available for lease under standard terms.

Management of coal leasing would be the same as Alternative A.

The recreation management action would identify the Meadowood surface tract (804 acres) surface tract as a SRMA. The management for this SRMA would focus on developing existing recreation opportunities, according to specific objectives.

Travel and access management actions would designate surface tracts as limited to designated roads and trails. The roads on surface tracts would be managed as follows:

- 5,221 feet of roads as open
- 3,016 feet of roads as open to limited use
- 4,206 feet of roads as closed.

Lands and realty management actions would make 616 acres available for disposal through sale or exchange, and 542 acres would be identified for transfer to other agencies. All surface tracts would be ROW avoidance areas.

This alternative would designate an additional 32 acres of the Jupiter Inlet Lighthouse ONA as an ACEC, for a total of 86 acres. There would be no other ACEC designations.

The management actions for the Potomac National Heritage Scenic Trail and the Washington-Rochambeau Revolutionary Route National Historic Trail would be the same as for Alternative B.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

Several alternatives and management options were considered as possible methods of resolving resource management issues and conflicts. The alternatives and options listed below were eliminated from detailed analysis because they were considered unreasonable and/or were not found to be necessary to achieve the management goals of the alternatives or not practical for technical, legal, or policy reasons.

2.4.1 Evaluate the Buffalo River Tract Eligibility and Suitability for Inclusion in the Wild and Scenic River System

The Buffalo River tract is adjacent to lands managed by the National Park Service (NPS) as part of the 135-mile long Buffalo National River. The Buffalo National River was established through legislation signed on March 1, 1972 (P.L. 92-237). The legislation protects the Buffalo River and adjacent lands “for the purpose of conserving and interpreting an area containing unique scenic and scientific features and preserving as a free-flowing stream an important segment of the Buffalo National River in Arkansas for the benefit and enjoyment of present and future generations….” As part of the designation, Congress authorizes the protection of 95,730 acres of lands within a corridor adjacent to the river. This segment of the Buffalo River, however, is not part of the National Wild and Scenic River System. Therefore, alternatives to evaluate the suitability of the Buffalo River tract for inclusion in the National Wild and Scenic River System were not considered.

2.4.2 Dispose All Surface Tracts

The alternative to dispose all surface tracts was considered as an approach to manage the scattered surface tracts in the *planning area*. However, tracts such as the Meadowood SRMA in Virginia and the Jupiter Inlet Lighthouse ONA are congressionally mandated to remain in public ownership and must be retained in public ownership. Additional surface tracts contain resource values, such as special status species and cultural sites, and require management emphasis. These tracts should be retained in public ownership. The disposal of all surface tracts alternative was proposed but not analyzed in detail. However, a set of criteria was developed by alternative to determine which surface tracts to dispose of in each alternative.

2.4.3 Retain All Surface Tracts

The alternative to retain all surface tracts was considered as an approach to manage surface tracts in the *planning area*. However, some surface tracts are remote, small, and do not contain high resource values. A set of retention criteria was developed by alternative and applied to the surface tracts to determine which surface tracts to retain.

2.5 ALTERNATIVE TABLES BY RESOURCE

The following tables present the management goals, objectives, and allowable uses and management actions by alternative for each resource, resource use, and special designation for the Draft RMP/EIS. Management goals, objectives, and allowable uses and management actions that span multiple columns apply to multiple alternatives. For example, the allowable uses and management actions for air quality apply to all alternatives. The alternative tables are supplemented by additional information in several appendices. For example, Appendix B contains information on the alternatives for each surface tract, including surface tracts proposed as ACECs, and Appendix C contains a full description of the fluid mineral leasing stipulations considered for each alternative.

Table 2-1. Air Quality

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
Management Goals			
Maintain existing air quality and air quality related values such as visibility by requiring that all BLM actions minimize impacts on air quality and comply with all applicable air quality laws, rules and regulations.			
Objectives			
Maintain the quality of air resources and limit impacts on air quality to meet National Ambient Air Quality Standards (NAAQS) and individual State Air Quality Implementation Plans (SIP) and local standards.			
Manage BLM actions and land use authorizations to prevent significant deterioration of Federal Class 1 areas and from exceeding air quality standards specified by each individual state within the planning area or other applicable federal, state, or local air quality standards, and conform with applicable SIP requirements.			
Allowable Uses and Management Actions			
Conduct actions authorized on BLM-administered lands and FMO in compliance with Clean Air Act requirements, including the applicable NAAQS (Section 109); the SIP (Section 110); control of pollution from federal facilities (Section 118); prevention of significant deterioration (PSD), including visibility impacts on mandatory Federal Class I areas (Section 160 et seq.); and conformity analyses and determinations (Section 176(c)).			
Ensure management activities and authorized uses are designed to comply with federal, state, and local air quality regulations, classifications, standards, and air pollution requirements.			
Implement mitigation measures within BLM's authority (Best Management Practices – for example) to reduce emissions and work cooperatively to encourage industry and other permittees to adopt measures to reduce emissions.			
Enhance the existing cooperative process that shares air quality information with agencies, stakeholders, and the public and engages other interested agencies to participate in the development process through the air quality memorandum of understanding for oil and gas development on federal lands (USFS, BLM, and EPA 2011).			

Table 2-2. Soil Resources

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
Management Goals			
Maintain or improve soil productivity and maintain or minimize accelerated soil erosion.			
Comply with federal, state, and local government policies to protect farmland.			
Objectives			
Minimize the impact of BLM-authorized activities on the unnecessary and irreversible conversion of farmland to nonagricultural uses.			
Minimize soil compaction and soil erosion.			
Allowable Uses and Management Actions			
Identify appropriate mitigation measures to minimize any unnecessary and irreversible conversion of farmland to nonagricultural uses where BLM management activities or authorized uses may result in effects on prime or unique farmlands (as defined in the Farmland Protection Policy Act (7 U.S.C. 4201 et seq.).			
Apply measures for minimizing accelerated soil erosion (Appendix D) on a site-specific basis through evaluation of management actions and implementation of best management practices (BMP).			

Table 2-3. Water Resources

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
Management Goals			
Maintain or improve the chemical, physical, and biological integrity of water resources.			
Objectives			
Comply with the Clean Water Act and state water quality standards.			
Comply with the requirements of state coastal area management programs for proposed actions on tracts within coastal areas.			
Protect aquatic habitats for special status fish, mussels, turtles, snails, plants, and migratory birds.			
Allowable Uses and Management Actions			
Apply BMPs to maintain or improve water quality (Appendix D).			
Manage activities that may affect 303d listed river segments and water bodies to minimize contribution to total maximum daily load (TMDL) requirements.			

Table 2-4. Vegetation

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
Management Goals			
Protect, preserve, or enhance the health of natural vegetation communities on BLM surface tracts with an emphasis on high-priority habitats identified in the state wildlife action plans.			
Objectives			
Reduce cover of invasive plants in native plant communities and prevent establishment of new invasive species on BLM surface tracts through early detection and rapid response actions.			
Restore natural fire regimes in fire dependent plant communities.			
Restore degraded vegetation communities to improve natural processes and meet desired future conditions on the surface tracts.			
See Appendix B for the desired future conditions of each surface tract.			
Allowable Uses and Management Actions			
The following vegetation actions would be allowed on those surface tracts identified for management: Use prescribed fire in coordination with local landowners and partners to meet resource objectives. Mechanical and manual methods may be used where prescribed fire is not feasible. Allow integrated pest management techniques, including use of BLM approved herbicides, manual and mechanical treatments, and biological controls, to meet resource management objectives. Use the protocols and standard operating procedures from the BLM Vegetation Treatments Using Herbicides Final Programmatic EIS Record of Decision (2007), including only herbicides approved for use on BLM lands. Use planting or seeding of native species as necessary to restore degraded plant communities. See Appendix B for tract specific actions.			
Continue vegetation management at Jupiter Inlet Lighthouse ONA, Lathrop Bayou HMA, and Meadowood SRMA (a total of 1,075 acres).	Extend the management of vegetation communities to all the BLM surface tracts identified for retention (2,776 acres), with priority given to special management areas, including the Jupiter Inlet Lighthouse ONA, Lathrop Bayou and Egmont Key ACECs, the Meadowood and Big Saline Bayou SRMAs, and the Ozark Highlands HMA, which would include the retained Arkansas surface tracts (890 acres).	Extend the management of vegetation communities to all the BLM surface tracts identified for retention (2,836 acres), with priority given to special management areas, including the Jupiter Inlet Lighthouse ONA, Lathrop Bayou and Egmont Key ACECs, the Meadowood and Big Saline Bayou SRMAs, and the Ozark Highlands HMA, which would include the retained Arkansas surface tracts (950 acres).	Same as Alternative A.

Table 2-5. Fish and Wildlife

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
Management Goals			
Manage BLM surface tracts to support native fish and wildlife populations.			
Objectives			
Restore and maintain fish and wildlife habitat, particularly for species of high conservation concern.			
Allowable Uses and Management Actions			
The following fish and wildlife actions would be allowed on those surface tracts identified for management: Improve wildlife habitat (e.g., improving riparian zones, remediating erosion, and bank stabilization), and construct or install wildlife features (e.g., nest boxes/platforms, bat towers/boxes). Control non-native species, including wild hogs. Coordinate with the state agencies to support management of game and recreational fish species on BLM surface tracts. See Appendix B for tract specific actions.			
Continue wildlife management program at Jupiter Inlet Lighthouse ONA, Lathrop Bayou HMA, and Meadowood SRMA) through collaboration with local partners (a total of 1,075 acres).	Collaborate and coordinate with local partners on habitat improvements and protection on surface tracts retained by BLM (2,776 acres), with priority given to special management areas, including the Jupiter Inlet Lighthouse ONA, Lathrop Bayou and Egmont Key ACECs, the Meadowood and Big Saline Bayou SRMAs, and the Ozark Highlands HMA, which would include the retained Arkansas surface tracts (890 acres).	Collaborate and coordinate with local partners on habitat improvements and protection on surface tracts retained by BLM (2,836 acres), with priority given to special management areas, including the Jupiter Inlet Lighthouse ONA, Lathrop Bayou and Egmont Key ACECs, the Meadowood and Big Saline Bayou SRMAs, and the Ozark Highlands HMA, which would include the retained Arkansas surface tracts (950 acres).	Same as Alternative A.

Table 2-6. Special Status Species

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
Management Goals			
Protect, preserve, and enhance federally listed, proposed, or candidate species, and their habitats, and promote the recovery of these species where appropriate on public domain surface tracts pursuant to Section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 et seq.).			
Maintain, protect, or enhance habitats of all BLM sensitive species and ensure that BLM-authorized actions do not contribute to the need to list these species under the ESA.			
Objectives			
Support special status species through implementation of recovery and other conservation actions on BLM surface tracts, in coordination with the U.S. Fish and Wildlife Service (USFWS) and other stakeholders.			
Allowable Uses and Management Actions			
The following special status species actions would be allowed on those surface tracts identified for management: Perform population management, augmentation, and reintroduction in support of recovery actions. Implement recovery and other conservation actions to support special status species, including, but not limited to, installation of red-cockaded woodpecker recruitment structures, installation of bat roosting structures, installation of protective fencing or enclosures, and restoration or enhancement of riparian zones. See Appendix B for specific actions on surface tracts with known or potential occurrence of special status species.			
Continue special status species actions at Jupiter Inlet Lighthouse ONA and Lathrop Bayou HMA.	Extend active habitat management activities to all retained lands that either support or have potential to support special status species.		Same as Alternative A.

Table 2-7. Wildland Fire

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
Management Goals			
Manage fire and fuels to protect life, firefighter safety, property, and critical resource values, and manage fire-dependent ecosystems for Fire Regime Condition Class (FRCC) 1.			
Objectives			
Suppress wildland fires within wildland-urban interface (WUI) areas to protect urban populations.			
Restore fire-dependent ecosystems through the use of prescribed fire management to trend to FRCC 1 where appropriate.			
Allowable Uses and Management Actions			
Pursue fire management agreements with state or local government fire protection agencies as appropriate.			
Allow prescribed burning to meet resource management objectives for vegetation and wildlife habitat.			
Use prescribed fire programs to achieve desired wildland fire conditions.			
Comply with the management direction provided in the National and State Fire Plans under the Healthy Forests Initiative.			

Table 2-8. Cultural Resources

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
Management Goals			
Identify, protect, and preserve in place representative samples of significant cultural resources and ensure that they are available for appropriate uses by present and future generations.			
Reduce eminent threats and resolve potential conflicts from natural or human-caused deterioration or potential conflict with other resource uses by ensuring that all authorizations for land use and resource use comply with the National Historic Preservation Act of 1966 (NHPA) Section 106.			
Allow traditional cultural resource uses and protect traditional use sites where appropriate.			
Objectives			
Conduct surveys on surface tracts to identify significant cultural resources.			
Avoid inadvertent damage to federal and non-federal cultural resources.			
Allowable Uses and Management Actions			
Identify and protect cultural resources on a case-by-case basis, according to site-specific needs. Any significant sites discovered would be available for scientific, conservation, traditional, or public uses. A site that is not significant (as determined by BLM with State Historic Preservation Office [SHPO] consultation) would be released from management concerns.			
Nominate eligible sites for the National Register of Historic Places (NRHP) on a case-by-case basis.			
Protect cultural resources on the Jupiter Inlet Lighthouse ONA and Meadowood SRMA primarily through site avoidance or conservation. Allow public, traditional, and scientific uses that would enhance the cultural resource values. Protect areas allocated to conservation through capping, restoration, or other measures to avoid natural or human-caused impacts. Develop and implement interpretive plans for the Jupiter Inlet Lighthouse ONA and Meadowood SRMA, and restore or re-create historic structures, as appropriate, to enhance visitor experience.			
Protect cultural resources on the Egmont Key tract through site avoidance or conservation.	Protect cultural resources on the Egmont Key tract through site avoidance or conservation. Allow public, traditional, and scientific cultural uses that would enhance the natural or cultural resource values. Protect areas allocated to conservation through capping, restoration, or other measures to avoid natural or human-caused impacts. Develop and implement an interpretive plan, and restore or re-create historic structures, as appropriate, to enhance visitor experience.		Transfer Egmont Key tract to the USFWS to be managed in accordance with the Comprehensive Conservation Plan for Egmont Key National Wildlife Refuge (NWR) (Draft, April 2009).

Table 2-9. Paleontological Resources

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
Management Goals			
Protect the scientifically significant paleontological resources.			
Objectives			
Periodically and systematically inventory BLM-administered surface tracts for paleontological resources.			
Allowable Uses and Management Actions			
Manage known paleontological resources on BLM-administered surface tracts according to BLM 8270 *Handbook* and BLM *Manual for the Management of Paleontological Resources*.			
If discovered, manage paleontological resources to protect their important scientific values. Area closures, restrictions, or other mitigation requirements for the protection of paleontological values would be determined on a case-by-case basis. Allow by permit the collection of known scientifically significant vertebrate and invertebrate fossils by qualified paleontologists.			

Table 2-10. Visual Resources

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
Management Goals			
Manage public lands in a manner that will protect the quality of the scenic (visual) values of public lands.			
Objectives			
Identify visual resource management (VRM) classes for all surface acres.			
Allowable Uses and Management Actions			
Manage the following acreages of surface tracts for the objectives defined for each VRM Class (Appendix B): • Class I: 0 acres • Class II: 185.03 acres • Class III: 889.83 acres • Class IV: 0 acres • None: 1,916.25 acres	Manage the following acreages of surface tracts for the objectives defined for each VRM Class: • Class I: 0 acres • Class II: 92 acres • Class III: 866.83 acres • Class IV: 2,032.28 acres See Appendix B for VRM Class of each surface tract.		

Table 2-11. Energy and Minerals

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
Management Goals			
Provide for leasing, exploration, and development of FMO while protecting other resource values.			
Objectives			
Provide for environmentally sound exploration and development of mineral resources consistent with current laws, regulations, and policies.			
Allowable Uses and Management Actions			
Apply BMPs and conservation measures to mineral development and exploration activities where applicable (Appendix D).			
Oil and Gas Leasing			
Allow leasing, exploration, and development of FMO under the jurisdiction of another federal surface management agency subject to surface management agency constraints, conditions, and stipulations developed through their land-use planning and NEPA compliance processes. BLM would apply stipulations to oil and gas leases as determined through this plan (Appendix C); however, surface management agencies may require additional stipulations during the lease-approval process. These stipulations could be in addition to the stipulations identified by BLM. Maintain lease issuance and post-lease administration responsibilities on USFS lands, consistent USFS land use plans.			
A total of 1,025,286 acres of federal mineral ownership would be available for fluid mineral leasing. Stipulations to protect sensitive resources would be developed as specific lease proposals are evaluated. In Florida, the stipulations from the 1995 RMP would continue to be used. A total of 890 acres would be closed to leasing, including the Jupiter Inlet Lighthouse ONA in and the Meadowood SRMA.	Apply fluid mineral leasing stipulations to new oil and gas leases as follows: • Open to leasing subject to standard terms and conditions: 301,843 acres • Open to leasing subject to moderate constraints (CSU): 112,276 acres • Open to leasing subject to major constraints (NSO): 610,927 acres • Closed to leasing: 1,130 acres The stipulations, exceptions, waivers, and modifications are in Appendix C.	Apply fluid mineral leasing stipulations to new oil and gas leases as follows: • Open to leasing subject to standard terms and conditions: 238,805 acres • Open to leasing subject to moderate constraints (CSU): 94,049 acres • Open to leasing subject to major constraints (NSO): 692,192 acres • Closed to leasing: 1,130 acres The stipulations, exceptions, waivers, and modifications are in Appendix C.	Apply fluid mineral leasing stipulations to new oil and gas leases as follows: • Open to leasing subject to standard terms and conditions: 353,036 acres • Open to leasing subject to moderate constraints CSU): 136,465 acres • Open to leasing subject to major constraints (NSO): 535,730 acres • Closed to leasing: 945 acres The stipulations, exceptions, waivers, and modifications are in Appendix C.
Close the following surface tracts to mining, mineral leasing, and mineral material sales: • Jupiter Inlet Lighthouse ONA (legislative closure)	Close the following surface tracts to mining, mineral leasing, and mineral material sales: • Jupiter Inlet Lighthouse ONA (legislative closure) • Lathrop Bayou ACEC • Egmont Key ACEC		Close the following surface tracts to mining, mineral leasing, and mineral material sales: • Jupiter Inlet Lighthouse ONA (legislative closure)

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
• Meadowood (SRMA)	• Meadowood SRMA		• Meadowood SRMA • Egmont, Key, Florida (closed upon becoming part of Egmont Key NWR)
Phosphate			
Within the area of high potential for phosphate development (Map 3-15), which includes FMO in portions of the Florida counties of Desoto, Hardee, Hillsborough, Manatee, and Polk, there would be 5,657 acres of FMO available for lease. Leasing constraints would apply to 3,739 acres, and 1,918 acres would be available for lease under standard terms. Leasing constraints are in Appendix M.		Within the area of high potential for phosphate development (Map 3-15), which includes FMO in portions of the Florida counties of Desoto, Hardee, Hillsborough, Manatee, and Polk, there would be 5,657 acres of FMO available for lease. Leasing constraints would apply to 4,265 acres, and 1,392 acres would be available for lease under standard terms. Leasing constraints are in Appendix M.	Within the area of high potential for phosphate development (Map 3-15), which includes FMO in portions of the Florida counties of Desoto, Hardee, Hillsborough, Manatee, and Polk, there would be 5,657 acres of FMO available for lease. Leasing constraints would apply to 2,355 acres, and 3,302 acres would be available for lease under standard terms. Leasing constraints are in Appendix M.
Coal			
The reasonably foreseeable development (RFD) for coal leasing is limited to eastern Kentucky (Map 3-17). Within the RFD area in eastern Kentucky, 79,282 acres of FMO would be available for further coal leasing consideration and limited to underground mining methods.			

Table 2-12. Recreation Management

<table>
<tr><th>Alternative A
(No Action)</th><th>Alternative B</th><th>Alternative C</th><th>Alternative D</th></tr>
<tr><td colspan="4">Management Goals</td></tr>
<tr><td colspan="4">Provide recreational activities in a variety of physical, social, and administrative settings, from semi-primitive to urban, that allow visitors to have desired recreational experiences and enjoy the resulting benefits.</td></tr>
<tr><td colspan="4">Objectives</td></tr>
<tr><td colspan="4">Ensure that visitors are not exposed to unhealthy or unsafe human-created conditions, and achieve a minimum level of conflict between recreation participants to: 1) allow other resources/programs to achieve their RMP objectives; 2) curb illegal trespass and property damage; and 3) maintain a diversity of recreation activity participation. For SRMA and ERMA objectives, refer to Appendix N.</td></tr>
<tr><td colspan="4">Allowable Uses and Management Actions</td></tr>
<tr><td colspan="4">All surface tracts other than SRMAs and ERMAs would be managed to meet basic recreation and visitor services and resource stewardship needs. Recreation would not be emphasized, however recreation activities may occur.</td></tr>
<tr><td>Use Recreation Opportunity Spectrum (ROS) classification objectives to evaluate recreational activities on the surface tracts.</td><td colspan="3">ROS classification on the surface tracts would be as follows:
• Urban: 919.50 acres
• Rural: 212.96 acres
• Roaded natural: 393.84 acres
• Semi-primitive motorized: 620 acres
• Semi-primitive non-motorized: 781.22 acres
• Primitive: 63.59 acres
Require special recreation permits (SRP) for all commercial tours. Include terms in each SRP to address sanitation, trash disposal, and use areas. See Appendix B for ROS classification of each surface tract.</td></tr>
<tr><td>Identify the following tracts as SRMAs:
• Meadowood
• Big Saline Bayou
Management for each SRMA is identified in Appendix N.</td><td colspan="2">Identify the following tracts as SRMAs:
• Meadowood
• Big Saline Bayou
Management for each SRMA is identified in Appendix N.</td><td>Identify the following tract as a SRMA:
• Meadowood
Management of each SRMA is identified in Appendix N.</td></tr>
<tr><td>Identify the following tract as an ERMA:
• Jupiter Inlet Lighthouse ONA
Management for each ERMA is identified in Appendix N.</td><td colspan="2">Identify the following tracts as ERMAs:
• Egmont Key
• Jupiter Inlet Lighthouse ONA
Management for each ERMA is identified in Appendix N.</td><td>Identify the following tract as an ERMA:
• Jupiter Inlet Lighthouse ONA
Management for each ERMA is identified in Appendix N.</td></tr>
</table>

Table 2-13. Travel and Access Management

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
Management Goals			
Allow visitor travel and access to provide for recreational appreciation of natural and cultural resources.			
Objectives			
Provide for health and safety of visitors.			
Coordinate with other resource management programs to minimize adverse environmental impacts, including impacts on travel and access opportunities.			
Allowable Uses and Management Actions			
The Lathrop Bayou HMA would be closed to OHV use. OHV use at Jupiter Inlet Lighthouse ONA and Meadowood SRMA would be limited to designated routes. On the other surface tracts use would be limited to existing routes of travel.	Designate the surface tracts as limited to designated roads and trails.		
No similar action.	On the surface tracts, manage roads as follows: • 1,191 feet of roads as open • 3,016 feet of roads as open to limited use • 8,236 feet of roads as closed. (See Appendix G for specific routes and limitations by tract.) Consideration of route and trail modifications (new or existing) would be conducted on a case-by-case basis in accordance with resource/use objectives and after appropriate NEPA review and analysis.		On the surface tracts, manage roads as follows: • 5,221 feet of roads as open • 3,016 feet of roads as open to limited use • 4,206 feet of roads as closed. (See Appendix G for specific routes and limitations by tract.)

Table 2-14. Lands and Realty

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
Management Goals			
Manage the land ownership pattern to improve BLM's ability to manage the land base and resource values and maintain or improve management efficiencies.			
Objectives			
Identify lands available for transfer, conveyance, or disposal to improve management efficiency.			
Allowable Uses and Management Actions			
Lands may be exchanged as authorized by Section 206 of the Federal Land Policy and Management act of 1976 (FLPMA) when the exchange would serve the national interest and benefit BLM programs or the programs of other federal agencies. Lands may be conveyed to state and local government agencies and other qualified organizations under the Recreation and Public Purposes (R&PP) Act of 1926, as amended. Under R&PP, lands may be conveyed or leased only for an established or proposed project for which there are development and management plans, as well as adequate funding by the R&PP applicant to complete the development and a reasonable timetable of development.			
Management of land ownership pattern would be conducted through jurisdictional transfer, conveyance, or disposal. Jurisdictional transfer could include withdrawal to other federal agencies. Specific surface tracts identified for disposal would be evaluated for the presence of significant resource values before the final decision. Resources to be evaluated would include minerals, recreation, cultural, wetlands, threatened and endangered species, and other special status species. Section 7 consultation with USFWS and conference with the appropriate state agency would occur if the disposal action would affect a listed species. Consultation with SHPO in accordance with Section 106 of the NHPA would occur for each proposed action. Review of existing withdrawals will determine whether they are fulfilling their intended purpose or are not needed.			
Federal mineral estate would be available for conveyance to owners of the surface estate as provided in Section 209 of FLPMA. Section 209 provides for this conveyance if there are no known mineral values in the land or if reservation of the mineral rights to the United States is interfering with or precluding appropriate surface development of the land and such development is a more beneficial use of the land. BLM would retain the FMO with known mineral value.			
Some tracts may have uncertain titles. These are cases in which the tracts are claimed by private owners but government land records show that they were not transferred from federal ownership. Tracts with uncertain titles would be handled on a case-by-case basis in accordance with the Color-of-Title Act, under which claimants may apply for these tracts and, if qualified, purchase the tracts to obtain title. Appendix A provides a list of lands of uncertain title occurring within the *planning area*.			
Allow acquisition of lands to meet the goals and objectives of national programs. Acquired lands would be managed consistent with the goals and objectives of the nearest federal land use designations. For example, lands acquired adjacent to existing ACECs for the protection of relevant and importance values would be managed as part of the ACEC.			
Public lands to be considered for FLPMA Section 203 sales must meet the following disposal criteria: (1) Such tract because of its location or other characteristics is difficult and uneconomic to manage as part of the public lands and is not suitable for management by another federal department or agency; or (2) Such tract was acquired for a specific purpose, and the tract is no longer required for that or any other federal purpose; or (3) Disposal of such tract will serve important public objectives, including, but not limited to, expansion of communities and economic development that cannot be achieved prudently or feasibly on land other than public land and that outweighs other public objectives and values, including, but not limited to, recreation and scenic values that would be served by maintaining such tract in federal ownership.			

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
Based on current management plans, 55 acres would be available for disposal, 22.27 acres would be available for exchange, and 83.57 acres would be available for transfer to a specific federal or state agency. Land tenure adjustment alternatives for each surface tract are detailed in Appendix E, tables E-2 through E-6.	Based on the lands and realty criteria, 65.69 acres would be available for disposal, 22.27 acres would be available for exchange, and 127.4 acres would be available only for transfer to a specific federal or state agency. Disposal and retention criteria, as well as land tenure adjustment alternatives for each surface tract are detailed in Appendix E, and tables E-2 through E-6.	Based on the lands and realty criteria, 5.48 acres would be available for disposal, 22.27 acres would be available for exchange, and 127.4 acres would be available only for transfer to a specific federal or state agency. Disposal and retention criteria, as well as land tenure adjustment alternatives for each surface tract are detailed in Appendix E, and tables E-2 through E-6.	Based on the lands and realty criteria, 593.6 acres would be available for disposal, 22.27 acres would be available for exchange, and 542.67 acres would be available only for transfer to a specific federal or state agency. Disposal and retention criteria, as well as land tenure adjustment alternatives for each surface tract are detailed in Appendix E, and tables E-2 through E-6.
Surface tracts would be open to ROW application except Drasco, Middle Fork, West Fork, Lathrop Bayou, Jupiter Inlet Lighthouse ONA, Lake Marion, and Meadowood SRMA tracts, which would be ROW avoidance areas (1,152.13 acres). ROW and other land use proposals would be processed on a case-by-case basis.	All surface tracts would be ROW avoidance areas (2,991.11 acres). Because of the small size of these tracts, ROWs could affect a relatively large area compared with the size of each tract. ROWs could be a relatively major conflict with other resource management objectives or adversely affect the value and marketability of tracts identified for disposal. ROWs could be considered on a case-by-case basis if it were determined that the ROW would have negligible impact on other resource management objectives or value and marketability. For disposal tracts, it may be appropriate to accommodate the proposed use by sale of the tract to the applicant.		

Table 2-15. Areas of Critical Environmental Concern

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
Management Goals			
Identify and manage areas as ACECs where special management attention is required to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources or other natural systems or processes, or to protect life and safety from natural hazards.			
Objectives			
Protect the relevant and important values associated with each potential ACEC. (See Appendix B for goals and objectives of each surface tract proposed as an ACEC and Appendix F for a list of important and relevant values.)			
Allowable Uses and Management Actions			
There would be one continued ACEC designation comprising 54.33 acres: • Jupiter Inlet Lighthouse ONA (54.33 acres) See Appendix B for the allowable uses and management actions for each surface tract proposed as an ACEC.	There would be three ACECs designated totaling 325.86 acres: • Jupiter Inlet Lighthouse ONA, including designation of an additional 31.5 acres (85.83 acres total) • Lathrop Bayou (185.03 acres) • Egmont Key (55.0 acres) See Appendix B for the allowable uses and management actions for each surface tract proposed as an ACEC.		There would be 1 ACEC designated comprising 85.83 acres: • Jupiter Inlet Lighthouse ONA, including designation of an additional 31.5 acres (85.83 acres total) See Appendix B for the allowable uses and management actions for each surface tract proposed as an ACEC.

Table 2-16. National Trails

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
Management Goals			
Establish National Trail management corridors in the Meadowood SRMA that complement the connectivity, recreation experience, and historic themes as part of the congressionally designated trails: Potomac Heritage National Scenic Trail and Washington Rochambeau Revolutionary Route National Historic Trail, in the Mason Neck area of southern Fairfax County, Virginia. These National Trails are recognized as units under the National Landscape Conservation System.			
Objectives			
Manage and promote these congressionally designated trails in conjunction with the NPS National trail administrators, land managers from adjacent agencies, and trail partners; understand, maintain, and protect the scenic, historic, natural, and cultural qualities and trail-related resources found at Meadowood SRMA; and develop interpretive information to enhance public appreciation for the scenic values and history of the area. Activities that substantially interfere with the nature and purposes of the trails shall not be permitted (16 U.S.C. 1246).			
Allowable Uses and Management Actions			
Potomac Heritage National Scenic Trail			
Segments of the congressionally designated Potomac National Heritage Scenic Trail would be managed to protect the resource values for which it was designated (16 U.S.C. 1244).	Coordinate with federal, state, and local authorities to determine the location of appropriate segments and trail alignment and maintain the continuous nature of the National Scenic Trail.		
	Limit trail use to non-motorized uses such as hiking, bicycling, and horseback riding and while providing for maximum compatible outdoor recreation potential.		
	Maintain the special environments and landforms that support trail visitor experiences such as providing interpretive information such as kiosks or signage at appropriate locations.		
	Establish a National Trail Management Corridor – The current proposed corridor for the Potomac Heritage NST consists of the following trail(s) segments – Beginning at 10110 Gunston Road and Meadowood SRMA – South Branch Loop to Giles Run to Turkey Meadow to Giles Run to South Branch Loop to Meadowood Connector to Wood Thrush to White-tail Ridge to Thompson Creek Loop and Pohick Bay Park Connector and ending at Gunston Road. This corridor is planned to remain on existing trails. This trail will tie into other planned Potomac Heritage NST segments on the Mason Neck Peninsula and surrounding area.		
	Refer to BLM Manual 6280-Management of National Scenic and Historic Trails and Trails Under Study or Recommended as Suitable for Congressional Designation for management of these National Trails.		
Washington-Rochambeau Revolutionary Route National Historic Trail			
The congressionally designated Washington-Rochambeau Revolutionary Route National Historic Trail would be managed to protect the resource values for which it was designated (16 U.S.C. 1244 and 16	Coordinate with federal, state, and local authorities to determine the location of appropriate segments and trail alignment		
	Limit trail use to non-motorized uses such as hiking, bicycling, and horseback riding.		
	Provide interpretive information such as kiosks or signage at appropriate locations.		
	Designate segments, research and locate cultural properties of the period of use, determine NRHP eligibility, and		

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
U.S.C. 470).	develop a site protection plan.		
	Identify and manage the historic route and historic remnants and artifacts for public use, enjoyment and vicarious trail experiences(conserve, protect, and restore landscape elements that are evocative to the period of use to the extent allowed by law).		
	Identify and manage high potential historic sites or high potential route segments, including the recommendation of additional Federal Protection Components		
	Establish a National Trail Management Corridor – The current proposed corridor for the Washington Rochambeau Revolutionary Route NHT consists of the following trail(s) segments – Beginning at 10110 Gunston Road and Meadowood SRMA – South Branch Loop to Giles Run to Turkey Meadow to Giles Run and ending at the documented Washington Rochambeau encampment (site 44FX3446) on Meadowood SRMA that is eligible for listing in the National Register at the national level under Criteria A, B, and D. This corridor is planned to remain on existing trails. This trail is located near the actual Washington Rochambeau Revolutionary Route (VA Route 611 – Old Colchester Road).		
	Refer to BLM Manual 6280-Management of National Scenic and Historic Trails and Trails Under Study or Recommended as Suitable for Congressional Designation for management of these National Trails.		

2.6 COMPARISION OF IMPACTS

Table 2-17 presents a summary of impacts from management actions proposed for the four management alternatives. Chapter 4 provides a more detailed impact analysis.

Table 2-17. Comparison of Impacts

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
Air Quality			
Prescribed burning, construction activities, and activities associated with mineral development would produce air emissions. Estimated emissions from mineral development activities on BLM-administered land would produce slightly less emissions than the calculated baseline emissions. Emissions from activities on BLM-administered land would not considerably contribute to air quality emissions within the region.	There would be a slight increase in emissions caused by the projected prescribed burning in Arkansas, Louisiana, and Virginia, and additional prescribed burning in Florida. Total emissions would not be a significant increase compared with Alternative A.	Impacts would be the same as those identified for Alternative B.	Impacts would be the same as those identified for Alternative A.
Soil Resources			
Soil resources would be affected by management actions that affect vegetation cover and soil stability. The implementation of management actions on the Lathrop Bayou, Jupiter Inlet Lighthouse ONA, and Meadowood SRMA surface tracts to improve habitat conditions (e.g., vegetation treatments) would enhance the health of vegetation communities and could increase vegetation cover over the long term. Such enhancements would decrease soil exposure and increase soil productivity. Surface disturbing activities associated with mineral development activities could expose soils to wind	Impacts on soil resources would be similar to those identified for Alternative A, except a lease stipulation would not allow oil gas operations within 250 feet of surface water, and vegetation treatments and other habitat improvement actions could be implemented on all retained surface tracts. This would increase the extent to which soil resources would be enhanced over the long term.	Impacts on soil resources would be similar to those identified for Alternative B, except a lease stipulation would not allow oil gas operations within 500 feet of surface water, and vegetation treatments would be implemented on an increased number of acres. This would increase the extent to which soil resources would be enhanced over the long term.	Impacts on soil resources would be similar to those identified for Alternative A, except a lease stipulation would not allow oil gas operations within 100 feet of surface water, and 4,206 feet of roads would be closed to OHV use, further limiting the potential impacts on soil resources.

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
and water erosion. The development of well pads and infrastructure would create an initial disturbance of 4,964 acres, which would affect soils over the short term. The residual disturbance of 1,624 acres from oil and gas development throughout the decision area and disturbance from phosphate mining on 802 acres in Florida could affect soils over the long term. Dispersed recreation use would also affect soils by removing and trampling vegetation. This could increase overland flow and the potential for soil erosion. Providing recreation opportunities and facilities in the Meadowood SRMA and Big Saline Bayou SRMA could increase the degree of impacts on soil resources.			
Water Resources			
Water resources would be affected by management actions that affect vegetation cover, surface runoff, and soil erosion. The implementation of management actions on the Lathrop Bayou, Jupiter Inlet Lighthouse ONA, and Meadowood SRMA surface tracts to improve habitat conditions (e.g., vegetation treatments) would enhance the health of vegetation communities and could increase vegetation cover over the long term. Such enhancements would increase the overall health and function of the watershed. Surface disturbing activities associated with mineral development	Impacts on water resources would be similar to those identified for Alternative A, except lease stipulations would not allow oil gas operations within 250 feet of surface water, or within 1,000 feet of karst features. In addition, vegetation treatments and other habitat improvement actions could be implemented on all retained surface tracts, thereby improving watershed function.	Impacts on water resources would be similar to those identified for Alternative B, except lease stipulations would not allow oil gas operations within 500 feet of surface water, or within 1,500 feet of karst features. In addition, vegetation treatments would be implemented on an increased number of surface tract acres, thereby improving watershed function.	Impacts on water resources would be similar to those identified for Alternative A, except lease stipulations would not allow oil gas operations within 100 feet of surface water, or within 1,000 feet of karst features. In addition, 4,206 feet of roads would be closed to OHV use, further limiting the potential impacts on water resources.

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
activities could expose soils to wind and water erosion. The development of well pads and infrastructure would create an initial disturbance of 4,964 acres, which would affect water resources over the short term. The residual disturbance of 1,624 acres from oil and gas development throughout the decision area and disturbance from phosphate mining on 802 acres in Florida could affect water resources over the long term. The disposal of produced water from oil and gas activities would also increase the potential for impacts on surface water and groundwater resources. Produced and flowback water would be managed in accordance with Onshore Order No. 7, and BMPs. The preferred method of disposal would be underground injection into a suitable geologic formation isolated from freshwater aquifers. Injection would require a permit under the Underground Injection Control (UIC) Program. Any surface disposal from oil and gas or operations or coal mining would require a permit under the National Pollutant Discharge Elimination System (NPDES) Program. Accidental leakage of drill fluids, hazardous waste spills, or leakage from reserve pits could occur. Impacts from accidental leaks would be reduced through implementation of federal, state, and local regulations that require site characterization and corrective action. Dispersed recreation use would affect water resources by reducing vegetation cover and compacting			

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
soils, thereby increasing surface runoff and sediment and nutrient transport to surface water resources. The implementation of management actions on the Lathrop Bayou, Jupiter Inlet Lighthouse ONA, and Meadowood SRMA surface tracts to improve habitat conditions (e.g., vegetation treatments) would increase vegetation cover over the long term and thereby reduce surface runoff and related impacts on surface water resources.			
Vegetation			
Vegetation resources would be affected by management actions that result in surface disturbance and vegetation disturbance or removal. Surface disturbing activities associated with oil, gas, and phosphate development could result in vegetation damage or loss. Disturbed areas would be prone to noxious weeds and reestablishment of less desirable species or habitat types. The development of well pads and infrastructure would create an initial disturbance of 4,964 acres, which would affect vegetation resources over the short term. The residual disturbance of 1,624 acres from oil and gas development throughout the decision area and disturbance from phosphate mining on 802 acres in Florida would affect vegetation resources over the long term. The implementation of management actions on the Lathrop Bayou, Jupiter Inlet Lighthouse ONA, and	Oil and gas development and phosphate mining would occur on the same number of acres as Alternative A; however, stipulations on oil and gas leases would provide protection for some specific sensitive vegetation types, including wetlands and riparian areas (250-foot buffers around water), and shift activity to lower value habitat. Vegetation treatments and other habitat improvement actions could be implemented on all retained surface tracts (2,776 acres), thereby increasing the quality of vegetation resources over the long term. Developing a vegetation and habitat management plan for the Ozark Highland HMA (890 acres) could allow further protection and enhancement of priority vegetation types in the area.	Impacts from oil and gas development and phosphate mining would be similar to Alternative B; however, stipulations on oil and gas leases would provide additional protection for some sensitive vegetation types, including an increase in protection for wetlands and riparian areas to a 500-foot buffer around water. Vegetation treatments and other habitat improvement actions could be implemented on an increased number of acres (2,836 acres). This would increase the extent to which vegetation resources would be enhanced. Developing a vegetation and habitat management plan for the Ozark Highland HMA (950 acres) could allow further protection and enhancement of priority vegetation types in the area.	Impacts from oil and gas development and phosphate mining would be similar Alternative B; however, stipulations on oil and gas leases would provide less protection for sensitive vegetation types, including a reduction of protection for wetlands and riparian areas to 100-foot buffers around water. The impacts from implementation of management actions on surface tracts would be the same as Alternative A.

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
Meadowood SRMA surface tracts (1,075 acres) to improve habitat conditions (e.g., vegetation treatments) would increase vegetation cover and quality over the long term and help reduce the spread of undesirable species or noxious weeds. Lack of active management for other retained surface tracts could promote the spread of noxious weeds and degradation of habitat in vulnerable areas. Lack of vegetation treatments, as well as trespass, could diminish habitat values.			
Fish and Wildlife			
Fish and wildlife habitat would be affected by management actions that result in habitat disturbance, surface disturbance, and vegetation removal. Surface disturbing activities associated with oil, gas, and phosphate development could result in habitat damage or loss. Disturbed areas would be prone to noxious weeds and reestablishment of less desirable plant species. Disturbance could result in wildlife species moving to other less desirable, lower quality habitat. Surface disturbing activity in riparian habitat could result in soil erosion, leading to sedimentation and nutrient loading of aquatic habitat, thereby affecting aquatic and riparian species. The development of well pads and infrastructure would create an initial disturbance of 4,964 acres. The residual disturbance of 1,624 acres from oil and gas development	Oil and gas development and phosphate mining would occur on the same number of acres as Alternative A; however, stipulations on oil and gas leases would provide protection for wildlife habitats, including wetlands and riparian areas (250-foot buffers around water), and shift activity to lower value habitat. Vegetation treatments and other habitat improvement actions could be implemented on all retained surface tracts (2,776 acres), thereby increasing the quality of fish and wildlife habitat over the long term. Developing a habitat management plan for the Ozark Highland HMA (890 acres) could allow further protection and enhancement of priority habitat types in the area to support fish and wildlife species.	Impacts from oil and gas development and phosphate mining would be similar to Alternative B; however, stipulations on oil and gas leases would provide additional protection for wildlife habitats, including an increase in protection for wetlands and riparian areas to a 500-foot buffer around water. Vegetation treatments and other habitat improvement actions could be implemented on all retained surface tracts (2,836 acres), thereby increasing the quality of fish and wildlife habitat over the long term. Developing a habitat management plan for the Ozark Highland HMA (950 acres) could allow further protection and enhancement of priority habitat types in the area to support fish and wildlife species.	Impacts from oil and gas development and phosphate mining would be similar Alternative B; however, stipulations on oil and gas leases would provide less protection for wildlife habitats, including a reduction of protection for wetlands, and riparian areas to 100-foot buffers around water. The impacts from implementation of management actions on surface tracts would be the same as Alternative A.

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
throughout the decision area and disturbance from phosphate mining on 802 acres in Florida would affect fish and wildlife habitat over the long term. The implementation of management actions on the Lathrop Bayou, Jupiter Inlet Lighthouse ONA, and Meadowood SRMA surface tracts (1,075 acres) to improve habitat conditions (e.g., vegetation treatments) would increase fish and wildlife habitat cover and quality over the long term and help reduce the spread of undesirable species or noxious weeds. Lack of active management for other retained surface tracts could promote the spread of noxious weeds and degradation of habitat in vulnerable areas. Lack of vegetation treatments, as well as trespass, could diminish habitat values.			
Special Status Species			
Special status species habitat would be affected by management actions that result in habitat disturbance, surface disturbance, and vegetation removal. Surface disturbing activities associated with oil, gas, and phosphate development could result in habitat damage or loss. Disturbed areas would be prone to noxious weeds and reestablishment of less desirable plant species. Disturbance could result in wildlife species moving to other less desirable, lower quality habitat. Surface disturbing activity in riparian habitat could result in soil	Oil and gas development and phosphate mining would occur on the same number of acres as Alternative A; however, stipulations on oil and gas leases would provide protection for specific special status species and habitats, including NSO stipulations on a total of 610,927 acres across the planning area, and shift activity to lower value habitat. Vegetation treatments and other habitat improvement actions could be implemented on all retained surface tracts (2,776 acres), thereby increasing the quality of fish and	Impacts from oil and gas development and phosphate mining would be similar to Alternative B; however, stipulations on oil and gas leases would provide additional protection for special status species and habitats, with NSO stipulations on a total of 692,192 acres across the planning area. Vegetation treatments and other habitat improvement actions could be implemented on all retained surface tracts (2,836 acres), thereby increasing the quality of fish and wildlife habitat over the long term.	Impacts from oil and gas development and phosphate mining would be similar Alternative B; however, stipulations on oil and gas leases would provide less protection for special status species habitats, with NSO stipulations on a total of 535,730 acres across the planning area. The impacts from implementation of management actions on surface tracts would be the same as Alternative A.

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
erosion, leading to sedimentation and nutrient loading of aquatic habitat, thereby affecting special status aquatic and riparian species. In addition, sensitive vegetation resources could be disturbed or removed during mineral development activities. The development of well pads and infrastructure would create an initial disturbance of 4,964 acres. The residual disturbance of 1,624 acres from oil and gas development and disturbance from phosphate mining on 802 acres in Florida could affect special status species habitat over the long term. The implementation of management actions for special status species on the Lathrop Bayou and Jupiter Inlet Lighthouse ONA (271 acres) to improve habitat conditions (e.g., vegetation treatments) would increase habitat quality over the long term. Lack of active management for other retained surface tracts could promote the spread of noxious weeds and degradation of habitat in vulnerable areas. Lack of vegetation treatments, as well as trespass, could diminish habitat values.	wildlife habitat over the long term. Developing a habitat management plan for the Ozark Highland HMA (890 acres) could allow further protection and enhancement of special status species habitat.	Developing a habitat management plan for the Ozark Highland HMA (950 acres) could allow further protection and enhancement of special status species habitat.	
Wildland Fire			
Wildland fire would be affected by management actions that affect vegetation cover and human presence in the *planning area*. The implementation of management actions on the Lathrop Bayou, Jupiter Inlet Lighthouse ONA, and	Impacts on wildland fire would be similar to those identified for Alternative A, except vegetation treatments could be implemented on all retained surface tracts, thereby increasing the extent of related impacts on wildland fire. In addition,	Impacts on wildland fire would be similar to those identified for Alternative A, except vegetation treatments could occur on an increased number of acres because fewer acres are proposed for disposal. This could further reduce	Impacts on wildland fire would be the same as those identified for Alternative A, except vegetation treatments could be implemented on all retained surface tracts, thereby increasing the extent of related

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
Meadowood SRMA surface tracts to improve habitat conditions (e.g., vegetation treatments) would remove standing and non-standing vegetation and thereby decrease the size and intensity of wildland fires and allow fires to be more easily controlled. Vegetation treatments would also serve to modify the composition and structure of vegetation communities and promote healthy, diverse communities that generally result in low-intensity fires. Mineral and infrastructure development activities and dispersed recreation use would increase the overall use and human presence in the *planning area*, which could introduce additional ignition sources to the *planning area* and thereby increase the probability of wildland fire occurrence and the need for fire suppression to protect life, property, and sensitive resources.	recreation use in the Big Saline Bayou, Egmont Key, and Jupiter Inlet Lighthouse ONA surface tracts could increase because of increased facilities and services on these tracts. This would increase the number of ignition sources in these areas and thereby increase related impacts on wildland fire.	vegetation cover and improve the health of vegetation communities, which would decrease the size and intensity of wildland fires.	impacts on wildland fire.
Cultural Resources			
BLM would continue to protect cultural resources from disturbance, damage, or loss from authorized uses through project avoidance or mitigation, including data recovery if necessary. As inventories are conducted, more cultural sites would be identified. Inventories and adherence to law, regulation, and policy would protect most cultural sites; however, inadvertent damage to undiscovered sites would remain a possibility. Based on the Reasonably Foreseeable Development (RFD), oil and gas development within the FMO could affect 4,964 acres over a 10-year period. Surface disturbance on these acres would typically be subject to Class III cultural resource inventories and evaluation on a project-by-project basis prior to allowing disturbance.			
Implementing vegetation manipulation projects could result in damage to cultural resources, but in the long term, improved vegetation condition would provide protection to cultural sites. Vegetation manipulation would be limited to three surface tracts.	Impacts from vegetation management actions would be the same as Alternative A, except vegetation manipulation would be allowed on all retained surface tracts. This could increase the scope of the impacts from the three surface tracts identified in Alternative A to all the	Impacts from vegetation management actions would be the same as those identified under Alternative B, except that vegetation treatments could be applied to additional acreage. Cultural resources on 1,130 acres closed to oil and gas leasing and	Impacts from vegetation management actions would be the same as those identified under Alternative A. Cultural resources on 945 acres closed to oil and gas leasing and 535,730 acres open to leasing subject to major constraints would be

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
Closing 890 acres to oil and gas leasing and application of stipulations from the Florida RMP would protect cultural resources from oil and gas development, with development shifted to locations more likely to have been previously disturbed. Retaining 2,830 acres of surface tracts in federal ownership would provide protection of cultural resource sites. Tracts available for disposal or exchange (77 acres) would lose NHPA protection after leaving federal ownership; however, those tracts would be surveyed for cultural resources prior to disposal.	retained surface tracts. It could also increase the potential to identify cultural resources in the inventories preceding the vegetation manipulation actions. Cultural resources on 1,130 acres closed to oil and gas leasing and 610,927 acres open to leasing subject to major constraints would be protected from oil and gas development activities, with development shifted to locations more likely to have been previously disturbed. In addition, the cultural resources NSO stipulation would protect NHPA sites, including eligible sites that are not yet listed. Retaining 2,776 acres of surface tracts in federal ownership would provide protection of cultural resource sites. Tracts available for disposal or exchange (88 acres) would lose NHPA protection after leaving federal ownership; however, those tracts would be surveyed for cultural resources prior to disposal.	692,192 acres open to leasing subject to major constraints would be protected from oil and gas development activities, with development shifted to locations more likely to have been previously disturbed. Retaining 2,836 acres of surface tracts in federal ownership would provide protection of cultural resource sites. Tracts available for disposal or exchange (28 acres) would lose NHPA protection after leaving federal ownership; however, those tracts would be surveyed for cultural resources prior to disposal.	protected from oil and gas development activities, with development shifted to locations more likely to have been previously disturbed. Retaining 1,833 acres of surface tracts in federal ownership would provide protection of cultural resource sites. Tracts available for disposal or exchange (616 acres) would lose NHPA protection after leaving federal ownership; however, those tracts would be surveyed for cultural resources prior to disposal.
Paleontological Resources			
BLM would continue to protect paleontological resources from disturbance, damage, or loss from authorized uses through project avoidance or mitigation, including data recovery if necessary. Applying BMPs to protect karst resources would protect resources within the *decision area* that have a higher potential for paleontological resources. Karst resources will contain a higher potential for sinkholes and exposed bedrock that could contain paleontological resources. Protecting these areas through the application of BMPs would also provide protection to associated paleontological resources. Based on the RFD, oil and gas development within the FMO could affect 4,964 acres over a 10-year period. In these areas, paleontological resources could be identified prior to oil and gas development when the inventory is performed.			
Closing 890 acres to oil and gas leasing and application of stipulations from the Florida RMP would protect paleontological resources from oil and gas development activities, with	Paleontological resources on 610,927 FMO acres open to oil and gas leasing subject to major constraints would be protected from oil and gas development activities,	Paleontological resources on 692,192 FMO acres open to oil and gas leasing subject to major constraints would be protected from oil and gas development activities,	Paleontological resources on 535,730 FMO acres open to oil and gas leasing subject to major constraints would be protected from oil and gas development activities,

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
development shifted to locations more likely to have been previously disturbed. Retaining 2,830 acres of surface tracts in federal ownership would provide protection of paleontological resource sites.	with development shifted to locations more likely to have been previously disturbed. Retaining 2,776 acres of surface tracts in federal ownership would provide protection of paleontological resource sites.	with development shifted to locations more likely to have been previously disturbed. Retaining 2,836 acres of surface tracts in federal ownership would provide protection of paleontological resource sites.	with development shifted to locations more likely to have been previously disturbed. Retaining 1,833 acres of surface tracts in federal ownership would provide protection of paleontological resource sites.
Visual Resources			
Vegetation manipulation could cause reduced visibility caused by smoke from prescribed fires and observable lines on the landscape from machinery. However, improving overall health and function of vegetation would improve the visual quality of the vegetation in the long term. Fire could create openings in forests and stimulate regrowth of shrubs, forbs, and grasses, introducing new lines, colors, and textures to the vegetative component of the landscape. Fire suppression would create noticeable lines in the vegetation and some disturbance to the landform. Over the long term, fire would create variety in the vegetation of a landscape that is interesting and appealing to view. VRM Class II areas (185 acres) would help to preserve visual resources by limiting the types and frequency of surface disturbing activities that could change the visual qualities of the landscape. VRM Class III (890 acres) objectives are less protective and would allow more surface disturbing impacts and landscape change.	Impacts on visual resources from implementing actions for wildland fire and oil and gas management would be the same as those identified under Alternative A. The implementation of management actions under the vegetation, fish and wildlife, and special status species resource programs, designed to protect, preserve, and enhance the health of vegetation communities, could also enhance the attractiveness of the visual resources. Impacts on visual resources from VRM actions would be the same as those described in Alternative A except there would be fewer acres of VRM Class II areas (92 acres as opposed to 185 acres in Alternative A) and the addition of 1,992 Class IV acres. Impacts on visual resources from recreation and travel and access management actions would be the same as those identified under Alternative A, except limiting OHV use to designated routes would help to restore visual impacts from existing roads and trails that are not designated routes.	Impacts on visual resources from implementing actions for wildland fire, and oil and gas management would be the same as those identified under Alternative A. Impacts on visual resources from implementing actions for vegetation resources, fish and wildlife, special status species, VRM, recreation management, and travel and access management would be the same as those identified under Alternative B.	Impacts on visual resources from implementing actions for vegetation, fish and wildlife, special status species, wildland fire, and oil and gas management would be the same as those identified under Alternative A. Impacts on visual resources from implementing actions for VRM, recreation, and travel and access management would be the same as those described in Alternative B.

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
Development of oil and gas resources could result in the removal of vegetation, alteration of the landform, and placement of structures on the landscape. Construction of recreation sites and facilities (e.g., equestrian facilities in the Meadowood SRMA, boat access areas in the Big Saline Bayou SRMA, signs, interpretive sites, trailheads, roads, and parking areas) would directly affect visual resources by adding unnatural features. Limiting OHV use to existing roads and trails would confine impacts on the landscape to the existing transportation system and eliminate the creation of new routes that would result in further changes to the landscape and visual quality.			
Energy and Minerals			
Providing for future leasing of phosphate would allow the development of phosphate to continue at historic and current rates, application of varying constraints across alternatives is not expected to affect projected mining activity. Making the FMO in eastern Kentucky available for further leasing consideration would allow the development of coal resources to continue at the current rate while allowing future consideration of leases in the area.			
Applying lease stipulations developed in the Florida RMP to protect sensitive resources, and applying stipulations to new oil and gas leases on a case-by-case basis in other states, could restrict oil and gas development by shifting surface locations of wells. Exceptions, waivers, and modifications to these stipulations could be applied in some instances, however. Closing the Meadowood SRMA in Virginia and the Jupiter Inlet Lighthouse ONA (890 acres) to oil and gas leasing	Applying lease stipulations could restrict oil and gas development by shifting surface locations of wells; however, the projected number of oil and gas wells to be developed over the next 10 years would not likely be affected by the additional stipulations. Impacts would not be anticipated on 301,843 acres open to oil and gas leasing subject to standard terms. Managing 112,276 acres open to oil and gas leasing subject to moderate constraints, and 610,927 acres open to leasing subject to major	The impacts on oil and gas development from applying lease stipulations would be similar to those identified for Alternative B, except 238,805 acres would be open to oil and gas leasing subject to standard terms, 94,049 acres would be open to oil and gas leasing subject to moderate constraints, 692,192 acres would be open subject to major constraints, and 1,130 acres would be closed to oil and gas leasing. The oil and gas leasing stipulations that result in moderate and major	The impacts on oil and gas development from applying lease stipulations would be similar to those identified for Alternative B, except 353,036 acres would be open to oil and gas leasing subject to standard terms, 136,465 acres would be open to oil and gas leasing subject to moderate constraints, 535,730 acres would be open subject to major constraints, and 945 acres would be closed to oil and gas leasing. The oil and gas leasing stipulations that result in moderate and major

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
would preclude oil and gas development and exploration in these areas. However, these two tracts are not in the expected oil and gas development area.	constraints, could affect the location or timing of development activities and could increase development costs, although exceptions, waivers, and modifications to these stipulations could be applied in some instances. Closing 1,130 acres in the Meadowood SRMA, Jupiter Inlet Lighthouse ONA, Lathrop Bayou, and Egmont Key to oil and gas leasing would not likely affect oil and gas leasing and development because these areas are not considered high development potential areas.	constraints could affect the location of development activities depending on the restriction, although exceptions, waivers, and modifications to these stipulations could be applied in some instances. Similar to Alternative B, the projected number of oil and gas wells to be developed over the next 10 years would not likely be affected by the proposed stipulations. Closing Meadowood SRMA, Jupiter Inlet Lighthouse ONA, Lathrop Bayou, and Egmont Key to oil and gas leasing would have the same impacts as those described under Alternative B.	constraints could affect the location of development activities depending on the restriction, although exceptions, waivers, and modifications to these stipulations could be applied in some instances. Similar to Alternative B, the projected number of oil and gas wells to be developed over the next 10 years would not likely be affected by the proposed stipulations. Closing Meadowood SRMA, Jupiter Inlet Lighthouse ONA, and Egmont Key to oil and gas leasing would have the same impacts as those described under Alternative B.
Recreation Management			
Vegetation treatments and habitat improvement actions on the Lathrop Bayou, Jupiter Inlet Lighthouse ONA, and Meadowood SRMA surface tracts could enhance the recreation setting and experience. Such actions also could limit the type and frequency of recreational activities in some areas. Wildland fire management actions could limit recreation in areas where such actions are taking place. Protecting cultural resources on the Jupiter Inlet ONA would increase recreation opportunities and would enhance the recreation experience for those users engaged in traditional and scientific uses. Application of VRM Class II designations (185 acres) in the Lathrop Bayou HMA would enhance the recreation experience. Management of VRM Class III areas	Impacts on recreation management from wildland fire management and from energy and mineral development would be the same as those described in Alternative A. Impacts from vegetation treatments and habitat improvement actions would be similar to Alternative A, except that management actions could be applied to all surface tracts identified for retention (2,776 acres). Protecting cultural resources on the Egmont Key tract and Jupiter Inlet ONA would increase recreation opportunities in these areas. Such actions would enhance the recreation experience for those users engaged in traditional and scientific uses. Impacts from VRM Class II (92 acres) and Class III area designations (867 acres) would be the same as Alternative A. Management of VRM Class IV areas (2,032 acres) would	Impacts on recreation from implementing actions for wildland fire and energy and mineral development would be the same as those described in Alternative A. Impacts on recreation from implementing actions for cultural resources, visual resources, recreation management, and travel and access management would be the same as described in Alternative B. Impacts from vegetation treatments and habitat improvement actions would be similar to Alternative A, except that management action could be applied to all surface tracts identified for retention (2,836 acres). Identifying 28 acres as available for disposal or exchange could reduce the amount of land available for recreation opportunities.	Impacts on recreation from implementing actions for vegetation, fish and wildlife, and special status species, wildland fire, cultural resources, and energy and mineral development would be the same as described in Alternative A. Impacts from visual resources management would be the same as described for Alternative B. Impacts on recreation from management of the Jupiter the Jupiter Inlet Lighthouse ONA and the Meadowood SRMA would be the same as Alternative A. Increased user conflicts would be expected at Big Saline Bayou because it would not be managed as an SRMA. Impacts from travel and access management actions would be the same as those described in Alternative B, except fewer route segments would be designated

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
(890 acres) would not limit the type or amount of recreation use. Oil and gas development could result in surface disturbance that could affect the desirability of these areas for recreation use. Impacts would be minor, however, because the vast majority of oil and gas development would occur on private surface. The exception is the Big Saline Bayou SRMA, where management actions would be designed to make these uses compatible. Management of the Meadowood SRMA would provide for non-motorized, trail-based, and equestrian recreational opportunities. Management of the SRMA would address user and resource conflicts while providing for a quality rural recreation experience. Management of the Big Saline Bayou SRMA would provide boating access for wildlife viewing and fishing. Actions that limit vehicle use to existing routes would restrict motorized access but these areas would remain open for non-motorized recreation opportunities. Identifying 77 acres as available for disposal or exchange could reduce the amount of land available for recreation opportunities.	allow major modifications to the landscape, which would diminish scenic quality to a degree that would detract from recreation experiences. Impacts on recreation from recreation and travel and access management actions would be the same as those described in Alternative A, except Egmont Key would provide a boat-accessed beach experience with a historical component. Limiting OHV use to designated routes throughout the *planning area* would further restrict recreational OHV use compared with Alternative A. Identifying 88 acres as available for disposal or exchange could reduce the amount of land available for recreation opportunities.		closed. Identifying 616 acres as available for disposal or exchange could reduce the amount of land available for recreation opportunities.
Travel and Access Management			
Recreation and travel and access management actions for the Meadowood SRMA would limit OHV use to administrative and permitted events, thereby restricting dispersed, casual motorized access and travel. Management actions for the Big	Impacts on travel and access from recreation and travel and access management actions would increase compared with Alternative A. OHV use would be limited to designated routes on all retained surface tracts, and 8,236 feet of roads would be	Impacts on travel and access from implementing actions for recreation management and travel and access management would be the same as those described in Alternative B.	Impacts on travel and access from implementing actions for recreation management and travel and access management would be the same as those described in Alternative B, except the roads closed to OHV use would be reduced from 8,236 feet to

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
Saline Bayou SRMA would limit OHV use to existing routes, which would preclude unrestricted, cross-country travel but would provide open access and travel on any route that currently exists in the SRMA.	closed to OHV use. This would limit OHV use to only those routes that are designated for use by BLM, which would reduce the miles of routes available for motorized access and travel.		4,206 feet.
Lands and Realty			
Allowing land tenure adjustments that meet the FLPMA Section 203 sales criteria for this alternative would improve management efficiency and reduce land-use conflicts. Four tracts with a total of 77 acres would be available for disposal (or exchange). The presence of protected resources, such as federally listed species or National Register cultural resource sites, could change the disposal category according to disposal criteria (Appendix E). Based on current information, however, this is not anticipated. Transfer of three tracts with 84 acres for management by other agencies would accommodate resource management needs and could improve management efficiency. Surface tracts would be open to ROW applications, allowing ROWs on most tracts. Historically, however, the demand for ROWs has been low, and this trend is expected to continue.	Allowing land tenure adjustments that meet the FLPMA Section 203 sales criteria for this alternative would improve management efficiency and reduce land-use conflicts. Four tracts with a total of 88 acres would be available for disposal (or exchange). The presence of protected resources, such as federally listed species or National Register cultural resource sites, could change the disposal category according to disposal criteria (Appendix E). Based on current information, however, this is not anticipated. Transfer of 3 tracts with 127 acres for management by other agencies would accommodate resource management needs, and could improve management efficiency. ROW avoidance would be applied on retained surface tracts in support of other surface management objectives. ROW avoidance would also be applied on disposal/transfer tracts to maintain value and marketability. Avoidance could be waived on a case-by-case basis, however, if a ROW would improve surface management capability, or tract value and marketability. Historically, however, the demand for ROWs has been low, and this trend is expected to continue.	Allowing land tenure adjustments that meet the disposal criteria for this alternative, including FLPMA Section 203 sales, would improve management efficiency and reduce land-use conflicts. Four tracts with a total of 28 acres would be available for disposal (or exchange). The presence of protected resources, such as federally listed species or National Register cultural resource sites, could change the disposal category according to disposal criteria (Appendix E). Based on current information, however, this is not anticipated. Transfer of 3 tracts with 127 acres for management by other agencies would accommodate resource management needs and could improve management efficiency. Impacts from ROW management actions would be the same as those in Alternative B.	Allowing land tenure adjustments that meet the disposal criteria for this alternative, including FLPMA Section 203 sales, would improve management efficiency and reduce land-use conflicts. Under this alternative, 16 tracts with a total of 616 acres would be available for disposal (or exchange). The presence of protected resources, such as federally listed species or National Register cultural resource sites, could change the disposal category according to disposal criteria (Appendix E). Based on current information, however, this is not anticipated. Transfer of 6 tracts with 543 acres for management by other agencies would accommodate resource management needs and could improve management efficiency. Impacts from ROW management actions would be the same as those in Alternative B.

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
Areas of Critical Environmental Concern			
Management associated with the existing Jupiter Inlet Lighthouse ONA ACEC (54 acres) and the remainder of the ONA would protect the associated relevant and important (R&I) values. The Lathrop Bayou tract would not be designated as an ACEC. The existing management does not identify actions to protect the R&I values. Effects from former land uses require that management be consistently applied to restore native vegetation communities and the habitats they provide for R&I species. Without such long-term management, the area would not be restored naturally. The Egmont Key tract would not be designated as an ACEC. Although the geographic nature provides some protection, the isolation has allowed invasive species to affect vegetation and wildlife populations. Past use and non-native species, combined with continuing use and limited management focus, have threatened R&I values.	All R&I values would be protected through special management associated with the management of the 3 ACECs (326 acres).	All R&I values would be protected through special management associated with the management of the 3 ACECs (326 acres).	The Jupiter Inlet Lighthouse ONA ACEC would be expanded to 85.83 acres, and associated management would protect and prevent irreparable damage to the R&I values. The Lathrop Bayou tract would not be designated as an ACEC. Management in the vegetation, special status species, and wildland fire sections of Chapter 2 specifically allow for some of the values to be protected. However, the lack of cohesion in the management and the lack of consistent objectives could lead to piecemeal application of the management. The delay in achieving the objectives, and the fact that some of the ACEC's objectives may not be implemented consistently, could place the species on a slower course to recovery than that achievable under Alternatives B and C. The Egmont Key tract would not be designated as an ACEC, but would be transferred to the USFWS. The USFWS Comprehensive Conservation Plan for Egmont Key NWR would protect the relevant and important cultural, wildlife, and botanical values from potential threats.
National Trails			
Managing the Potomac National Heritage Scenic Trail to protect the resource values for which it was designated would restrict activities that interfere with the nature and purposes of the trail. The lack of interpretation along the trail segment	Providing interpretive information the Potomac National Heritage Scenic Trail would increase public appreciation for the trail's values. Increased public appreciation could lead to increased user stewardship, appreciation, and protection of the	Impacts would be the same as those identified in Alternative B.	Impacts would be the same as those identified in Alternative B.

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
could result in the public being unaware of the resource values of the trail. Managing the Washington-Rochambeau Revolutionary Route National Historic Trail to protect the resource values for which it was designated would restrict activities that interfere with the nature and purposes of the trail. The lack of interpretation along the trail segment could result in the public being unaware of the resource values of the trail and their historical significance.	corridor. Researching the locating cultural properties of the period of use and providing interpretive information the Washington-Rochambeau Revolutionary Route National Historic Trail would increase public appreciation for the trail's values and significance in the region and in the nation's history. Increased public appreciation could lead to increased user stewardship, appreciation, and protection of the corridor.		
Socioeconomics			
Oil and gas leasing at the projected levels in the RFD would generate considerable economic benefits, especially in Arkansas and Louisiana. These states have higher levels of projected oil and gas development than Kentucky and Virginia. The economic benefits would occur over large areas and in already active oil and gas production areas. Changes in social structure would likely not occur, given that the BLM-attributed population gains would be small. Socioeconomic impacts associated with the projected phosphate development on BLM FMO in Florida and coal mining of BLM FMO in Kentucky—jobs, income, fiscal receipts, aesthetic impacts of open pit mining, traffic associated with the mining operation, etc.—would be a small portion of the total impacts in the respective areas. Also, these impacts are already occurring in	Socioeconomic effects and impacts of implementing management actions for energy and minerals would be essentially the same as those identified under Alternative A. The total level of energy and mineral development is not expected to differ from Alternative A.	Socioeconomic effects and impacts of implementing management actions for energy and minerals would be essentially the same as those identified under Alternative A. The total level of energy and mineral development is not expected to differ from Alternative A.	Socioeconomic effects and impacts of implementing management actions for energy and minerals would be essentially the same as those identified under Alternative A. The total level of energy and mineral development is not expected to differ from Alternative A.

Alternative A (No Action)	Alternative B	Alternative C	Alternative D
these regions and would be perpetuated in the future with or without development of the BLM minerals. Socioeconomic effects and impacts would occur from implementing management actions for recreation management. Recreation provides quality of life benefits to local residents and visitors. Recreation would also have economic impacts to the extent that recreational users of BLM tracts make expenditures within the local or regional area, which supports income and jobs for others.			

CHAPTER 3—AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter describes the existing physical, biological, cultural, social, and economic characteristics within the Bureau of Land Management's (BLM) *planning area* in the states of Arkansas, Florida, Kentucky, Louisiana, Tennessee, and Virginia. Management of resources and resource uses on public lands and minerals administered by BLM is directed by a variety of laws, regulations, policies, and other requirements. The description of existing conditions for resource programs in the *planning area* serves as the baseline against which the impacts of the different alternatives are analyzed and compared. Emphasis is placed on those resources that are managed by BLM or that may be affected by BLM's management actions.

3.1.1 How to Read This Chapter

This chapter is organized by resource area- or program-level information, state-level information, and in some cases, by specific tract-level information. Resource information that applies to all states within the *planning area* is presented at the beginning of each resource section. Some resources may not have specific tract information if the information is not currently available or if it does not apply to the level of analysis for that resource.

3.2 AIR QUALITY

3.2.1 Climate Change

The United States (U.S.) Department of the Interior (USDOI 2001) issued orders to assess the impacts on global climate change in connection with planning efforts. The Government Accountability Office (GAO 2007) noted that no guidance has been issued regarding how to implement the order. It also noted that there is insufficient site-specific information to allow managers to plan for climate change. It is generally accepted that there has been an increase in the rate of temperature increase and the likely cause is an increase in gases that trap heat in the atmosphere, referred to as greenhouse gases (GHG), especially carbon dioxide (CO_2).

Some GHGs, such as CO_2, occur naturally and are emitted into the atmosphere through natural processes and human activities, while others are created and emitted solely through human activities. The principal GHGs that enter the atmosphere because of human activities include CO_2, through the burning of fossil fuels, solid waste, trees, and wood products; methane (CH_4) emitted during the production and transport of coal, natural gas, and oil, and livestock and other agricultural practices; nitrous oxide (N_2O) emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste; and fluorinated gases that are emitted from a variety of industrial processes (Environmental Protection Agency [EPA] 2008a).

Ongoing scientific research has identified the potential effects of GHG emissions on global climate. Through complex interactions on a regional and global scale, these GHG emissions cause a net warming effect of the atmosphere (making surface temperatures suitable for life on Earth), primarily by decreasing the amount of heat energy radiated by the Earth back into space. Although GHG levels have varied for millennia (along with corresponding variations in climatic conditions), recent industrialization and burning of fossil carbon sources have caused CO_2 concentrations to potentially increase and are likely to contribute to overall climatic changes, typically referred to as global warming. Increasing CO_2 concentrations also lead to preferential fertilization and growth of specific plant species.

Global mean surface temperatures have increased nearly 1.0°C (1.8°F) from 1890 to 2006 (Goddard Institute for Space Studies 2007). However, observations and predictive models indicate that average temperature changes are likely to be greater in the Northern Hemisphere. Data indicate that at latitudes above 24° N, temperatures have increased 1.2°C (2.1°F) since 1900, with nearly a 1.0°C (1.8°F) increase since 1970 alone. Without additional meteorological monitoring systems, it is difficult to determine the spatial and temporal variability and change of climatic conditions, but increasing concentrations of GHGs are likely to accelerate the rate of climate change.

In 2001, the Intergovernmental Panel on Climate Change (IPCC) indicated that by the year 2100, global average surface temperatures would increase 2.5 to 10.4°F (1.4 to 5.8°C) above 1990 levels. The National Academy of Sciences (2006) has confirmed these findings but also indicated there are uncertainties regarding how climate change may affect different regions. Computer model predictions indicate that increases in temperature will not be equally distributed but rather are likely to be accentuated at higher latitudes. Warming during the winter months is expected to be higher than during the summer, and an increase in daily minimum temperatures is more likely than increases in daily maximum temperatures.

Several activities occur within the *planning area* that may generate GHG emissions. Activities such as oil and gas development, large fires, and recreation using combustion engines, can potentially generate CO2 and methane.

3.2.2 Arkansas Air Quality

Arkansas is located in a humid, temperate climatic region characterized by moderate winters; long, hot summers; and an evenly distributed annual rainfall. Arkansas has a temperate climate that is warmer and more humid in the southern lowlands than in the mountainous regions. Arkansas has cool winters. The northern area has the coolest temperatures, which rise steadily as one moves south. The state has warm to hot summers, with most of Arkansas averaging above 80°F. The far north is cooler (Southeastern Regional Climate Center [SERCC] 2009).

Arkansas has a rainy climate with precipitation averages ranging from 44 to 54 inches per year across the state, while the capital city of Little Rock receives less than 4 inches of annual snow. The heaviest precipitation generally falls in the southern section of the state. Average yearly precipitation is approximately 45 inches in the mountainous areas and greater in the lowlands. The annual relative humidity averages 57 percent. Snowfall is not uncommon but not excessive in most years—the average snowfall is approximately 5 inches (National Oceanic and Atmospheric Administration [NOAA] 2007a).

Surface wind speeds in Arkansas vary depending on terrain. Average wind speeds vary from 7 to 10 miles per hour in most locations and follow water drainage features of the land or dominant weather disturbances from the northwest or southeast (Gulf of Mexico) (NOAA 1998).

Dispersion can also be related to the NOAA Stagnation Index, which primarily focuses on ozone (O_3) (NOAA 2007a). Based on this index, Arkansas was prone to air stagnation on a monthly basis for 20 to 60 percent of the days from May through September in 2007. This dispersion index is similar to other areas in the country.

Baseline Air Quality

Ambient Air Quality: The EPA has established ambient air quality standards for criteria pollutants considered harmful to public health and the environment. The ambient air quality measurements in Arkansas for sulfur dioxide (SO_2), NO_2, carbon monoxide (CO), O_3, and particulate matter (PM) (less than 10 microns [PM_{10}] and less than 2.5 microns [$PM_{2.5}$]) are shown in Table 3-1. Ambient air quality measurements made by the Arkansas Department of Environmental Quality (ADEQ) indicate that ambient air quality is within the standards, except air quality is in nonattainment for O_3 in Marion, North Little Rock, and Little Rock. O_3 is formed from the chemical reactions of nitrogen oxides, volatile organic compounds (VOC), and sunlight. Several Arkansas locations exceed the ambient air quality standards.

Table 3-1. Recent Highest Ambient Air Quality Measurements in Arkansas

Pollutant	Averaging Time	Highest Measured Value (ppm)	Location	NAAQS (ppm)
SO_2	1 year	0.002	El Dorado	0.03
	24 hours	0.006	El Dorado	0.14
	3 hours	0.018	El Dorado	0.50
NO_2	1 year	0.126	North Little Rock	0.053
CO	8 hours	1.8	North Little Rock	9
	1 hour	6.8	North Little Rock	35
O_3	8 hours	0.102[a]	Marion	0.075

Pollutant	Averaging Time	Highest Measured Value (ppm)	Location	NAAQS (ppm)
PM_{10}	24 hours	64 µg/m^3	North Little Rock	150 µg/m^3
$PM_{2.5}$	1 year	12.4 µg/m^3	Little Rock	15 µg/m^3
	24 hours	31.0 µg/m^3	Little Rock	35 µg/m^3
a. Fourth highest value ppm = parts per million, NAAQS = National Ambient Air Quality Standards				

Source: AIRS Annual Air Quality Report 2008 (EPA 2009a).

Visibility and Atmospheric Deposition: Visibility measurements have been made at Upper Buffalo Wilderness Area and are available through the Interagency Monitoring of Protected Visual Environments (IMPROVE) Network (IMPROVE 2007). Data for 2007 indicate an annual deciview (dv) of 26.5. The 10-year trend at this site is steady, with no change in visibility.

Atmospheric deposition measurements have been taken through the National Atmospheric Deposition Program (NADP) at four different sites in Arkansas. The laboratory pH for these sites for the year 2007 ranges from 4.9 to 5.1. Trending data available for the area indicate improvement (i.e., less acidic) in the pH (NOAA 2007b).

Area Air Quality Designations

Currently, Arkansas is classified as attainment for criteria pollutants (EPA 2009b). (Note: EPA has not yet considered the potential ozone exceedances monitored during 2008, Table 3-2.) Designations of Prevention of Significant Deterioration (PSD) areas meeting the ambient air quality standards are divided into the following three categories: Class I for areas of restricted growth, Class II for areas of moderate growth, and Class III for industrialized areas (Clean Air Act of 1977, as amended). All of Arkansas is designated as PSD Class II, except for the Caney Creek and Upper Buffalo Wilderness Areas. Other Class I areas within 60 miles of the planning area include the Hercules-Glades and Mingo Wilderness Areas in Missouri.

3.2.3 Florida Air Quality

Florida is located in two climatic regions—the climate of north and central Florida is humid subtropical, and south Florida has a tropical climate. A “feast-or-famine” situation attributed to weather conditions is typically expected as the climate delivers energy and moisture in subtropical latitudes between a large landmass to the north and the Gulf of Mexico to the south and west, and the Atlantic Ocean to the east (SERCC 2009).

Typical mean annual temperature for the entire state is 71°F. Temperatures occasionally exceed 100 °F in many places in Florida and drop to 0°F or lower about once a year. Freezing temperatures are experienced on the Gulf coast almost every winter. Easterly winds off the warm waters of the Gulf Stream running through the Florida Straits keep temperatures moderate across the southern peninsula year round (SERCC 2009).

Normal precipitation ranges from 50 to 65 inches across the state (SERCC 2009). Statewide, the highest rainfall amounts occur from June through September. In winters when an El Niño climate cycle exists, rainfall increases while temperatures are cooler statewide. Snow and sleet have occurred as early as November and as late as April, although most areas do not experience any snow during a typical year.

Surface wind speeds are variable depending on terrain and proximity to the coast. Average wind speeds vary from six to 11 miles per hour in most locations and follow water drainage features of the land or are driven by sea breezes (NOAA 1998). During the summer and fall, tropical storms and hurricanes frequently hit the state. Over the entire year, winds average out of the north across the Panhandle and near Orlando, out of the west at Gainesville and Jacksonville, and generally out of the east elsewhere. Easterly winds off the warm waters of the Gulf Stream running through the Florida Straits keep temperatures moderate across the southern peninsula year round.

Dispersion can also be related to the NOAA Stagnation Index, which primarily focuses on O_3 (NOAA 2007a). Based on this index, Florida was prone to air stagnation on a monthly basis for 10 to 30 percent of the days from May through September of 2007. This dispersion index is slightly better than other areas in the country.

Baseline Air Quality

Ambient Air Quality: The EPA has established ambient air quality standards for criteria pollutants considered harmful to public health and the environment. The ambient air quality measurements in Florida for SO_2, NO_2, CO, O_3, PM_{10}, and $PM_{2.5}$ are shown in Table 3-2. The State of Florida has adopted these values and made the SO_2 standards more stringent. Ambient air quality measurements taken by the Florida Department of Environmental Protection (FDEP) indicate that ambient air quality is within the standards, except air quality is exceeding the recently amended particulate and O_3 standards in several areas throughout the state. O_3 is formed from the chemical reactions of nitrogen oxides, VOCs, and sunlight.

Table 3-2. Recent Highest Ambient Air Quality Measurements in Florida

Pollutant	Averaging Time	Highest Measured Value (ppm)	Location	NAAQS (ppm)
SO_2	1 year	0.003	Pensacola	0.03[b]
	24 hours	0.049	Tampa	0.14[b]
	3 hours	0.205	Hamilton County	0.50
NO_2	1 year	0.009	Jacksonville	0.053
CO	8 hours	3	Jacksonville	9
	1 hour	8	Jacksonville	35
O_3	8 hours[a]	0.082	Tampa	0.075
PM_{10}	24 hours	119 µg/m^3	Lee County	150 µg/m^3
$PM_{2.5}$	1 year	11.1 µg/m^3	Tallahassee	15 µg/m^3
	24 hours	35.7 µg/m^3	Miami	35 µg/m^3

a. Fourth highest value
b. Florida's standards are 0.02 ppm for the one year and 0.10 ppm for the 24-hour standard
ppm = parts per million, NAAQS = National Ambient Air Quality Standards

Source: AIRS Annual Air Quality Report 2008 (EPA 2009a).

Visibility and Atmospheric Deposition: Visibility measurements have been made at Chassahowitzka Wilderness Area and are available through the IMPROVE Network (IMPROVE 2007). Data for 2007 indicate an annual dv of 25.3. The 10-year trend at this site shows a slight improvement in visibility.

Atmospheric deposition measurements have been measured through the NADP at seven different sites in Florida. The laboratory pH for these sites for 2007 ranged from 4.7 to 5.0. Trending data available for the area indicate improvement (i.e., less acidic) in the pH (NOAA 2007b).

Area Air Quality Designations

Currently there are no nonattainment designations for Florida (EPA 2009b). This could change pending review of monitoring data with the newly adopted O_3 and particulate standards. Recently, the Jacksonville, Miami, and Tampa areas were redesignated from maintenance areas for the one-hour O_3 standard to being no longer subject to the standard.

PSD designation of areas meeting the ambient air quality standards is divided into the following three categories: Class I for areas of restricted growth, Class II for areas of moderate growth, and Class III for industrialized areas (Clean Air Act of 1977, as amended). All of Florida is designated as PSD Class II, except for the Everglades National Park in southwestern Florida, the Chassahowitzka Wilderness Area in central Florida, and St. Marks National Wildlife Refuge (NWR) in the Florida Panhandle. Other Class I areas (within 60 miles of the planning area) include Wolf Island NWR on the southeastern coast of Georgia, and Okefenokee Wilderness Area in southern Georgia.

3.2.4 Kentucky Air Quality

Kentucky is located in a humid, subtropical climatic region characterized by temperate winters; long, hot summers; and an evenly distributed annual rainfall. Kentucky experiences all four seasons, usually with striking variations in the severity of summer and winter from year to year. Mean annual temperatures range from 53°F in the northeast to 59°F in the southwest, but significant seasonal variations can exist (SERCC 2009).

The average annual precipitation is 46 inches a year, ranging from 42 inches in the north to 52 inches in the south. Snowfall can occur with annual averages of 10 inches in the north and 5 inches in the south. Surface wind speeds are variable depending on terrain. Average wind speeds vary from six to nine miles per hour in most locations and follow water drainage features of the land (NOAA 1998). Dispersion also can be related to the NOAA Stagnation Index, which primarily focuses on O_3 (NOAA 2007a). Based on this index, Kentucky was prone to air stagnation on a monthly basis for 30 to 60 percent of the days from May through September 2007. This dispersion index is similar to other areas in the country.

Baseline Air Quality

Ambient Air Quality: The EPA has established ambient air quality standards for criteria pollutants considered harmful to public health and the environment. Table 3-3 lists the ambient air quality measurements in Kentucky for SO_2, NO_2, CO, O_3, PM_{10}, and $PM_{2.5}$. Ambient air quality measurements by the Kentucky Division for Air Quality (KDAQ) indicate that ambient air quality is within the standards, except that air quality is in nonattainment for particulates in the Kentucky counties surrounding the Cincinnati, Ohio; Huntington, Ohio; and Louisville, Kentucky, areas and for O_3 in the Cincinnati, Ohio, area (KDAQ 2009). O_3 is formed from the chemical reactions of nitrogen oxides, VOCs, and sunlight.

Table 3-3. Recent Highest Ambient Air Quality Measurements in Kentucky

Pollutant	Averaging Time	Highest Measured Value (ppm)	Location	NAAQS (ppm)
SO_2	1 year	0.005	Louisville	0.03
	24 hours	0.023	Louisville	0.14
	3 hours	0.194	Henderson County	0.50
NO_2	1 year	0.015	Louisville	0.053
CO	8 hours	2.8	Louisville	9
	1 hour	3.4	Louisville	35
O_3	8 hours[a]	0.090	Louisville	0.080
PM_{10}	24 hours	119 µg/m^3	Ashland	150 µg/m^3
$PM_{2.5}$	1 year	13.3 µg/m^3	Louisville	15 µg/m^3
	24 hours	35.9 µg/m^3	Covington	35 µg/m^3

a. Fourth highest value
ppm = parts per million, NAAQS = National Ambient Air Quality Standards

Source: AIRS Annual Air Quality Report 2008 (EPA 2009a).

Visibility and Atmospheric Deposition: Visibility measurements made at Mammoth Cave National Park are available through the IMPROVE Network (IMPROVE 2007). Data for 2007 indicate an annual dv of 32.1. The 10-year trend at this site shows a very slight decrease in visibility.

The annual average values for 2007 range from a pH of 4.5 to 4.7 (KDAQ 2009). Annual pH averages for sites have shown modest upward trends since 1985, meaning that rainfall is gradually becoming less acidic. This improvement is attributed at least in part to successful efforts of power plants to curb SO_2 and NO_2 emissions. Atmospheric deposition measurements have been measured through the NADP at four different sites in Kentucky. The laboratory pH for these sites for the year 2007 ranges from 4.9 to 5.1. Trending data available for area indicate improvement (i.e., less acidic) in the pH (NOAA 2007b).

Area Air Quality Designations

Currently, most of Kentucky is classified as attainment for criteria pollutants. $PM_{2.5}$ nonattainment areas include the Cincinnati, Huntington-Ashland, and Louisville areas. O_3 is nonattainment in the Cincinnati area and is classified as maintenance for Clarksville, Huntington-Ashland, and Louisville areas. Recently, the Cincinnati area and Edmonson County were redesignated from maintenance areas for the one-hour O_3 standard to being no longer subject to the standard.

PSD designations of areas meeting the ambient air quality standards are divided into three categories: Class I for areas of restricted growth, Class II for areas of moderate growth, and Class III for industrialized areas (Clean Air Act of 1977, as amended). All of Kentucky is designated as PSD Class II, except for Mammoth Cave National Park. Other Class I areas within 60 miles of the planning area are the Mingo Wilderness Area in eastern Missouri; Great Smokey Mountains National Park in Tennessee; James River Face Wilderness Area in Virginia; and the Joyce Kilmer Slickrock, Lineville Gorge, Shining Rock Wilderness Areas in North Carolina.

3.2.5 Louisiana Air Quality

Louisiana has a relatively constant semitropical climate. The subtropical characteristics of the state are due in large part to the influence of the Gulf of Mexico, which even at its most distant point is no more than 200 miles away. Rainfall and humidity decrease and daily temperature variations increase with distance from the Gulf of Mexico. Summers in Louisiana are hot and humid, with high temperatures from mid-June to mid-September averaging 90°F or more, and overnight lows averaging above 70°F (SERCC 2009).

Precipitation is frequent throughout the year, although the summer is slightly wetter than the rest of the year. Annual rainfall totals range from 40 to 70 inches. There is a decrease in precipitation in October. Southern Louisiana receives far more rainfall, especially during the winter months. Snow falls occasionally in the north but rarely in the South (SERCC 2009).

Prevailing winds are from the south or southeast. During the summer and fall, tropical storms and hurricanes are frequent in the state, especially along the coast. Surface wind speeds are variable depending on terrain. Average wind speeds vary from four to nine miles per hour in most locations and follow water drainage features of the land and/or are driven by sea breezes (NOAA 1998).

Dispersion also can be related to the NOAA Stagnation Index, which focuses primarily on O_3 (NOAA 2007a). Based on this index, Louisiana was prone to air stagnation on a monthly basis for 10 to 40 percent of the days from May through September 2007. This dispersion index is slightly better than other areas in the country.

Baseline Air Quality

Ambient Air Quality: The EPA has established ambient air quality standards for criteria pollutants considered harmful to public health and the environment. The ambient air quality measurements in Louisiana for SO_2, NO_2, CO, O_3, PM_{10}, and $PM_{2.5}$ are shown in Table 3-4. Ambient air quality measurements taken by the Louisiana Division of Environmental Quality (LDEQ) indicate that ambient air quality is within the standards, except in the Baton Rouge area, where air quality is in nonattainment for O_3 (LDEQ 2008). O_3 is formed from the chemical reactions of nitrogen oxides, VOCs, and sunlight.

Table 3-4. Recent Highest Ambient Air Quality Measurements in Louisiana

Pollutant	Averaging Time	Highest Measured Value (ppm)	Location	NAAQS (ppm)
SO_2	1 year	0.009	Chalmette	0.03
	24 hours	NA	Chalmette	0.14
	3 hours	0.112	Chalmette	0.50
NO_2	1 year	0.015	Capitol	0.053
CO	8 hours	2	Capitol	9
	1 hour	2	Capitol	35
O_3	8 hours[a]	0.089	Louisiana State University	0.080
PM_{10}	24 hours	87 µg/m^3	Chalmette	150 µg/m^3

Pollutant	Averaging Time	Highest Measured Value (ppm)	Location	NAAQS (ppm)
$PM_{2.5}$	1 year	13.7 µg/m^3	Port Allen	15 µg/m^3
	24 hours	31 µg/m^3	Shreveport	35 µg/m^3
a. Fourth highest value ppm = parts per million, NAAQS = National Ambient Air Quality Standards				

Source: LDEQ Annual Air Quality Report 2007 (LDEQ 2008a).

Visibility and Atmospheric Deposition: Visibility measurements taken at Sikes are available through the IMPROVE Network (IMPROVE 2007). Data for 2007 indicate an annual dv of 27.0. The 10-year trend at this site shows a very slight decrease in visibility.

Atmospheric deposition measurements were taken through the NADP at one site in Louisiana. The laboratory pH for this site is 4.8. Trending data available for the area indicate improvement (i.e., less acidic) in the pH (NOAA 2007b).

Area Air Quality Designations

Currently, most of Louisiana is classified as attainment for criteria pollutants. O_3 is nonattainment (moderate) in the Baton Rouge area. Recently, the Lafayette, Lake Charles, and New Orleans areas, as well as Point Coupee, Beauregard, Grant, LaFourche, St. James, and St. Mary Parishes, were redesignated from maintenance areas for the one-hour O_3 standard to being no longer subject to the standard. Also, the nonattainment one-hour O_3 designation for Baton Rouge was changed to being no longer subject to the standard.

PSD designations of areas meeting the ambient air quality standards are divided into the following three categories: Class I for areas of restricted growth, Class II for areas of moderate growth, and Class III for industrialized areas (Clean Air Act of 1977, as amended). All of Louisiana is designated as PSD Class II, except for Breton Wilderness Area. Other Class I areas within 100 miles of potential development activities include Caney Creek Wilderness in southwestern Arkansas.

3.2.6 Tennessee Air Quality

Tennessee has a temperate climate, with warm summers and mild winters. The state usually enjoys four distinct seasons and generally has a mild climate year round. However, the state's varied topography can lead to a wide range of climatic conditions. The warmest regions of the state and those with the longest growing season are the Gulf Coastal Plain, the Central Basin, and the Sequatchie Valley. Summers are very humid because of moisture from the Gulf of Mexico. Even though the temperature rarely reaches great heights, the moisture makes it feel hotter than it is. Winters, by contrast, can be very cold, and temperatures below freezing occur relatively often.

The typical average annual temperature in Tennessee is 53°F. Average high temperatures during the year are 48°F in winter months and 91°F during the summer. Tennessee experiences average low temperatures of 32°F in the winter and 74°F in the summer (SERCC 2009).

Severe storms occur infrequently in Tennessee. The greatest rainfall occurs in the winter and early spring, especially March. The early fall months, particularly September and October, are the driest. Statewide

average annual precipitation can vary from approximately 42 to 62 inches. Average annual rainfall measured in 2008 was 51 inches. Snowfall varies and is more prevalent in eastern Tennessee than in the western section; Nashville can receive about 10 inches a year and Memphis about 5 inches a year (SERCC 2009).

Surface wind speeds vary depending on terrain. Average wind speeds vary from four to 11 miles per hour in most locations. Dispersion can also be related to the NOAA Stagnation Index, which primarily focuses on O_3 (NOAA 2007a). Based on this index, Tennessee was prone to air stagnation on a monthly basis for 20 to 70 percent of the days from May through September 2007. This dispersion index is similar to other areas in the country.

Baseline Air Quality

Ambient Air Quality: EPA has established ambient air quality standards for criteria pollutants considered harmful to public health and the environment. Table 3-5 shows the ambient air quality measurements in Tennessee for SO_2, NO_2, CO, O_3, PM_{10}, and $PM_{2.5}$. Ambient air quality measurements made by the Tennessee Department of Environment and Conservation (TDEC) in 2008 (TDEC 2009) indicate that ambient air quality is within the standards, except for $PM_{2.5}$ and eight-hour O_3 in certain areas of the state. O_3 forms from the chemical reactions of nitrogen oxides, VOCs and sunlight.

Table 3-5. Recent Highest Ambient Air Quality Measurements in Tennessee

Pollutant	Averaging Time	Highest Measured Value (ppm)	Location	NAAQS (ppm)
SO_2	1 year	0.011	Blount County	0.03
	24 hours	0.11	McMinn County	0.14
	3 hours	0.333	McMinn County	0.50
NO_2	1 year	0.015	Davidson County	0.053
CO	8 hours	2.4	Davidson County	9.0
	1 hour	3.2	Davidson and Shelby Counties	35.0
O_3	8 hours	0.086[a]	Knox County	0.075
PM_{10}	24 hours	61 µg/m^3	Shelby County	150.0 µg/m^3
$PM_{2.5}$	1 year	13.9 µg/m^3	Knox County	15.0 µg/m^3
	24 hours	39.2 µg/m^3	Knox County	35.0 µg/m^3

a. Fourth-highest value
ppm = parts per million, NAAQS = National Ambient Air Quality Standards

Source: (TDEC 2009) 2008 Ambient Air Monitoring Data

Visibility and Atmospheric Deposition: Visibility measurements have been made at Great Smoky Mountain National Park and are available through the IMPROVE website. Data for 2007 indicate an annual dv of 30 (IMPROVE 2007). This site shows an unchanged level of visibility over the period since 1991.

Atmospheric deposition measurements have been measured through the NADP at four different sites in Tennessee. In 2007, the laboratory pH for these sites ranged from 4.5 to 4.8 (NOAA 2007b).

Area Air Quality Designations

Nine different counties are currently in nonattainment for the one-hour O_3, including Hamilton, Meigs, Hawkins, Sullivan, Davidson, Rutherford, Sumner, Williamson, and Wilson counties. These are Early Action Compact (EAC) areas,[1] and the state submitted monitoring data indicating that these areas were in attainment for the eight-hour O_3 standard effective April 15, 2008. Exactly one year later, on April 15, 2009, the one-hour O_3 standard was revoked and is no longer applicable to these areas. The eight-hour O_3 National Ambient Air Quality Standards (NAAQS) tables will be modified in the regulations to reflect the attainment designation for these EAC areas, and the one-hour O_3 NAAQS tables in the regulations will reflect that the one-hour standard no longer applies in these areas as of April 15, 2009 (EPA 2009b).

In addition, Montgomery County is currently classified as a maintenance area (previously an area of nonattainment) for eight-hour O_3, and Hamilton County and the Knoxville area are classified as nonattainment for the $PM_{2.5}$ standard.

PSD designations of areas meeting the ambient air quality standards are divided into the following three categories: Class I for areas of restricted growth, Class II for areas of moderate growth, and Class III for industrialized areas (Clean Air Act of 1977, as amended). Tennessee currently has two Class I PSD areas: Great Smoky Mountains National Park (managed by the National Park Service [NPS]) and Joyce Kilmer-Slickrock Wilderness (managed by the U.S. Forest Service [USFS]). The remainder of the state is designated Class II, except for the areas listed in Table 3-5 that did not meet NAAQS and are unclassified. Other Class I areas within approximately 60 miles of the planning area include the Cohutta Wilderness Area located in Georgia (managed by the USFS), Mingo NWR in Missouri, Mammoth Cave National Park in Kentucky, Sipsey Wilderness Area in Alabama, and Linville Gorge and Shining Rock Wilderness Areas in North Carolina (NPS 2009a).

3.2.7 Virginia Air Quality

The Commonwealth of Virginia has five different climate regions: the Tidewater, Piedmont, Northern Virginia, Western Mountain, and Southwestern Mountain regions. Some areas, such as Charlottesville, Lynchburg, and Warrenton, have climates that are amenable to long growing seasons and infrequent subzero temperature minimums, while winters on the northern Blue Ridge are known for frequently producing bitterly cold temperatures similar to those of Chicago (University of Virginia [UVA] 2009).

Virginia's climate is a result of global-scale weather patterns modified by the diverse landscape of the commonwealth. The commonwealth's landscape affects the climate primarily in three ways. First, the Atlantic Ocean and the warmer Gulf Stream waters play a dominant role in differentiating Virginia's precipitation climate. Second, the high relief of the Appalachian and Blue Ridge Mountain systems helps

[1] In December 2003, the EPA proposed to defer the effective date of air quality designations for certain areas of the country that did not meet the eight-hour ozone NAAQS. The areas with these deferments, known as EACs, agreed to reduce ground-level ozone pollution earlier than the Clean Air Act requires. These plans include all the necessary elements of a comprehensive air quality plan, but are tailored to local needs and driven by local decisions. An EAC is designed to develop and implement control strategies, account for growth, and achieve and maintain the eight-hour ozone standard. This approach offers a more expeditious timeline for achieving emission reductions earlier than the EPA's expected eight-hour implementation rulemaking, while providing fail-safe provisions for the area to revert to the traditional State Implementation Plan (SIP) process if specific milestones are not met.

control Virginia's climate. The third control on climate is the commonwealth's complex pattern of rivers and streams, which drain the precipitation that falls and help modify the pattern of moist airflow from fallen precipitation. Most of Virginia's rainfall is from storms associated with warm and cold fronts. During September, as much as 40 percent of Virginia's rainfall can come from hurricanes and tropical storms (UVA 2009). Annual rainfall totals in Virginia can vary from 33 inches in the Shenandoah Valley to more than 60 inches in the mountains of southwestern Virginia. Statewide average annual precipitation can vary from approximately 35 to 56 inches (SERCC 2009).

The typical average annual temperature in Virginia is 58°F. High temperatures in Virginia average approximately 70°F and vary from 47°F in the winter to about 93°F in the summer. The average annual low temperature is about 39 °F and ranges from 22°F in the winter to approximately 58°F in the summer (SERCC 2009; UVA 2009).

Surface wind speeds are variable depending on an area's terrain and proximity to the coast. Average wind speeds in Virginia vary from six to 12 miles per hour in most locations. Wind speeds follow water drainage features of the land or are driven by sea breezes (NOAA 1998).

Dispersion can also be related to the NOAA Stagnation Index, which primarily focuses on O_3. Based on this index, Virginia was prone to air stagnation on a monthly basis from ten to 70 percent of the days for May through September 2007 (NOAA 2007a). The month with the greatest percentage of days with stagnation was September. On average, 10 to 40 percent of days in the summer months are prone to air stagnation. This dispersion index is similar to other areas in the country.

Baseline Air Quality

Ambient Air Quality: The EPA has established ambient air quality standards for criteria pollutants considered harmful to public health and the environment. Table 3-6 shows the ambient air quality measurements in Virginia for SO_2, NO_2, CO, O_3, PM_{10}, and $PM_{2.5}$. Ambient air quality measurements made by the Virginia Department of Environmental Quality's (VDEQ) Division of Air Quality indicate that concentrations of CO, NO_2, and SO_2 were within the EPA's NAAQS in 2007. Virginia continues to experience exceedances of the O_3 pollution standard, particularly in the Northern Virginia, Richmond, and Hampton Roads regions. In 2007 Northern Virginia had 12 days when an eight-hour O_3 average greater than 0.08 parts per million (ppm) was recorded at one or more monitoring stations in the area. Richmond had seven days, Hampton Roads recorded three days, and Stafford County recorded four O_3 exceedance days. The Roanoke area recorded one day where the ambient air showed an exceedance of the 0.08 ppm eight-hour standard, and Caroline County recorded two days (VDEQ 2007). Also, the new $PM_{2.5}$ 24-hour standard was exceeded in Henrico County.

Table 3-6. Recent Highest Ambient Air Quality Measurements in Virginia

Pollutant	Averaging Time	Highest Measured Value[1] (ppm)	Location	NAAQS (ppm)
SO_2	1 year	0.005	Fairfax and Charles City Counties, Norfolk	0.03
	24 hours	0.019	Charles City County, Norfolk	0.14
	3 hours	0.081	Norfolk	0.50
NO_2	1 year	0.018	Alexandria	0.053

Pollutant	Averaging Time	Highest Measured Value[1] (ppm)	Location	NAAQS (ppm)
CO	8 hours	3.7	Roanoke	9
	1 hour	4.1	Roanoke	35
O_3	8 hours[a]	0.088	Arlington and Fairfax Counties	0.075
PM_{10}	24 hours	78 µg/m^3	Frederick County	150 µg/m^3
$PM_{2.5}$	1 year	14.2 µg/m^3	Roanoke	15 µg/m^3
	24 hours	57 µg/m^3	Henrico County	35 µg/m^3

a. Fourth-highest value
ppm = parts per million, NAAQS = National Ambient Air Quality Standards

Source: Virginia Ambient Air Monitoring 2007 Data Report (VDEQ 2007)

Visibility and Atmospheric Deposition: Visibility measurements have been made at Shenandoah National Park and are available through the IMPROVE website. Data for 2007 indicate an annual dv of 29 (IMPROVE 2007). Since 2001, this site shows an unchanged level of visibility over the period.

Atmospheric deposition measurements have been measured through the NADP at five different sites in Virginia. In 2007, the laboratory pH for these sites ranged from 4.4 to 4.6 (NOAA 2007b).

Area Air Quality Designations

Nine different areas are currently in nonattainment for the eight-hour O_3 standard and the $PM_{2.5}$ standard in the Washington, DC, metropolitan area, including Washington, DC; Alexandria; Arlington County; Fairfax; Fairfax County; Falls Church; Loudoun County; Manassas; Manassas Park; and Prince William County (EPA 2009b). Frederick County and Roanoke are currently considered as nonattainment with the one-hour O_3 standard. These are EAC areas, and the commonwealth submitted monitoring data indicating that they are in attainment for the eight-hour O_3 standard effective April 15, 2008. Exactly one year later on April 15, 2009, the one-hour O_3 standard was revoked for these areas. The eight-hour O_3 NAAQS tables will be modified in the regulations to reflect the attainment designation and to reflect that the one-hour O_3 NAAQS tables no longer apply to these EAC areas (EPA 2009b). In addition, a portion of White Top Mountain above the 4,500-foot elevation in Smyth County has a maintenance plan requirement under Section 110(a)(1) of the Clean Air Act for one-hour O_3 (EPA 2009b).

PSD designations of areas meeting the ambient air quality standards are divided into the following three categories: Class I for areas of restricted growth, Class II for areas of moderate growth, and Class III for industrialized areas (Clean Air Act of 1977, as amended). The two Class I areas in Virginia are the Shenandoah National Park (managed by the NPS) and James River Face Wilderness Area (managed by the USFS). The remainder of the commonwealth is designated Class II, except for the areas listed in Table 3-6, which did not meet NAAQS and are unclassified (VDEQ 2007). Other Class I areas within 60 miles of the planning area include the Dolly Sods Wilderness Area and the Otter Creek Wilderness Area, both in the Monongahela National Forest in West Virginia (managed by the USFS), and the Linville Gorge Wilderness Area in North Carolina (EPA 2009b).

3.3 SOIL RESOURCES

Soil formation and character are determined by parent material, surface slope, climate, biological activity, and time. There is a diversity of soils throughout the *planning area*, from rocky upland areas, to rich agricultural soils and low-lying wetland soils, to sandy soils along coastlines. Eight of the 12 soil orders are found, including Alfisols, Entisols, Histosols, Inceptisols, Mollisols, Spodosols, Ultisols, and Vertisols. A description of soils for each state is provided in the following sections, including the dominant soil orders (Soil Survey Staff 1999) and variation in soils by ecoregion (McNab 1996).

The Farmland Protection Policy Act (FPPA) provides for preservation of prime farmland, which is defined as having the availability and best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. Its soil quality, growing season, and moisture supply can produce economically sustained high yields of crops when treated and managed according to acceptable farming methods, including water management. Some soils within the *planning area* have been identified as prime farmland. FPPA requires identification of proposed actions that may affect lands classified as prime farmlands. This is a potential issue on split-estate agricultural lands overlying federal mineral ownership (FMO). Acres classified as prime farmland on a statewide basis (USDA 2009) are given in the following sections.

3.3.1 Arkansas Soil Resources

Arkansas is characterized by a rich diversity of soils, ranging from maturely weathered uplands to alluvial bottoms. The dominant soil orders (and suborders) in Arkansas include Ultisols (Udults and Aquults), Alfisols, (Udalfs and Aqualfs), Vertisols (Aquerts and Uderts), Inceptisols (Aquepts), and Entisols (Fluvents and Aquents). Dominance of soil taxa varies to some extent by ecoregion. Udults are dominant throughout most of the state, except in the Mississippi Alluvial Plain, where Aqualfs, Udalfs, Aquerts, and Aquents are dominant, and the Mississippi Valley Loess Plains, where soils are mostly Aquepts. In the Boston Mountains, dominant soils are mostly Udults. In the Ozark Highlands and Ouachita Mountains, Udalfs and Fluvents, respectively, are also dominant (after Udults). In the Arkansas Valley, dominant soils include Udults, Udalfs, Fluvents, and Aquerts. The South Central Plain is perhaps the most diverse ecoregion in terms of dominant soils, where taxa include Udults, Aquults, Aqualfs, Udalfs, Aquerts, Uderts, and Fluvents. Soils of the surface tracts are mainly Udults.

In 2007, there were 12,914,700 acres of prime farmland in Arkansas in areas that were classified as cropland, pastureland, forestland, other rural land, or rangeland. This total, compared with 13,214,400 acres in 1982, was a net decrease of about 299,700 acres or 2.3 percent. There are 83,534 acres of FMO in Arkansas where the surface cover type is identified as agriculture, including 59,527 acres in the area of expected development for oil and gas. Some of this FMO is likely to contain prime farmland.

3.3.2 Florida Soil Resources

A wide variety of soils exists in Florida, ranging from the sugar sands of the coastal dunes, to the peats of the northern Everglades, and the ubiquitous Spodosols of the flatwoods. Seven of the 12 main soil orders are found in Florida. Within the areas of expected development of oil and gas and phosphate, the dominant soil orders (and suborders) are Spodosols (Aquods), Entisols (Psamments and Aquents), Alfisols (Aqualfs), Mollisols (Aquolls), Histosols (Saprists), and Inceptisols (Aquepts). Soils present on surface tracts include Aquods, Aquents, Aquolls, and Psamments. Soils at Jupiter Inlet Lighthouse Outstanding Natural Area (ONA), for example, are primarily Psamments, and soils on the Lathrop Bayou tract include Aquods, Aquents, and Aquolls.

In 2007, there were 1,033,400 acres of prime farmland in Florida in areas that were classified as cropland, pastureland, forestland, or other rural land. This total, compared with 1,098,600 acres in 1982, is a net decrease of about 65,200 acres or 5.9 percent. There are 6,373 acres of FMO in Florida where the surface cover type is identified as agriculture, including 138 acres within the area of expected development for oil and gas and 419 acres within the area of expected phosphate development. Some of this FMO may contain prime farmland.

3.3.3 Kentucky Soil Resources

The general characteristics of soils in Kentucky are varied, including weathered uplands, glacial till, windblown loess, and alluvial deposits. There are six dominant soil orders represented in Kentucky; four of these are found on FMO, including Alfisols (Udalfs), Entisols (Aquents and Psamments), Inceptisols (Udepts and Aquepts), and Ultisols (Udults). On FMO in western Kentucky, soils are mostly Udalfs, in the east mostly Udults and Udepts with some Aquents and Psamments, while in the central portion of the commonwealth dominant soils include a combination of Udalfs, Aquents, Psamments, Udults, and Udepts.

In 2007, there were 5,530,500 acres of prime farmland in Kentucky in areas that were classified as cropland, pastureland, forestland, or other rural land. This total, compared to 5,905,800 acres in 1982, was a net decrease of about 375,300 acres or 6.4 percent. There are 15,107 acres of FMO in Kentucky where the surface cover type is identified as agriculture, including 12,291 acres within the area of expected development for oil and gas. This may include some lands with soil types classified as prime farmland.

3.3.4 Louisiana Soil Resources

More than one-fourth of the Louisiana is covered by rich alluvium deposited by the overflowing of its rivers and bayous. Muck and peat soils are found within the coastal marshes, while in the uplands and hills, there are more-mature soils that are less fertile. The dominant soil orders (and suborders) in Louisiana include Alfisols (Aqualfs and Udalfs), Ultisols (Udults), Vertisols (Aquerts and Uderts), Entisols (Aquents and Fluvents), Histosols (Saprists), Mollisols (Aquolls), and Inceptisols (Udepts). There is variation in soil taxa by ecoregion. In the Mississippi River Alluvial Plain, Aqualfs, Udalfs, Aquents, Aquerts, Aquepts, and Udepts are dominant. In the West Gulf Coastal Plain, the most dominant soils are Aqualfs, Udalfs, Fluvents, Udults, and Uderts. Dominant soils of the Gulf Coast prairies and marshes are Aqualfs, Udalfs, Aquents, Saprists, and Aquolls, while in the East Gulf Coastal Plain, the dominant soils are mainly Aqualfs, Udalfs, Udepts, Udults, and Aquults. Soils of the surface tracts include Aqualfs, Udalfs, Aquepts, Udults, and Uderts.

In 2007, there were 11,891,100 acres of prime farmland in Louisiana in areas that were classified as cropland, pastureland, forestland, other rural land, or rangeland. This total, compared with 12,451,500 acres in 1982, is a net decrease of about 560,400 acres or 5.4 percent. There are 23,481 acres of FMO in Louisiana where the surface cover type is identified as agriculture or grassland, including 18,180 acres in the area of expected development for oil and gas. Some of this FMO is likely to contain prime farmland.

3.3.5 Tennessee Soil Resources

There is a wide variety of soils in Tennessee, with eight soil orders represented as dominant in different areas. FMO within Tennessee is primarily within the Interior Low Plateau ecoregion, where dominant soil orders (and suborders) are Ultisols (Udults), Alfisols (Udalfs), and Inceptisols (Udepts).

In 2007, there were 5,825,600 acres of prime farmland in Tennessee in areas that were classified as cropland, pastureland, forestland, or other rural land. This total, compared with 6,303,600 acres in 1982, was a net decrease of about 478,000 acres or 7.6 percent. There are 480 acres of FMO in Tennessee where the surface cover type is identified as either agriculture or pasture, including 416 acres in the area of expected development for oil and gas. This may include some lands with soil types classified as prime farmland.

3.3.6 Virginia Soil Resources

In Virginia, the area of expected development for oil and gas includes FMO within the Northern Ridge and Valley and the Northern Cumberland Mountains. In the Northern Ridge and Valley, soils are mostly Ultisols (Udults), Inceptisols (Udepts), and Alfisols (Udalfs), derived from heavily weathered shale, siltstone, sandstone residuum and colluvium, cherty limestone, and limestone residuum. In the Northern Cumberland Mountains, soils are mainly Inceptisols (Udepts) and Ultisols (Udults), formed in material weathered from sandstone, siltstone, and shale. Soils within the Meadowood Special Recreation Management Area (SRMA) are mostly Ultisols (Udults) and Alfisols (Udalfs), typical for the Middle Atlantic Coastal Plain.

In 2007, there were 4,455,500 acres of prime farmland in Virginia in areas that were classified as cropland, pastureland, forestland, or other rural land. This total, compared with 4,822,500 acres in 1982, was a net decrease of about 367,000 acres or 7.6 percent. There are 571 acres of FMO in Virginia where the surface cover type is identified as agriculture, including 409 acres within the area of expected development for oil and gas. This may include some lands with soil types classified as prime farmland. There are approximately 247 acres of soils in the Meadowood SRMA classified in the Matapeake, Mattapex, Sassafras and Woodstown soils series, which is considered prime farmland if used for agriculture.

3.4 WATER RESOURCES

3.4.1 Arkansas Water Resources

Surface Water

Arkansas is divided into the following six major river basins: Red River Basin, Ouachita River Basin, Arkansas River Basin, White River Basin, St. Francis River Basin, and the Mississippi River Basin. Arkansas contains 87,617 miles of rivers and streams (28,408 miles of perennial streams, 53,465 miles of intermittent streams, 5,251 miles of ditches and canals, and 494 miles of border streams) and 514,245 acres of lakes, reservoirs, and ponds (ADEQ 2004). Approximately 2.5 miles of rivers and streams occur within the 1,075 acres of BLM-administered surface tracts in Arkansas. Approximately 1,114 miles of rivers and streams and 80,160 acres of lakes and reservoirs occur within the 366,021 acres of FMO. Map 3-1 shows major watersheds and surface water bodies within Arkansas.

Surface Water Quality

Arkansas contains areas of high-quality surface water and areas where degradation and contamination are occurring. Agricultural activities and surface erosion are the main source of water body impairment. The major efforts of nonpoint source management are oriented toward the waste management activities of animal production areas and controlling surface erosion.

The Arkansas Water Quality Assessment Report (EPA 2008) assessed approximately 9,980 miles of stream and found that 4,437 miles were not meeting all designated uses. Of the 64,778 acres of lakes assessed, 34,768 acres were found to be impaired. The 2008 assessment indicated that the primary source of nonpoint source pollution was unknown, with agriculture and construction as the next largest categories of nonpoint source pollution causing impairments to water bodies of the state (EPA 2008). Table 3-7 and Table 3-8 contain individual designated use summaries for streams and lakes.

Map 3-1. Arkansas Major Watersheds and Surface Water

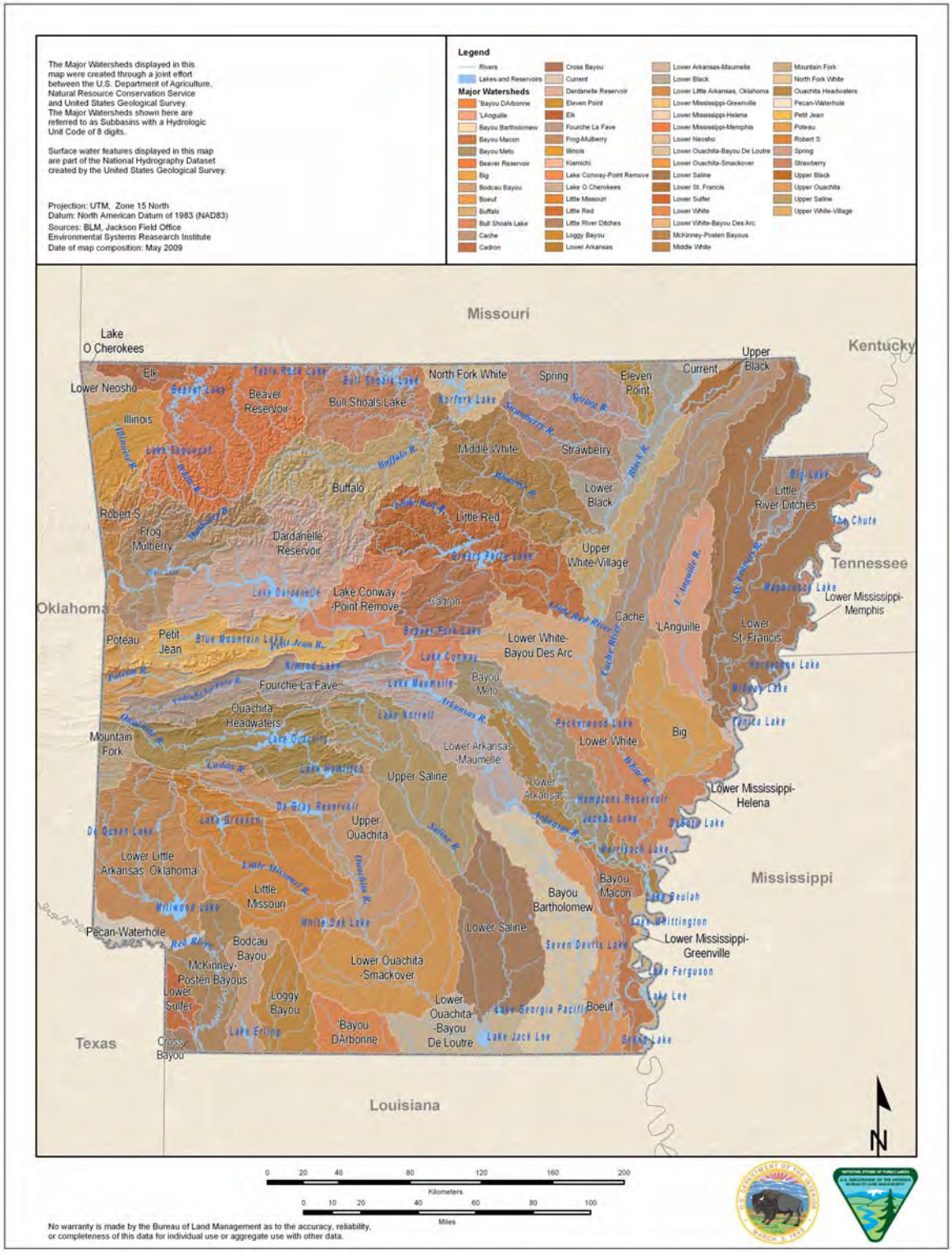


Table 3-7. Individual Designated Use Support Summary for Arkansas Streams and Rivers

Designated Use	Total Assessed (miles)	Percentage Good	Percentage Threatened	Percentage Impaired
Agricultural Water Supply	9,934.1	86.4	0	13.6
Domestic Water Supply	9,814.9	95.3	0	4.7
Fish Consumption	9,934.1	96.5	0	3.5
Fisheries	9,941.4	65.5	0	35.5
Primary Contact Recreation	9,972.1	92.1	0	7.9
Secondary Contact Recreation	9,963.1	99.8	0	0.2
Industrial Water Supply	9,934.1	86.4	0	13.6

Source: EPA 2008 Arkansas Water Quality Assessment Report

Table 3-8. Individual Designated Use Support Summary for Arkansas Reservoirs and Lakes

Designated Use	Total Assessed (acres)	Percentage Good	Percentage Threatened	Percentage Impaired
Agricultural Water Supply	64,778.0	100.0	0	0
Domestic Water Supply	64,778.0	100.0	0	0
Fish Consumption	64,778.0	63.8	0	36.2
Fisheries	64,778.0	82.5	0	17.5
Primary Contact Recreation	64,778.0	100.0	0	0
Secondary Contact Recreation	64,778.0	100.0	0	0
Industrial Water Supply	64,778.0	100.0	0	0

Source: EPA 2008 Arkansas Water Quality Assessment Report

Most of Arkansas' wetlands are located in the Delta Region, which is dominated by row-crop agriculture, where the primary threat to wetlands is conversion to cropland. Although the conversion rate appears to have peaked in the 1960s and is now decreasing, the total wetland base has declined substantially, making smaller losses more critical.

Water quality in the Delta Region is significantly influenced by nonpoint source runoff from highly agriculturalized areas. The vast majority of the waterways within this region form a network of extensively channelized drainage ditches. Within these systems, the fishable goal of the Clean Water Act is being met, even though the aquatic life communities have been substantially altered. Many of the

waterways within the Delta Region do not consistently maintain the swimmable criteria set forth in the Arkansas water quality standards (ADEQ 2004).

The Gulf Coastal Region of southern Arkansas exhibits site-specific impacts because of historical resource extraction activities, including the extraction of petroleum products, brine, bromine, barite, gypsum, bauxite, gravel, and other products. Although timber is the major resource harvested in this area, no large-scale impairments from these activities have been identified in this area (ADEQ 2004).

The Ouachita Mountains Region has characteristically been described as a recreational region that possesses exceptionally high quality water. The predominant land use is silviculture, both in private timber companies and National Forest holdings. Some of the Ouachita Mountains have been plotted on a national-scale map as areas potentially sensitive to acidification (acid rain). Data are currently inconclusive concerning any impact on the region from acid precipitation. Additional concerns have been voiced by various groups and organizations regarding potential erosion and siltation as a result of management practices used in timber harvest. Periodic water quality monitoring data have not indicated significant impairments to the streams within this region. Occasional above-normal turbidity values have been observed during periods of significant rainfall events. Potential impairments to waters in this region include land clearing for pasture without protective riparian zones, in-stream gravel removal, resource extraction, and existing areas of confined animal production (ADEQ 2004).

The Arkansas River Valley Region exhibits distinct seasonal characteristics of its surface waters with zero flows common during summer critical conditions. Peak runoff events from within this region tend to introduce contaminants from the predominantly agricultural land use, which are primarily pasturelands with increasing poultry production. The development of natural gas has resulted in some site-specific water quality degradation. Soil types in much of this area are highly erosive and tend to easily go into colloidal suspension, thus causing long-lasting, high-turbidity values (ADEQ 2004).

The Boston Mountains Region, located in north central Arkansas, is sparsely populated. The dominant land use is silviculture, and much of the region is located within the Ozark National Forest. It is a high recreational use region with exceptionally high quality water. A large percentage of the streams from this region are designated as extraordinary resource waters. For example, the Buffalo National River originates in the Boston Mountain Region. Major concerns about potential water quality degradation include conversion of hardwoods to improved pastures, confined animal operations, even-aged timber management, and localized natural gas production. Current monitoring data from within this region continues to reflect high-quality water. Periodic, elevated levels of turbidity are noted in some waters in this region. This is most likely caused by clearing of timberland adjacent to major streams for conversion to pastures, which accelerates stream channel and bank erosion. In addition, secondary and tertiary road construction and maintenance and in-stream gravel removal contribute to turbidity problems (ADEQ 2004).

The Ozark Highlands Region, located in extreme northern Arkansas, is noted for its mountainous terrain, with steep gradients and fast-flowing, spring-fed streams. A large percentage of the streams from within this region are designated as extraordinary resource waters. The fractured limestone and dolomite lithology of the region allows a direct linkage from surface waters to ground waters. The water quality problems within this region are directly related to land use. The large human population increase in this area has also resulted in increased water contamination from infrastructure development as well as surface erosion from construction activities. Within this region are some of the highest animal production rates in the state. The waste generated from these animal production facilities is generally land applied and, therefore, has the potential to contaminate both surface and ground waters. The nutrient levels measured from this region are atypically high and are trending upward. Removal of gravel from the banks and beds

of streams is a frequent activity. This causes direct habitat destruction and greatly accelerates siltation problems within the streams (ADEQ 2004).

Arkansas surface waters are classified for specific designated uses. Approximately 1,833 miles (about 16 percent) of Arkansas' streams are classified as high-quality, outstanding state or national resources.

Impaired Water Bodies

Surface water quality problems are detailed in Arkansas' 2008 303(d) List of Impaired Water Bodies (EPA 2008). Although there are no impaired water bodies within BLM surface tracts in Arkansas, approximately 4,437 miles of stream within Arkansas were assessed as impaired. These waters will require the development of a Total Maximum Daily Load (TMDL), unless some other pollution control mechanism is implemented and future assessments indicate full attainment of water quality standards. To date, TMDLs have been developed for 732 miles of Arkansas' streams and 26,935 acres of Arkansas' lakes.

Surface Water Use

In 2005, the amount of water withdrawn from surface water sources in Arkansas was estimated to be 11,455 million gallons per day (Mgal/d) (Holland 2007). Power generation was the use category with the most surface water withdrawal, with 1,996 Mgal/day; followed by irrigation, with 1,323 Mgal/day; and public water supply, with 266 Mgal/day. Commercial and industrial uses combined for a total of 137 Mgal/day, and mining accounted for about one Mgal/day. In the 21 counties within the area of expected development of oil and gas, the total surface water withdrawal in 2005 was 1,660 Mgal/d, an average of 79 Mgal/day per county. The highest withdrawals were in Pope County, with 1,163 Mgal/day, and the lowest in Nevada County, with about a little more than one Mgal/day.

Ground Water

Shallow freshwater aquifer systems are found throughout Arkansas and supply an abundance of high-quality ground water for a wide range of users, including industrial, municipal, agricultural, and domestic users. Ground water is one of the most important sources of water supply in Arkansas and accounts for approximately 60 percent of the total water use in the state (ADEQ 2004).

Ground water in Arkansas occurs in two general geologic settings, which are represented by five major physiographic regions of the state: the Ozarks, the Arkansas River Valley, the Ouachita Mountains, the Gulf Coastal Plain, and the Mississippi Alluvial Valley. The Mississippi River Valley alluvial aquifer and the Sparta Aquifer are the most important aquifers in eastern Arkansas, together supplying more than 95 percent of the ground water used in this region of the State. The Sparta Aquifer is used mainly for municipal supply and industrial use, although declining levels in the alluvial aquifer in some areas have resulted in more frequent use of the Sparta Aquifer for irrigation uses (ADEQ 2004).

Ground water sources in the Interior Highlands (the Ozarks, the Arkansas River Valley, and the Ouachita Mountains) are important both as domestic and municipal supplies. The Roubidoux Formation and the Gunter Sandstone Member of the Van Buren Formation constitute the only significant aquifer systems in the Ozarks and are used extensively for municipal supply systems where surface-water sources are unavailable. Together these units may yield up to 500 gallons per minute to wells (ADEQ 2004).

Ground Water Quality and Use

Almost all of the surficial aquifers supply water of good to very good quality, ranging from calcium-bicarbonate to sodium-bicarbonate water types. Areas of poor water quality can result from both natural and anthropogenic sources. Natural sources of contamination are typically regional in extent and are related to water-rock interactions. Anthropogenic impacts include both point and nonpoint sources of contamination. Nonpoint sources can result in large areas of impact, although contaminant concentrations typically are significantly lower than point sources, and the contaminants typically represent soluble, non-reactive species. Point sources of contamination often result in elevated levels of contaminants that exceed federal maximum contaminant levels; however, the extent of contamination normally is confined to a small area, with little to no offsite migration or impact on receptors (ADEQ 2004).

In 2005, the amount of water withdrawn from ground water sources in Arkansas was estimated to be 7,510 Mgal/d (Holland 2007). Irrigation was the use category with the most ground water withdrawal, with 6,942 Mgal/day; followed by aquaculture, with 246 Mgal/day; and public water supply, with 138 Mgal/day. Commercial and industrial uses combined for a total of 69 Mgal/day, and mining accounted for less than one Mgal/day. In the 21 counties within the area of expected development of oil and gas, the total ground water withdrawal in 2005 was 1,361 Mgal/d, an average of 65 Mgal/day per county. The highest withdrawals were in Jackson County, with 383 Mgal/day, and the lowest in Johnson County, with less than one Mgal/day.

3.4.2 Florida Water Resources

Surface Water

Florida is divided into 29 major watersheds, containing 51,858 miles of rivers and streams (19,705 miles of perennial streams; 2,956 of intermittent streams; 25,909 miles of ditches and canals). Florida contains more than 7,700 lakes exceeding 10 acres, with a total surface area of 1,618,368 acres. The state also has 4,460 square miles of estuaries and more than 8,000 miles of coastline (FDEP 2008). Approximately 115 miles of rivers and streams and 2,336 acres of lakes and reservoirs occur within the 98,573 acres of FMO. Map 3-2 shows major watersheds and surface water bodies within Florida.

The state has more than 1,700 streams and rivers. The longest river entirely in the state is the St. Johns, which flows north as a recognizable stream about 273 miles from the St. Johns Marsh in northern St. Lucie County to its mouth at Jacksonville. The river drains a land area equal to about one-sixth of Florida's surface. The Apalachicola River, in the Florida Panhandle, has the largest discharge flow, averaging almost 25,000 cubic feet per second. Its basin, draining more than 19,000 square miles, extends to north Georgia's southern Appalachian Mountains (FDEP 2008).

Florida has several types of natural river systems. In north and northwest Florida, many rivers are alluvial. The Choctawhatchee, Apalachicola, and Escambia rivers best represent this type. Common features include a well-developed floodplain, levees, terraces, oxbows, and remnant channels (sloughs) that parallel the active riverbed.

There are many blackwater streams and rivers in Florida. Blackwater rivers usually have acidic, highly colored, slowly moving waters containing few sediments. These systems typically drain acidic flatwoods or swamps and are low in biological productivity. The upper Suwannee River and the north New River are good examples of blackwater rivers.

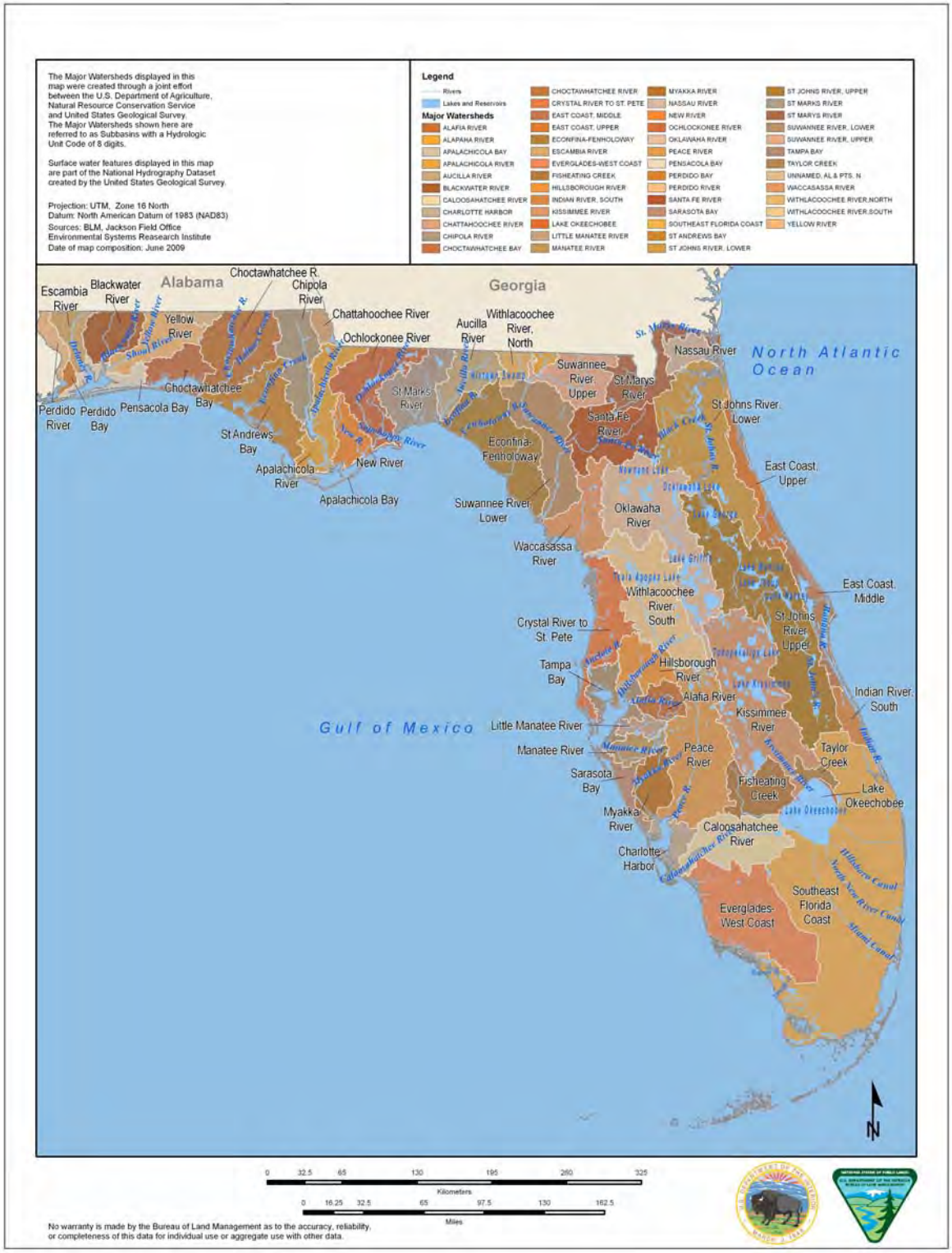
Many major river systems that originate as springs are found in central and north Florida, the Big Bend area of the Gulf coast, and the southern portion of the Tallahassee Hills. Chemically, these rivers are

clear, alkaline, and well buffered, with little temperature variation. They have relatively constant flows and little sediment. Their clear water encourages the growth of submerged plants that provide habitat for diverse animal species.

Florida has more than 7,700 lakes, which occupy close to six percent of its surface. The largest, Lake Okeechobee (covering 435,840 acres), is the ninth largest lake in surface area in the United States and the second largest freshwater lake wholly within the conterminous United States. Most of the state's lakes are shallow, averaging seven to 20 feet deep, although many sinkhole lakes and parts of other lakes can be much deeper. Many lakes are spring-fed; others are seepage lakes fed by ground water or depression lakes fed by surface water sources (FDEP 2008).

Florida's estuaries include embayments, low- and high-energy tidal salt marshes, lagoons or sounds behind barrier islands, mangrove swamps, coral reefs, oyster bars, and tidal segments of large river mouths. The Atlantic coast of Florida from the mouth of the St. Marys River to Biscayne Bay is a high-energy shoreline bordered by long stretches of barrier islands, behind which lie highly saline lagoons. This 350-mile stretch of coast contains only 18 river mouths and inlets. Biscayne Bay spans the transition from high- to low-energy shorelines, which are more typical of Florida's west coast. At the southern end of the state lie Florida Bay and the Ten Thousand Islands, both of which are dominated by mangrove islands fronting expansive freshwater marshes on the mainland. Many tidal creeks and natural passes connect the islands and marshes (FDEP 2008).

Map 3-2. Florida Major Watersheds and Surface Water



Florida's west coast has low relief, and the continental shelf extends seaward for many miles. Unlike the east coast, numerous rivers, creeks, and springs contribute to estuarine habitats. Generally, the west coast's estuaries are well-mixed systems with classically broad variations in salinity. They often lie behind barrier islands or at the mouths of rivers that discharge into salt marshes or mangrove-fringed bays. The Florida Panhandle from Apalachee Bay west to Pensacola Bay comprises high-energy barrier islands, with sand beaches fronting the Gulf of Mexico (FDEP 2008).

Major coastal and estuarine habitats vary from northern to southern Florida. Salt marshes dominate from Apalachicola Bay to Tampa Bay and from the Indian River Lagoon north to the Georgia state line. The estuaries west of Apalachicola Bay have few salt marshes. Mangrove swamps dominate the southern Florida coast. There are about 6,000 coral reefs between the city of Stuart on the Atlantic Coast south and west to the Dry Tortugas, while seagrasses are most abundant from Tarpon Springs to Charlotte Harbor and from Florida Bay to Biscayne Bay (FDEP 2008).

Florida has many varied types of wetlands, including estuarine Spartina and mangrove marshes, as well as freshwater sawgrass marshes, cypress swamps, and floodplain marshes. Wetlands compose almost one-third of the state (FDEP 2008). The following are the largest and most important in the state:

- The Everglades and the adjacent Big Cypress Swamp
- The Green Swamp in the state's central plateau
- The Big Bend coast from the St. Marks River to the (South) Withlacoochee River
- Vast expanses of Spartina marsh between the Nassau and St. Mary's rivers
- The system of the St. Johns River marshes
- The headwaters and floodplains of many rivers throughout the state, especially the Apalachicola, Suwannee, St. Johns, Ocklawaha, Kissimmee, and Peace rivers.

Surface Water Quality

In many areas, surface water quality has been degraded by industrial, residential, and agricultural land uses. Many point sources of pollution, such as sewage treatment plant discharges, have been eliminated, but contamination from widespread, diffuse nonpoint sources, such as urban development and agriculture, remains a problem (FDEP 2008). Table 3-9, Table 3-10, and Table 3-11 contain designated use support summaries for Florida streams, rivers, lakes, and estuaries.

Table 3-9. Individual Designated Use Support Summary for Florida Streams and Rivers

Designated Use	Total in State (miles)	Total Assessed (miles)	Supporting Designated Uses (miles)	Not Supporting Designated Uses (miles)	Insufficient Data (miles)
Potable Water Supplies	470	470	77	207	186
Shellfish Propagation	357	357	3	149	205
Recreation and Fish Protection	19,364	19,364	1,457	6,057	11,849

Source: 2008 Integrated Water Quality Assessment for Florida

Table 3-10. Individual Designated Use Support Summary for Florida Reservoirs and Lakes

Designated Use	Total in State (acres)	Total Assessed (acres)	Supporting Designated Uses (acres)	Not Supporting Designated Uses (acres)	Insufficient Data (acres)
Potable Water Supplies	502,579	502,579	0	490,853	11,726
Shellfish Propagation	0	0	0	0	0
Recreation and Fish Protection	993,362	993,362	51,273	470,762	471,348

Source: 2008 Integrated Water Quality Assessment for Florida

Table 3-11. Individual Designated Use Support Summary for Florida Estuaries

Designated Use	Total in State (acres)	Total Assessed (acres)	Supporting Designated Uses (acres)	Not Supporting Designated Use (acres)	Insufficient Data (acres)
Potable Water Supplies	0	0	0	0	0
Shellfish Propagation	1,516	1,516	0	1,516	0
Recreation and Fish Protection	2,155	2,155	48	2,088	19

Source: 2008 Integrated Water Quality Assessment for Florida

Along the coasts, water quality in many estuaries has deteriorated, habitat losses have affected commercial and recreational fisheries, and sediments in many urban estuaries contain heavy metals and organic contaminants. Consumption advisories have been issued because tissues in a number of freshwater and saltwater fish species in many waters contain excessive concentrations of mercury (FDEP 2008).

Florida has a low percentage of support for designated use (i.e., meeting established water-quality criteria for a designated use classification) for surface waters. Changes in water quality over time are an important indicator of the health of surface waters. Of 823 rivers/streams, lakes, estuaries, and coastal waters evaluated from 1997 to 2007, about 54 percent were stable, about 22 percent were improving (in urban areas, because of improved wastewater and stormwater treatment), and about 24 percent were degrading (in agricultural areas, the Suwannee River Basin, and areas of urban growth) (FDEP 2008).

Trends in Florida lakes between 1997 and 2007 were specifically analyzed, and there were sufficient data for trend analysis for 349 lakes. Of these 349 lakes, 92 were improving, 141 were stable, and 116 were degrading. Trends were unknown (FDEP 2008) for 954 lakes.

Impaired Water Bodies

Surface water quality problems are detailed in Florida's 1998 303(d) list of impaired water bodies and the adopted 303(d) lists for 2002 through 2007 (FDEP 2007b). According to these lists, no impaired water bodies are located on BLM public lands in Florida.

With 100 percent of the state evaluated, it can be shown that approximately 2,565 TMDLs will be required for 1,688 Florida waters. Because TMDLs are developed for individual pollutants, a water body may have multiple TMDLs. To date, the FDEP has developed, proposed, or adopted 322 TMDLs for 166 water bodies (FDEP 2008).

Surface Water Use

Surface water is among Florida's most valued resources. The State has more than 1,700 streams and rivers, 7,800 freshwater lakes, 700 springs, and 11 million acres of wetlands. Although renewable, these water resources are finite. Continued growth in population, tourism, and agriculture will increase the demands on these water supplies. The permanent population of Florida in 2005 totaled 17.9 million, ranking fourth in the Nation, and nearly 86 million tourists visited the State. In 2005, Florida harvested two-thirds of the total citrus production in the United States and ranked fifth in the Nation in net farm income. Freshwater is vital for sustaining Florida's population, economy, and agricultural production (U.S. Geological Survey [USGS] 2005b).

Fresh surface-water withdrawals for 2005 in Florida were 2,626 Mgal/d. Agricultural irrigation and public supply withdrew the largest amount of freshwater in 2005, withdrawing 2,766 and 2,540 Mgal/d, respectively. Public supply gross per capita water use in Florida for 2005 was 158 gallons per day. The South Florida Water Management District withdrew the largest amount of freshwater in 2005 with 3,461 Mgal/day (USGS 2005b).

Ground Water

Florida is in the Coastal Plain physiographic province, which is blanketed by surficial sands and underlain by a thick sequence of bedded limestone and dolomite. Together the surficial sands, limestone, and dolomites form an enormous ground water reservoir that provides proportionally larger quantities of ground water than in any other state.

The following five aquifer systems provide Florida with significant sources of drinking water:

- The Floridan aquifer system is one of the highest producing aquifers in the world. It extends across all of Florida, southern Georgia, and adjoining parts of Alabama and South Carolina. This aquifer system comprises a sequence of limestone and dolomite (FDEP 2009).
- The surficial aquifer system, found over much of the state, includes any otherwise undefined aquifers that are found at land surface. This system is generally under unconfined, or water-table, conditions and is made up of mostly unconsolidated sand, shelly sand, and shell (FDEP 2009).
- The Biscayne aquifer, located in southeast Florida, consists of highly permeable limestone and less permeable sand and sandstone. The northern part of the aquifer has more sand and grades northward and westward into the sandy deposits that are part of the surficial aquifer system. In most places, the highly permeable rocks of the Biscayne aquifer are covered by a thin veneer of porous soil, and aquifer water levels rise rapidly in response to rainfall (FDEP 2009).
- The sand and gravel aquifer, located in the western part of the Florida Panhandle, consists of sand and gravel with interbedded layers of silt and clay. The clay layers form local confined conditions within the aquifer (FDEP 2009).
- Intermediate aquifer system, located in southwestern Florida, lies between the surficial aquifer system and the Floridan aquifer. The intermediate aquifer system starts in Hillsborough and Polk counties and extends south through Collier County. The aquifer system is under confined conditions and is mainly composed of permeable layers of sand, shell, and limestone separated by clay confining units (FDEP 2009).

Ground Water Quality and Use

The overall quality of ground water in Florida is good. Many public water systems and private water wells are used without any extensive treatment. However, there are ground water quality issues in specific areas. Information regarding specific contaminants in Florida's ground water is included in the *Integrated Water Quality Assessment for Florida: 2008 305(b) Report and 303(d) List Update* (FDEP 2008).

The EPA's *2004 Florida Source Water Assessment* (FDEP 2008) identified the top five potential sources of contamination in Florida: underground storage tanks (not leaking); gasoline service stations (including historical gas stations); municipal sanitary waste treatment and disposal (commercial, domestic, and industrial waste), known contamination sites/plumes; and dry-cleaning facilities. Several of these have commonly been the focus of waste cleanup and monitoring activities in Florida. However, there are also instances where ground water has been degraded as the result of nonpoint activities.

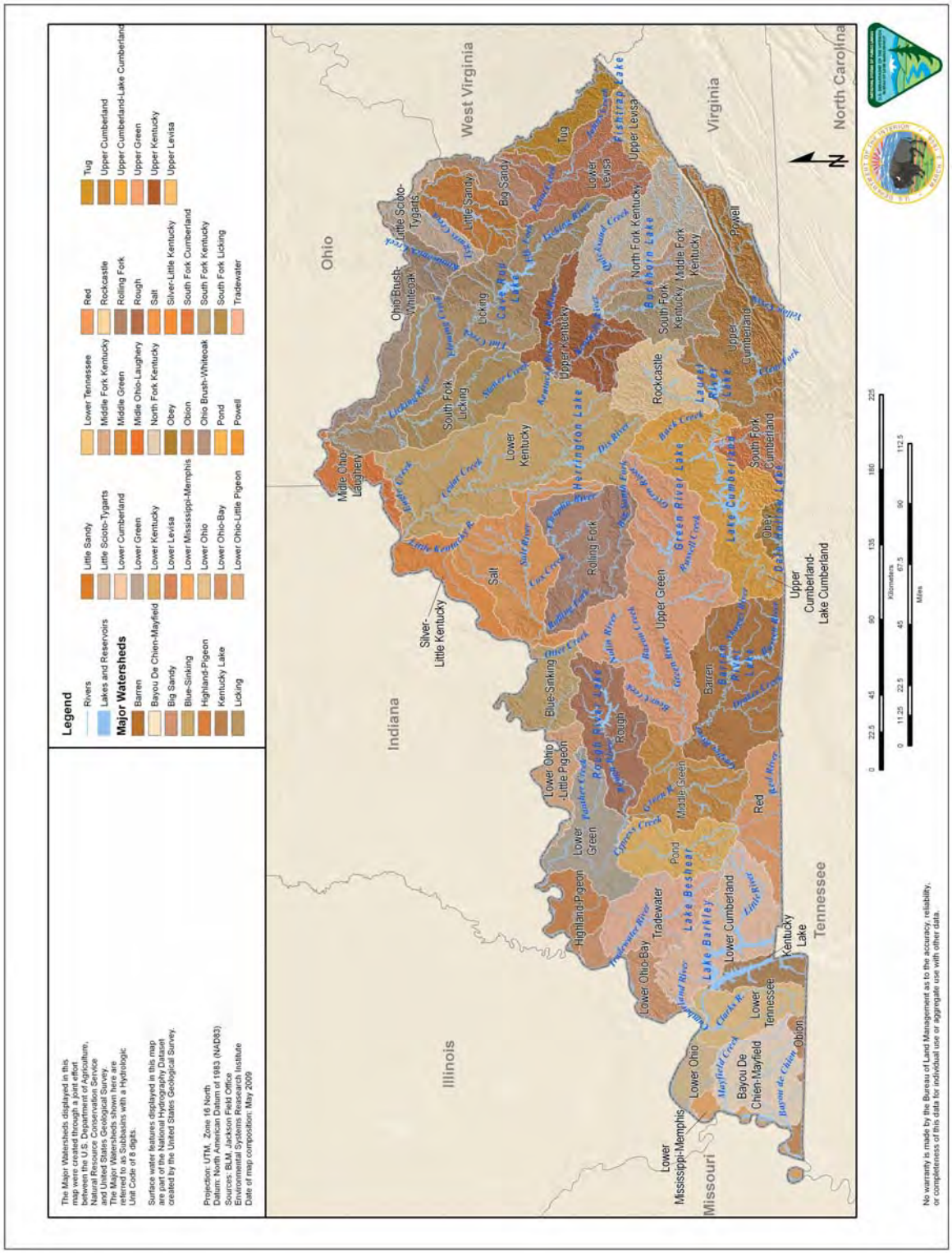
The vast majority of the public water systems in Florida use ground water as their source. There are approximately 12,000 wells associated with ground water systems used for public water supply in Florida (FDEP 2009). These wells produce water from the five major aquifers or aquifer systems. These sources of high-quality, potable ground water underlying virtually all of Florida supported average withdrawals of more than 5,078 Mgal/d in 2000. Ground water resources supply more than 50 percent of all water needs, including agricultural, industrial, mining, and electric power generation (FDEP 2008).

3.4.3 Kentucky Water Resources

Surface Water

Kentucky is divided into 12 major watershed basins containing 90,961 miles of rivers and streams and 229,500 acres of publicly owned reservoirs and lakes. Map 3-3 shows the major watersheds and surface water bodies. Approximately 324,000 acres wetlands also occur in Kentucky (KEPPC 2008).

Map 3-3. Kentucky Major Watersheds and Surface Water



Surface Water Quality

Numerous surface waters in Kentucky meet established water quality criteria for designated use classifications. Table 3-12 and Table 3-13 summarize designated use support. Roughly 921 miles of rivers and streams and 110,098 acres of lakes and reservoirs occur within the 338,757 acres of FMO in Kentucky.

Table 3-12. Individual Designated Use Support Summary for Kentucky Streams and Rivers

Designated Use	Total in Commonwealth (miles)	Total Assessed (miles)	Supporting Designated Uses (miles)	Not Supporting Designated Uses (miles)
Warm Water Aquatic Habitat	10,193	9,170	4,768	4,399
Cold Water Aquatic Habitat	365	361	286	75
Fish Consumption	10,553	1,245	805	440
Primary Contact Recreation	10,533	4,493	1,346	3,148
Secondary Contact Recreation	10,553	1,868	1,295	573
Drinking Water	869	684	684	0

Source: KEPPC 2008

Table 3-13. Individual Designated Use Support Summary for Kentucky Reservoirs and Lakes

Designated Use	Water Body Type	Total in Commonwealth (acres)	Total Assessed (acres)	Supporting Designated Uses (acres)	Not Supporting Designated Uses (acres)
Warm Water Aquatic Habitat	Reservoir	219,135	217,811	209,093	8,781
	Lake	571	571	342	229
Cold Water Aquatic Habitat	Reservoir	2,410	2,410	2,410	0
Fish Consumption	Reservoir	216,135	204,664	112,209	92,455
	Lake	571	63	0	63
Primary Contact Recreation	Reservoir	219,135	62,149	61,930	219
	Lake	571	0	0	0
Secondary Contact Recreation	Reservoir	219,135	213,497	200,773	12,724
	Lake	571	317	317	0
Domestic	Reservoir	194,217	192,692	191,031	1,661

Designated Use	Water Body Type	Total in Commonwealth (acres)	Total Assessed (acres)	Supporting Designated Uses (acres)	Not Supporting Designated Uses (acres)
Water Supply					

Source: KEPPC 2008

The leading causes for designated nonsupport of Kentucky rivers and streams are sedimentation, fecal coliform and *E. coli*, nutrient/eutrophication indicators, habitat, and unknown causes. The leading sources of these impairments are habitat-related, agriculture, urban or municipal, mining, and unknown sources. In Kentucky's lakes and reservoirs, mercury in fish tissue, agriculture-related sources, municipal point sources, and septic systems are the most commonly identified sources of impairments. Low dissolved oxygen also has been identified as a major problem in Kentucky's lakes and reservoirs. This condition is caused by excess nutrients during daylight hours as photosynthesis from excess algae occurs (KEPPC 2008).

The water quality of Kentucky rivers and streams is decreasing compared with past water quality reports. The following is a breakdown of the changes in designated use support over the past several years:

- **Aquatic Life Designated Uses:** The number of river/stream miles that do not support this use has increased by 33 percent compared with the number reported in Kentucky's 2004 305(b) Report (KEPPC 2008).
- **Fish Consumption Designated Use:** The number of river/stream miles that do not support this use has decreased by 23 percent compared with the number reported in Kentucky's 2006 Integrated Report. However, this is attributed to removing the Ohio River stream miles from this assessment (KEPPC 2008).
- **Primary Contact Recreation (Swimming):** The number of river/stream miles that do not support this use has increased by 46.4 percent compared with the number reported in Kentucky's 2006 *Integrated Report* (KEPPC 2008).
- **Secondary Contact Recreation:** The number of river/stream miles that do not support this use has increased by 50.4 percent compared with the number reported in Kentucky's 2006 Integrated Report (KEPPC 2008).

Impaired Water Bodies

Kentucky's 2008 303(d) *List of Impaired Waters* details surface water quality problems (EPA 2008). A total of 6,286 stream and river miles are identified as Category 5, which are waters that are impaired or threatened and need TMDLs for the identified pollutants. These waters are placed on the 303(d) list. A total of 88,040 lake acres have been identified as Category 5.

Surface Water Use

Surface sources provide about 95 percent of the water used in Kentucky. About 2.6 million Kentuckians are served by surface water sources. Surface water provides domestic water supplies for 92 percent of Kentucky's urban population and for about half of Kentucky's rural population. Some of the major uses of surface water in Kentucky are agriculture, public water, and irrigation.

Ground Water

Naturally occurring potable ground water is found throughout Kentucky, although quantities available for use vary considerably as controlled by regional geologic characteristics. Kentucky's ground water resources exist in four aquifer types: alluvial deposits, karst flow systems, unconsolidated sediments of

the Jackson Purchase area, and fractured bedrock. High-yielding alluvial deposits are typical of the Ohio and Mississippi river valleys that comprise Kentucky's northern and western borders. Karst occurs in approximately 50 percent of Kentucky and is characterized by numerous shallow conduit-flow systems of generally limited extent. The most extensive karst aquifers are in the Pennyroyal region of western Kentucky. Karst aquifers are present, but less well developed, in the Inner Bluegrass region. The availability of ground water in karst areas is highly variable and generally supports public and domestic supplies. Locally, it may support agriculture and industry. In the western and eastern coal field regions, wells in fractured sedimentary rocks generally provide sufficient water for domestic use. The unconsolidated sediments of the Jackson Purchase region are prolific aquifers, supporting widespread domestic, industrial, agricultural, and public water systems (GWPC 2009c).

Ground Water Quality and Use

High levels of naturally occurring iron and sulfur continue to impact private wells, producing aesthetic problems for well owners in many parts of the commonwealth, especially eastern Kentucky. Bacteria occurrence remains common in wells, usually indicating potential sanitary problems. The high levels of iron, sulfur, and bacteria commonly result from a lack of proper well maintenance, but in most circumstances, they are preventable and treatable (GWPC 2009c).

Disruption of ground water use because of contamination has occurred locally but has been uncommon. Currently, 2,746 sites have known or suspected ground water contamination, including 2,431 underground storage tank sites, 45 solid waste sites, 228 commonwealth and federal Superfund sites, and 42 hazardous waste sites with ground water contamination. Kentucky recently developed a broad-based remediation program that applies to contaminated sites, including brownfields. This program should significantly reduce the number of contaminated sites during the next several years (GWPC 2009c).

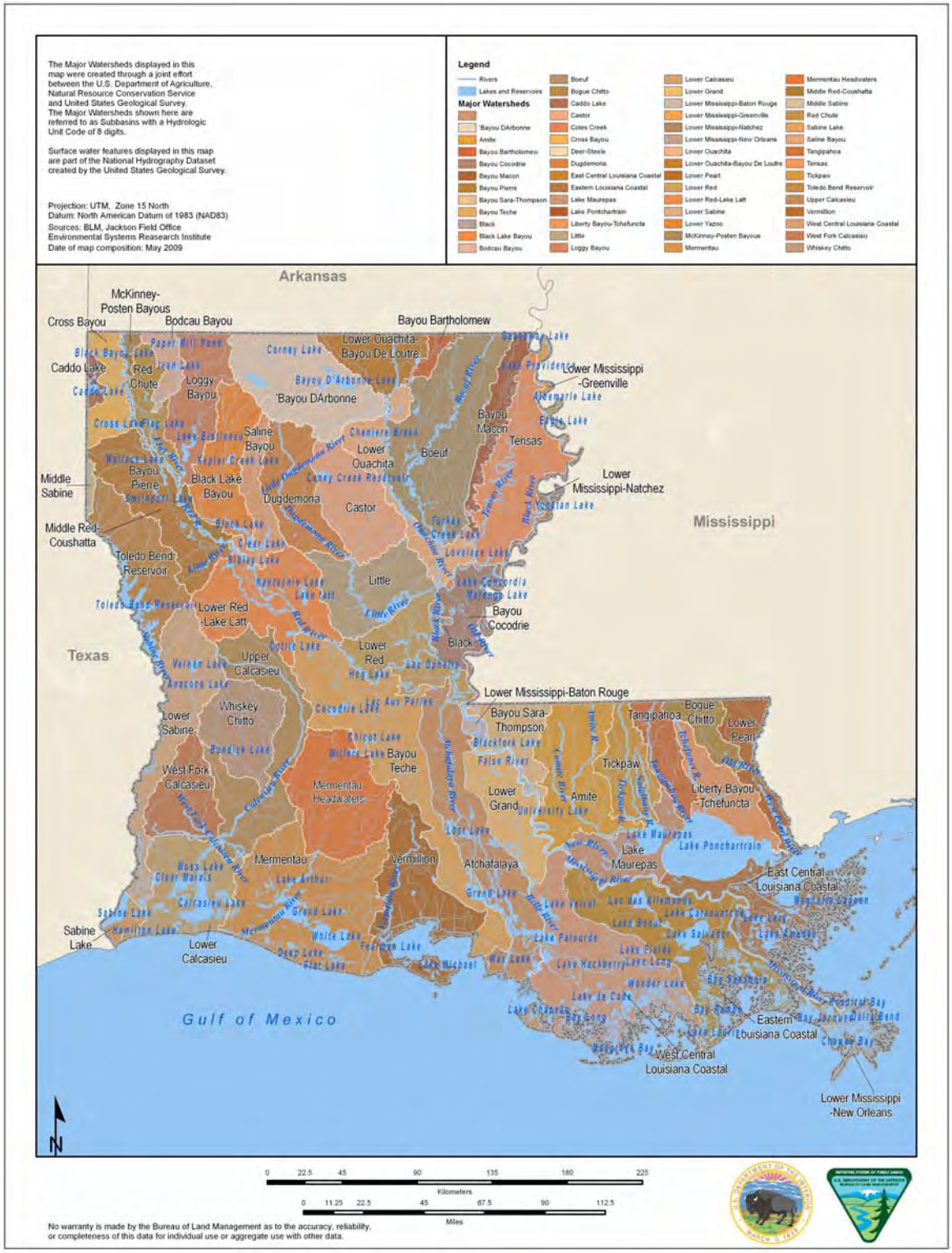
Kentucky's ground water is an important source of drinking water and use for industry and irrigation. Ground water also contributes significant recharge to streams (GWPC 2009c).

3.4.4 Louisiana Water Resources

Surface Water

Louisiana is divided into 52 major watershed basins, containing 66,294 miles of rivers and streams (32,955 miles of perennial streams, 20,667 miles of intermittent streams, and 12,672 miles of ditches and canals) and 1,078,031 acres of reservoirs and lakes. There also are approximately 5,550,951 acres of fresh and tidal wetlands and 4,899,840 acres of estuaries in Louisiana (LDEQ 2006). Approximately 2.1 miles of rivers and streams and 42 acres of lakes and reservoirs occur within the 738 acres of BLM-administered surface tracts in Louisiana. Approximately 561 miles of rivers and streams and 17,564 acres of lakes and reservoirs occur within the 156,887 acres of FMO. Map 3-4 contains major watersheds and water bodies within Louisiana.

Map 3-4. Louisiana Major Watersheds and Surface Water



Surface Water Quality

A large number of surface waters in Louisiana meet established water quality criteria for designated use classifications. Table 3-14, Table 3-15, Table 3-16, and Table 3-17 provide a summary of designated use support.

Table 3-14. Summary of Designated Use Support for Louisiana Rivers and Streams

Designated Use	Fully Supporting (miles)	Not Fully Supporting (miles)	Insufficient Data (miles)	Not Assessed (miles)	Total for Designated Use (miles)
Primary Contact Recreation	7,398	1,636	76	70	9,179
Secondary Contact Recreation	9,017	239	0	88	9,344
Fish and Wildlife Propagation	2,515	6,679	0	67	9,262
Drinking Water Source	1,050	426	0	12	1,488
Outstanding Natural Resource	995	582	0	10	1,587
Oyster Propagation	264	206	0	0	470
Agriculture	1,719	0	0	325	2,044
Limited Aquatic Life/Wildlife	19	63	0	0	82

Source: 2008 Louisiana Water Quality Inventory: Integrated Report, Fulfilling Requirements of the Federal Clean Water Act, Sections 305(b) and 303(d).

Table 3-15. Summary of Designated Use Support for Louisiana Lakes

Designated Use	Fully Supporting (acres)	Not Fully Supporting (acres)	Insufficient Data (acres)	Not Assessed (acres)	Total Designated Use (acres)
Primary Contact Recreation	619,129	38,039	832	2,322	660,322
Secondary Contact Recreation	631,120	26,880	0	2,322	660,322
Fish and Wildlife Propagation	22,921	635,079	0	2,322	660,322
Drinking Water Source	249,027	2,690	12,909	38	264,664
Agriculture	425,672	0	0	326	425,998

Source: 2008 Louisiana Water Quality Inventory: Integrated Report, Fulfilling Requirements of the Federal Clean Water Act, Sections 305(b) and 303(d).

Table 3-16. Summary of Designated Use Support for Louisiana Estuaries

Designated Use	Fully Supporting (miles^2)	Not Fully Supporting (miles^2)	Insufficient Data (miles^2)	Not Assessed (miles^2)	Total Size for Designated Use (miles^2)
Primary Contact Recreation	4,950	4	0	0	4,954
Secondary Contact Recreation	4,954	0	0	0	4,954
Fish and Wildlife Propagation	3,130	1,824	0	0	4,954
Oyster Propagation	3,422	846	0	0	4,268

Source: 2008 Louisiana Water Quality Inventory: Integrated Report, Fulfilling Requirements of the Federal Clean Water Act, Sections 305(b) and 303(d).

Table 3-17. Summary of Designated Use Support for Louisiana Wetlands

Designated Use	Fully Supporting (acres)	Not Fully Supporting (acres)	Insufficient Data (acres)	Not Assessed (acres)	Total of Designated Use (acres)
Primary Contact Recreation	1,017,600	7,680	0	0	1,025,280
Secondary Contact Recreation	1,029,760	0	0	47,293	1,077,053
Fish and Wildlife Propagation	622,720	402,560	0	51,773	1,077,053
Drinking Water Supply	464,000	0	0	0	464,000

Source: 2008 Louisiana Water Quality Inventory: Integrated Report, Fulfilling Requirements of the Federal Clean Water Act, Sections 305(b) and 303(d).

Impaired Water Bodies

Based on the 2008 analysis, and excluding mercury sources and natural conditions, the majority of water quality impairments in Louisiana are the result of improperly treated sewage and agriculture, with 194 and 141 occurrences of these two categories, respectively. Sewage discharges may come from large municipal sewage treatment systems but more often result from home sewage treatment systems and small community or neighborhood systems. Other sources of bacteria and nutrients include agricultural pasture areas, dairy farms, or concentrated animal feeding areas (LDEQ 2008).

Many of Louisiana's water bodies remain impaired for the designated use of fish and wildlife propagation. This is largely because there are many possible causes and sources of impairment affecting

this use. Any one of these causes can result in a water body being considered impaired for fish and wildlife propagation. There are more than 30 different suspected causes of impairment reported as affecting fish and wildlife propagation. With the exception of mercury, all of the top eight suspected causes of impairment generally can be related to what are known as nonpoint sources of pollution. The remaining causes of impairment generally are related to various forms of industry, small business, or municipal sources (LDEQ 2008).

Surface Water Use

In 2005, the amount of water withdrawn from surface water sources in Louisiana was estimated to be 8,700 Mgal/d (Sargent 2007). Power generation was the use category with the most ground water withdrawal, with 5,139 Mgal/day; followed by industrial use with, 2,843 Mgal/day; public supply, with 365 Mgal/day; and irrigation, with 308 Mgal/day. Surface water use for oil and gas extraction was three Mgal/day and was included as part of the industrial use category. In the 22 parishes within the area of expected development of oil and gas, the total surface water withdrawal in 2005 was 3,911 Mgal/d, an average of 178 Mgal/day per parish. The highest withdrawals were in Saint Charles Parish, with 3,103 Mgal/day, and the lowest in Saint Helena Parish with a little more than one Mgal/day.

LDEQ recognizes three primary designated uses for most waters of the commonwealth. These are primary contact recreation (swimming), secondary contact recreation (boating), and fish and wildlife propagation (fishing). The sizes of water bodies classified for these and other designated uses are shown in Table 3-18.

Table 3-18. Total Sizes of Louisiana Water Bodies Classified for Various Designated Uses

Classified Uses	Water Body Type			
	River (miles)	Lakes (acres)	Estuaries (square miles)	Wetlands (acres)
Primary Contact Recreation	9,321	660,284	4,954	1,025,280
Secondary Contact Recreation	9,490	660,284	4,954	1,036,288
Fish and Wildlife Propagation	9,408	660,284	4,954	1,036,288
Drinking Water Supply	1,311	251,717	0	464,000
Oyster Propagation	547	0	4,268	0
Agriculture	2,041	425,998	0	0
Outstanding Natural Resource	1,587	0	0	0
Limited Aquatic Life and Wildlife	82	0	0	0

Source: 2006 Louisiana Water Quality Inventory: Integrated Report, Fulfilling Requirements of the Federal Clean Water Act, Sections 305(b) and 303(d).

Ground Water

There are 13 major aquifers or aquifer systems underlying Louisiana: Red River Alluvial Aquifer, Mississippi River Alluvial Aquifer, Upland Terrace Aquifer (northern Louisiana), Chicot Aquifer System, Chicot Equivalent Aquifer System (southeastern Louisiana), Evangeline Aquifer, Evangeline Equivalent Aquifer System (southeastern Louisiana), Jasper Aquifer Systems, Jasper Equivalent Aquifer System (Southeastern Louisiana), Catahoula Aquifer, Cockfield Aquifer, Sparta Aquifer, and the Carrizo-Wilcox Aquifer. The Chicot, Evangeline, and Jasper Equivalent Aquifer Systems in southeastern Louisiana collectively make up what is known as the Southern Hills Aquifer System (GWPC 2009b).

Ground Water Quality and Use

The results of the Baseline Monitoring Program indicate that water quality is good in Louisiana aquifers. Although the overall quality of the state's ground water is good, more than 200 sites are undergoing active investigation or remediation of contaminated ground water, not including underground storage tank or Superfund sites. There also were 14 public water supply systems affected by VOC contamination of ground water between 1989 and 2002 (GWPC 2009b).

In 2005, the amount of water withdrawn from ground water sources in Louisiana was estimated to be 1,600 Mgal/d (Sargent 2007). Irrigation was the use category with the most ground water withdrawal, with 684 Mgal/day; followed by public supply with 354Mgal/day; and industrial use, with 267 Mgal/day. Ground water use for oil and gas extraction was three Mgal/day and was included as part of the industrial use category. In the 22 parishes within the area of expected development of oil and gas, the total ground water withdrawal in 2005 was 252 Mgal/d, an average of 11 Mgal/day per parish. The highest withdrawals were in East Carroll Parish, with 36 Mgal/day, and the lowest in Plaquemines Parish with less than one Mgal/day.

3.4.5 Tennessee Water Resources

Surface Water

Tennessee is divided into 55 hydrologic watershed boundaries, containing 60,417 miles of rivers and streams and more than 570,000 acres of reservoirs and lakes. Approximately 787,000 acres of wetlands remain in Tennessee, a 60-percent loss from historical acreage (TDEC 2008a). Approximately 51 miles of rivers and streams and 20,429 acres of lakes and reservoirs occur in the 52,558 acres of FMO in Tennessee. Map 3-5 shows major watersheds and water bodies within Tennessee.

Surface Water Quality

A large number of surface waters in Tennessee meet established water quality criteria for designated use classifications. About 62 percent of assessed streams and 68 percent of assessed reservoir acres are fully supporting of designated uses. The remainder of the assessed water bodies are impaired to some degree and, therefore, not supporting of all designated uses. Table 3-19 and Table 3-20 provide a summary of designated use support.

Table 3-19. Individual Classified Use Support for Tennessee Rivers and Streams

Designated Uses	Streams Classified (miles)	Classified Assessed (miles)	Meeting Use (miles)	Percentage of Assessed Miles Meeting Use
Fish and Aquatic	60,417	30,471	21,308	70%

Designated Uses	Streams Classified (miles)	Classified Assessed (miles)	Meeting Use (miles)	Percentage of Assessed Miles Meeting Use
Life Protection				
Recreation	60,417	15,400	9,420	61%
Irrigation	60,417	30,942	30,942	100%
Livestock Watering and Wildlife	60,417	30,966	30,962	99%
Domestic Water Supply	3,691	3,379	3,354	99%
Navigation	383	0	0	100%
Industrial Water Supply	3,386	3,225	3,225	100%

Source: USFWS

Table 3-20. Individual Classified Use Support for Tennessee Reservoirs and Lakes

Designated Uses	Areas Classified	Classified Assessed (acres)	Meeting Use (acres)	Percentage of Assessed Acres Meeting Use
Fish and Aquatic Life Protection	572,165	563,904	523,202	93%
Recreation	572,165	565,125	398,289	70%
Irrigation	572,165	563,904	563,904	100%
Livestock Watering and Wildlife	572,165	561,795	561,795	100%
Domestic Water Supply	529,183	526,864	526,864	100%
Navigation	290,471	1,971	1,971	100%
Industrial Water Supply	428,991	428,976	428,976	100%

Source: USFWS

The most common causes of pollution in rivers and streams are sediment/silt, habitat alteration, pathogens, and nutrients. The main sources of these pollutants are agriculture, hydrologic modification, municipal dischargers, and construction. The leading causes of pollution in reservoirs and lakes are metals; dissolved oxygen; and organic substances, such as polychlorinated biphenyls (PCB), dioxins, and chlordane. The principal sources of problems in reservoirs and lakes are the historical discharge of pollutants that have accumulated in sediment and fish flesh, plus atmospheric deposition. Other sources include agriculture, hydrologic modifications, municipal dischargers, and construction (TDEC 2008a).

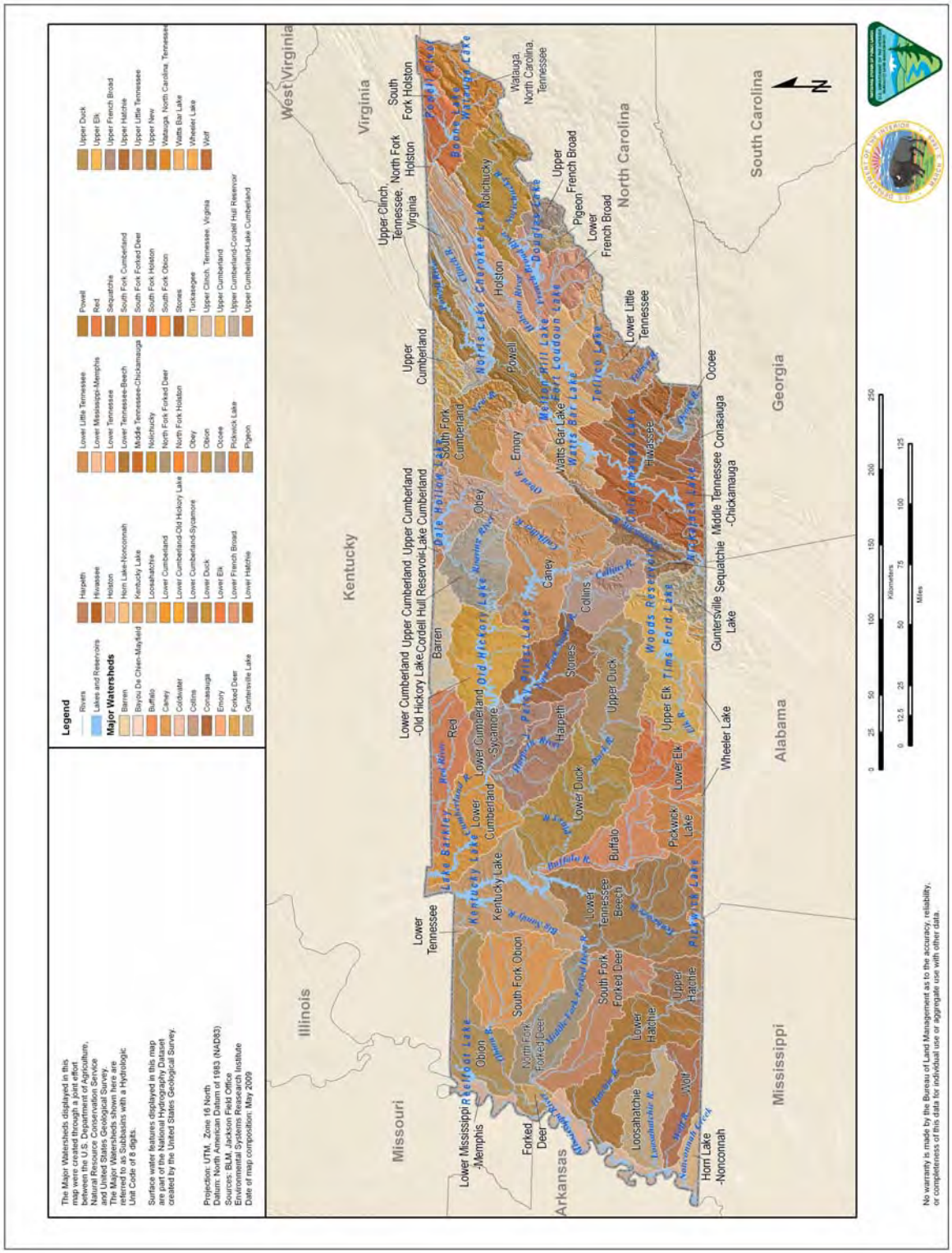
It is estimated that Tennessee has lost more than one million acres of wetlands over the last century. The largest single cause of impact on those wetlands was channelization and drainage for agricultural conversion. Today, approximately 787,000 acres of wetlands remain in Tennessee, which is a 60-percent loss from historical acreage. Land development and transportation projects contribute to most of the pollution and are a significant cause of impacts on wetlands. Historical industrial activities have contaminated a few wetlands.

Impaired Water Bodies

Tennessee's 2008 303(d) *List of Impaired Waters* details surface water quality problems (TDEC 2008c). A total of 9,414 stream miles (16 percent of assessed streams) are identified as Category 5, which are waters that are impaired or threatened and need TMDLs for the identified pollutants. These waters are placed on the 303(d) list. A total of 181,925 lake acres (31.8 percent of assessed lakes) have been identified as Category 5.

Of Tennessee's existing wetland acres, seven percent, or 54,811 acres, are considered impaired. However, no mechanism exists to accurately measure the loss or gain of wetlands in Tennessee (TDEC 2008a).

Map 3-5. Tennessee Major Watersheds and Surface Water



Surface Water Use

All streams, rivers, lakes, and reservoirs in Tennessee are classified for at least two public uses: protection of fish and aquatic life and recreation. Most water bodies are also classified for irrigation, livestock watering, and wildlife. Three additional classifications apply to specific water bodies. The drinking water supply designation is assigned to water bodies currently or likely to be used as domestic water sources in the future. The navigation and industrial water supply classifications are usually limited to waters currently being used for those purposes but can be expanded to other waters as needed (TDEC 2008a).

Ground Water

The ground water system in Tennessee comprises regional aquifers. Ground water provides a large amount of the state's public water supply. Memphis is one of the largest cities in the world that relies on ground water for its public water supply. Ground water is contained in nine main aquifers: the Alluvial Sand Aquifer, Confined Tertiary Sand Aquifer, Unconfined Tertiary Sand Aquifer, Ordovician Carbonate Aquifer, Cambrian-Ordovician Carbonate Aquifer, Crystalline Rock Aquifer, Pennsylvanian Sandstone Aquifer, Mississippian Carbonate Aquifer, and Cretaceous Sand Aquifer (TDEC 2008a).

Ground Water Quality and Use

Tennessee has an abundance of high-quality ground water and a good quantity of ground water. With localized exceptions, Tennessee's ground water is still of good quality as evidenced by the number of public water systems using ground water in Tennessee and the dozen or more bottled water facilities. There have been a limited number of incidences of contamination of public water systems across the state (TDEC 2008b).

The vulnerability of Tennessee's ground water sources is linked to the geology of the state. Ground water can be quite vulnerable to contamination, particularly in karst terrain (limestone characterized by caves, sinkholes, and springs) and in unconfined sand aquifers. This vulnerability is particularly true for contamination from the highly mobile and widely used VOCs such as chlorinated solvents and gasoline components (TDEC 2008b).

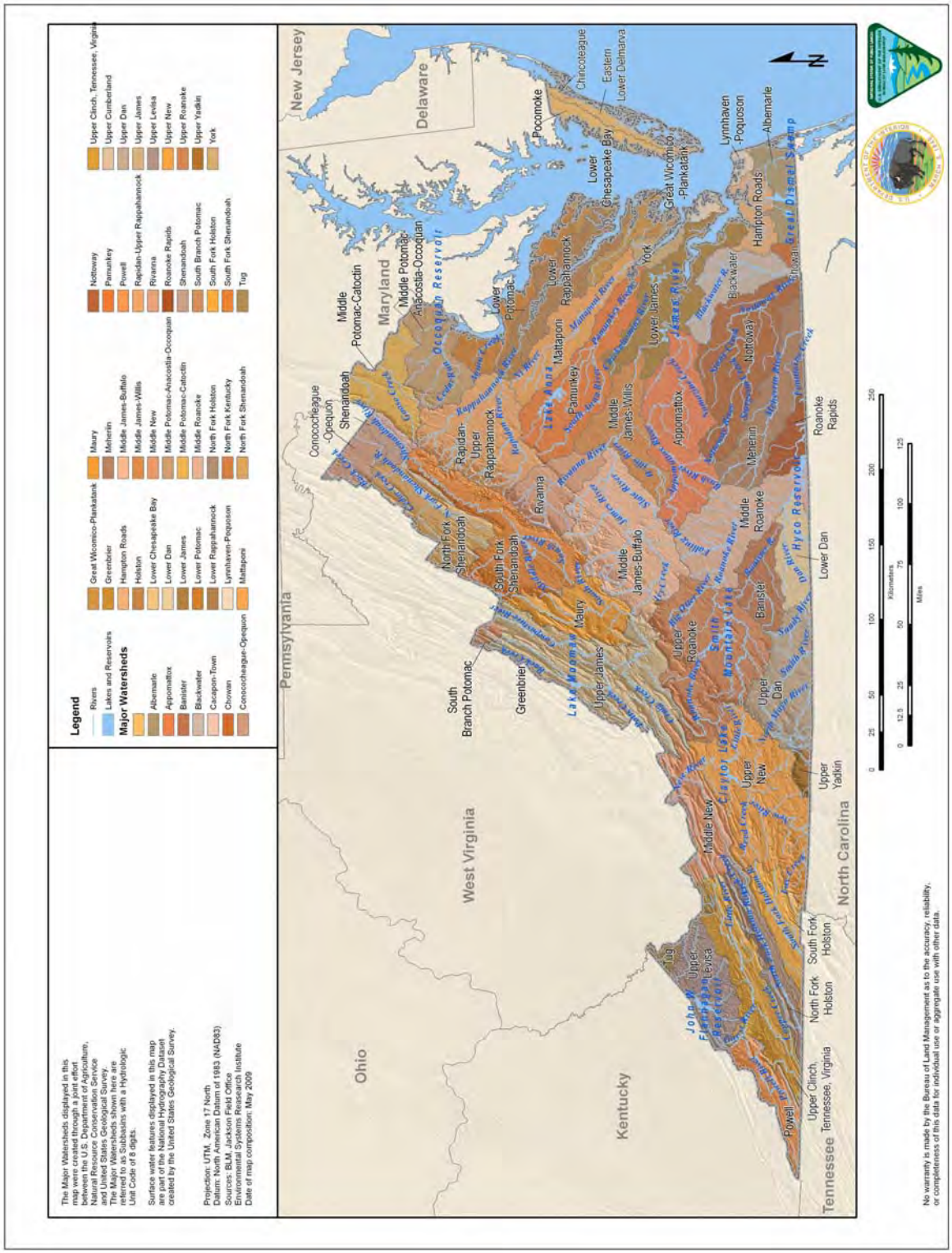
Although Tennessee has abundant sources of ground water, several counties in the state have current or long-term issues with water supply. With increasing water needs throughout the state and continuation of ground water contamination, overall water supply is becoming an issue in Tennessee. Failing septic tanks and dumping of garbage and other wastes in sinkholes are common causes of ground water contamination (TDEC 2008a).

3.4.6 Virginia Water Resources

Surface Water

Virginia is divided into nine major river basins containing 51,016 miles of perennial rivers and streams and approximately 2,305 square miles of estuaries. These nine basins are the Potomac-Shenandoah, James River, Rappahannock River, Roanoke River, Chowan River-Dismal Swamp, Tennessee-Big Sandy River, Chesapeake Bay and Small Coastal, York River, and New River Basins. Virginia contains approximately 114,884 acres of lakes and reservoirs (VDEQ 2008). Approximately 5 miles of rivers and streams occur within the 804 acres of the Meadowood SRMA, the BLM-administered surface tract in Virginia. Approximately 58 miles of rivers and streams and 1,293 acres of lakes and reservoirs occur within the 13,380 acres of FMO. Map 3-6 shows major watersheds and water bodies within Virginia.

Map 3-6. Virginia Major Watersheds and Surface Water



The Potomac-Shenandoah Basin comprises the Shenandoah River Subbasin and the Potomac River Subbasin. It occupies the northern portion of Virginia and covers 5,747 square miles. The Shenandoah River Subbasin headwaters begin in Augusta County and flow in a northeasterly direction for approximately 100 miles to the West Virginia state line. Approximately 45 percent of the land in this subbasin is forested, 39 percent is farmland and pasture, and 16 percent is urban. The Potomac River Subbasin headwaters begin in Highland County. The river then flows in a northeasterly direction through West Virginia and Maryland before joining the Shenandoah at Harper's Ferry, West Virginia (VDEQ 2008). The BLM surface tract in Virginia, Meadowood SRMA, is located in the Middle Potomac Anacostia Occoquan watershed within the Potomac River Subbasin.

Surface Water Quality

Virginia has a low percentage of support for designated use for surface waters. Table 3-21 provides a summary of designated use support.

Table 3-21. Summary of Overall Individual Use Support for Virginia Water Bodies

Designated Use	Water Body Type	Fully Supporting	Total Impaired	Naturally Impaired	Insufficient Information	Not Assessed	Size Assessed
Aquatic Life	River (mi.)	9,988	4,154	1,175	1,271	35,603	14,142
	Lake (acres)	52,266	59,528	2,954	90	3,951	111,794
	Estuary (sq. mi.)	93	2,155	2	9	48	2,248
Fish Consumption	River (mi.)	2,633	2,088	0	246	46,048	4,722
	Lake (acres)	19,202	76,933	0	416	19,285	96,134
	Estuary (sq. mi.)	38	2,067	0	10	188	2,106
Public Water Supply	River (mi.)	1,432	2	0	19	7,791	1,434
	Lake (acres)	73,026	0	0	0	16,888	73,026
	Estuary (sq. mi.)	6	0	0	0	1	6
Recreation	River (mi.)	3,651	7,391	0	935	39,038	11,043
	Lake (acres)	96,231	5,061	0	1,060	13,482	101,292
	Estuary (sq. mi.)	489	87	0	59	1,670	577
Shellfishing	River (mi.)	NA	NA	NA	NA	NA	NA
	Lake (acres)	NA	NA	NA	NA	NA	NA
	Estuary	1,900	98	0	0	10	1,997

Designated Use	Water Body Type	Fully Supporting	Total Impaired	Naturally Impaired	Insufficient Information	Not Assessed	Size Assessed
	(sq. mi.)						
Wildlife	River (mi.)	12,030	36	0	145	38,805	12,066
	Lake (acres)	105,758	574	0	0	9,504	106,332
	Estuary (sq. mi.)	302	86	0	1	1,916	388

Source: VDEQ 2008

The health of Virginia's rivers, streams, lakes, and estuaries has been declining for the past decade. However, the extent of impaired lakes and estuaries decreased between 2006 and 2008 (VDEQ 2008). Table 3-22 provides a history of impaired area by water body type.

Table 3-22. Impaired Area Identified Per Assessment Cycle by Water Body Type 1996 to 2008

Water Body Type	1996	1998	2002	2004	2006	2008
Rivers and Streams (51,016 miles)	2,016	2,611	4,838	6,931	9,002	10,543
Lakes (115,835 acres)	17,141	0	115,558[a]	89,834	109,208	94,044
Estuaries (2,305 square miles)	506	437	1,689	1,907	2,216	2,182

a. Area included lakes shared by Virginia and North Carolina. Additional 25,724 acres determined to be in North Carolina and removed from Virginia's total impaired acreage.

Source: VDEQ 2008

The leading cause of impairment of designated uses in Virginia's rivers and streams is violation of the *E. coli* bacteria standards. Agricultural practices appear to be one of the primary sources contributing to the bacteria standards violations. However, urban runoff, leaking sanitary sewers, urban storm sewers, failing septic tanks, domestic animals, and even wildlife can also be significant contributing sources (VDEQ 2008).

A leading cause of impairment in Virginia's estuarine waters is failure to meet the shallow water use goals (primarily submerged aquatic vegetation) adopted in 2005, which are associated with overall aquatic life use. Dissolved oxygen violations during the summer months are widespread in estuarine waters. Another major cause of impairment is violation of the fecal coliform bacteria standard associated with shellfish consumption advisories (VDEQ 2008).

Impaired Water Bodies

Surface water quality problems are detailed in Virginia's 2008 305(b)/303(d) Integrated Report (VDEQ 2008). According to this report, there are no impaired water bodies within the Meadowood surface tract or BLM-administered FMO in Virginia.

Approximately 8,130 stream miles in Virginia (16 percent of assessed streams) are identified as Category 5, which are waters that are impaired or threatened and need TMDLs for the identified pollutants. Category 5 waters are placed on the 303(d) list. A total of 92,579 lake acres (80 percent of assessed lakes) and 2,182 square miles of estuaries (95 percent of assessed estuaries) are identified as Category 5 (VDEQ 2008).

Surface Water Use

Estimated surface water withdrawals for Virginia in 2007 were 1,206 Mgal/d. Surface water uses consist of agriculture, commercial, irrigation, manufacturing, mining, and the public water supply. The largest use of surface water in 2007 was the public water supply at 663.8 Mgal/d. The second largest use of surface water in 2007 was manufacturing, with an estimated withdrawal of 398.8 Mgal/d, followed by mining (29 Mgal/d), irrigation (5.5 Mgal/d, commercial (5.2 million Mgal/d), and agriculture (5.2 Mgal/d) (VDEQ 2008).

Ground Water

Ground water sources in Virginia are divided among the following five physiographic provinces:

- Cumberland Plateau
- Valley and Ridge
- Blue Ridge
- Piedmont
- Coastal Plain.

The Cumberland Plateau Province, encompassing the southwestern tip of Virginia, is underlain by sedimentary rocks, principally sandstone, shale, and coal (VDEQ 2008).

Consolidated sedimentary rocks deposited beneath ancient seas underlie the Valley and Ridge Province to the west of the Blue Ridge. In the lowlands, such as the Shenandoah Valley, limestone and dolomite occur beneath the surface, forming the most productive aquifers in Virginia's consolidated rock formations. In contrast, sandstone and shale are the rock types often present in the ridges and upland areas, which yield only enough water for rural and domestic supplies. The connection between ground water and surface water plays a major role in ground water recharge in the Valley and Ridge, where streams often cross fault zones recharging aquifers. Wells in the fault zones have the greatest yields. Recharge also occurs through surface runoff into limestone sinkholes, bypassing filtration through the soil (VDEQ 2008).

The Blue Ridge Province is a relatively narrow zone to the west of the Piedmont, from four to 25 miles wide. The steep terrain and thin soil covering in the Blue Ridge Providence results in rapid surface runoff and low ground water recharge. There has been little residential or industrial development in the Blue Ridge itself; therefore, ground water use has been mainly for domestic needs rather than for public wells. (VDEQ 2008).

The largest physiographic province in Virginia is the Piedmont, extending from the fall line on the east to the Blue Ridge Mountains in the center of the commonwealth. Hard, crystalline igneous and metamorphic formations dominate this region, with some areas of sedimentary rocks and saprolite deposits overlying the bedrock. The size and number of fractures and faults in the bedrock that store and transmit ground water decrease with depth, so most significant water supplies are within a few hundred feet of the surface. Relatively large yields of water can be obtained where fracture and fault systems are extensive, such as in the western Piedmont along the base of the Blue Ridge Mountains (VDEQ 2008).

The BLM surface tract, the Meadowood SRMA, is located within the Coastal Plain. The Coastal Plain extends inland from the coast about 110 miles to the fall line and passes roughly through Fairfax County, Fredericksburg, Richmond, Petersburg, and Emporia. The Eastern Shore is part of this region, and the two counties there have been conducting studies for several years to develop a more detailed understanding of the ground water situation. The Coastal Plain region is the only one in Virginia that comprises mostly unconsolidated deposits, primarily alternating layers of sand, gravel, shell rock, silt, and clay. More ground water is stored in these very permeable materials than in any other province in the commonwealth (VDEQ 2008). A large portion of the commonwealth's ground water use occurs in the Coastal Plain, which has two separate ground water systems—one shallow and one deep. In many places, a shallow unconfined aquifer system lies above relatively impermeable clay beds and is the source of water for hundreds of domestic and other small capacity wells. The principal source of major ground water withdrawals is a deeper system of confined aquifers. The recharge area for these aquifers occurs miles away where the formations outcrop, but infiltration from the water table and shallower confined aquifer recharges the deeper confined aquifers and could carry pollutants into these deeper reaches (VDEQ 2008).

Ground Water Quality and Use

Although Virginia's ground water is generally of good quality, both the quality and quantity can vary across the physiographic provinces. Below is a description of ground water quality by physiographic province.

Ground water quality in the Cumberland Plateau varies with depth. The first 100 feet of rock below stream level are often of poor quality, tending to be sulfurous and iron-rich, and naturally saline waters occur at depths greater than 300 feet. Better quality water can be found at depths of 150 to 300 feet below stream level. In coal mining areas, some ground water has become acidic as a result of mine drainage and is usually unsuitable for most uses (VDEQ 2008).

Recharge through surface runoff into limestone sinkholes in the Valley and Ridge Province can cause serious water quality problems because polluted surface water may be introduced directly into the ground water system. Private trash dumps located in sinkholes that receive surface runoff can also adversely affect ground water quality. In addition, carbonate formations contribute to the hardness of the ground water (VDEQ 2008).

Because the rocks in the Blue Ridge are relatively insoluble, the ground water is not severely mineralized, but iron content is high in some locations (VDEQ 2008).

The diversity of the subsurface geology of the Piedmont Province results in wide variations in ground water quality and well yields, with ground water use at many locations limited. A few areas, for example, have problems with high iron concentrations and acidity. Because of the range in ground water quality and quantity in this region, as well as the subsequent varying potential for contamination, well site evaluation and well monitoring are very important here (VDEQ 2008).

Except for areas where saltwater, iron, and hydrogen sulfide occur, the natural water quality in the Coastal Plain Aquifers is good. In aquifers near a saltwater interface, saltwater may migrate west as aquifers are pumped. As a result, water from the deep aquifers on much of the lower York-James Peninsula and the Norfolk-Virginia Beach area generally contains high chloride concentrations, rendering the water too salty for domestic use without treatment (VDEQ 2008).

The 1990 Census estimated that 1.4 million Virginians depended on ground water as the sole supply for their domestic water (U.S. Census Bureau 1990). Approximately eight out of every 10 Virginians use ground water from public water supplies, private wells, or springs for at least part of their daily water supply (VDEQ 2008).

3.5 VEGETATION

The following sections address ecoregions, vegetation communities, priority plant species, and invasive plants on FMO inclusive of the surface tracts. Additional detail for each of the surface tracts is available in Appendix B. On FMO, where BLM is not the surface manager, BLM is responsible for vegetation resources only as it relates to the development of federal minerals, including the assessment of the impacts of mineral development. BLM is responsible for the management of vegetation resources on the BLM surface tracts.

The ecoregion and vegetation community classification systems used in this document are largely based on the individual State Wildlife Action Plans (WAP), previously called Comprehensive Wildlife Conservation Strategies. More information on these plans and access to individual state plans is available at www.wildlifeactionplan.org. As background, Congress charged each state and territory with developing a WAP to identify the state's species and habitats of greatest conservation need, and to outline the goals and actions needed for their conservation. Using each of the state's WAPs allows this planning effort to assess BLM resources relative to each state's priorities and overall conservation strategy.

3.5.1 Ecoregions

Brief summaries of the ecoregions for each state are provided in the following sections, as are maps of the ecoregions in each state. The ecoregion classification systems reflect those used in each state's WAP. These state-by-state sections include tables that provide the acres of FMO by ecoregion, acres of FMO where mineral development is expected, and acres of FMO associated with surface tracts.

3.5.2 Vegetation Communities/Habitats

The vegetation classification systems used to map vegetation communities on FMO were adopted from each state's WAP, with some modifications. Where statewide coverage was not complete, or in states where no map was produced, Gap Analysis Program (GAP) land cover (USGS 2011) and ecoregion data were used to complete the coverage. A crosswalk was developed between the WAP and GAP vegetation classifications, combining GAP values with state ecoregions to make logical correlations, where possible, with habitats described in the WAPs. The correlation was derived from both a logical interpretation and a statistical comparison. In the statistical comparison, the combined Ecoregion/GAP values of the FMO polygons, already classified by WAP habitats, were analyzed to determine how frequent a given Ecoregion/GAP polygon and a WAP polygon occurred together. The greater the frequency of a match, the greater the justification for classifying the polygon with a WAP habitat type. This analysis resulted in classification of some additional tracts by WAP habitats, but most unclassified polygons were found to be either water, urban, or agricultural.

Appendix J contains descriptions of the geographic information system (GIS) data used to calculate the FMO acreage in these tables.

3.5.3 Priority Plant Species

Priority plant species are rare, at-risk plant species that are not federally listed, proposed, or candidates for listing but are of management concern to ensure that BLM actions do not contribute to the need for federal listing. BLM reviewed each state's natural heritage database and screened for those plant species ranked by the state heritage programs as either Critically Imperiled (S1), or Imperiled (S2) with occurrence records on or within one mile of FMO in the areas of expected development or on surface tracts. In addition, state-designated lists of rare plants are included as priority species and noted when they

occur on surface tracts. While the natural heritage database occurrence records do not represent a complete survey, this method allowed BLM to focus on those plants most likely to be affected by future BLM actions. This approach was used only for this general planning purpose; site-specific assessments would be conducted prior to surface disturbing activities.

3.5.4 Invasive Plants

It is BLM's policy to use an integrated pest management program to prevent, control, or contain noxious invasive weeds on BLM lands (BLM Manual 9015—Integrated Weed Management). On surface tracts, BLM is responsible for the control, suppression, or eradication of invasive plant species under existing laws and policies, including the Federal Noxious Weed Act of 1974,as amended 1990 (7 United States Code [U.S.C.] 2801-2813). An integrated pest management approach is used to identify the most effective and least intrusive methods or combination of methods to reach the resource goals. This includes the targeted use of selected herbicides, in accordance with *BLM Manual 9011—Chemical Pest Control*.

BLM also assesses ground disturbing activities and projects that alter plant communities and takes measures that reduce the risk of introducing noxious weeds and the need for future treatments. This is accomplished by identifying potential risks prior to ground disturbing activities, stabilizing disturbed areas, and establishing an appropriate vegetation cover during restoration. Where BLM is not the surface manager, seed mixtures and stabilization methods are developed in consultation with the surface management agency (SMA) or private landowner to ensure that construction and restoration activities support the management objectives for the site. The goal is to use native species to the maximum extent practical, with non-invasive annuals used, where needed, for adequate stabilization. For example, annual rye grass or winter wheat may be used during the non-growing season for interim cover before warm season natives can be sowed. BLM consults with the private landowner or SMA to ensure that seed mixtures are consistent with the ongoing use of the area. BLM counsels against the use of species known to be invasive in natural areas.

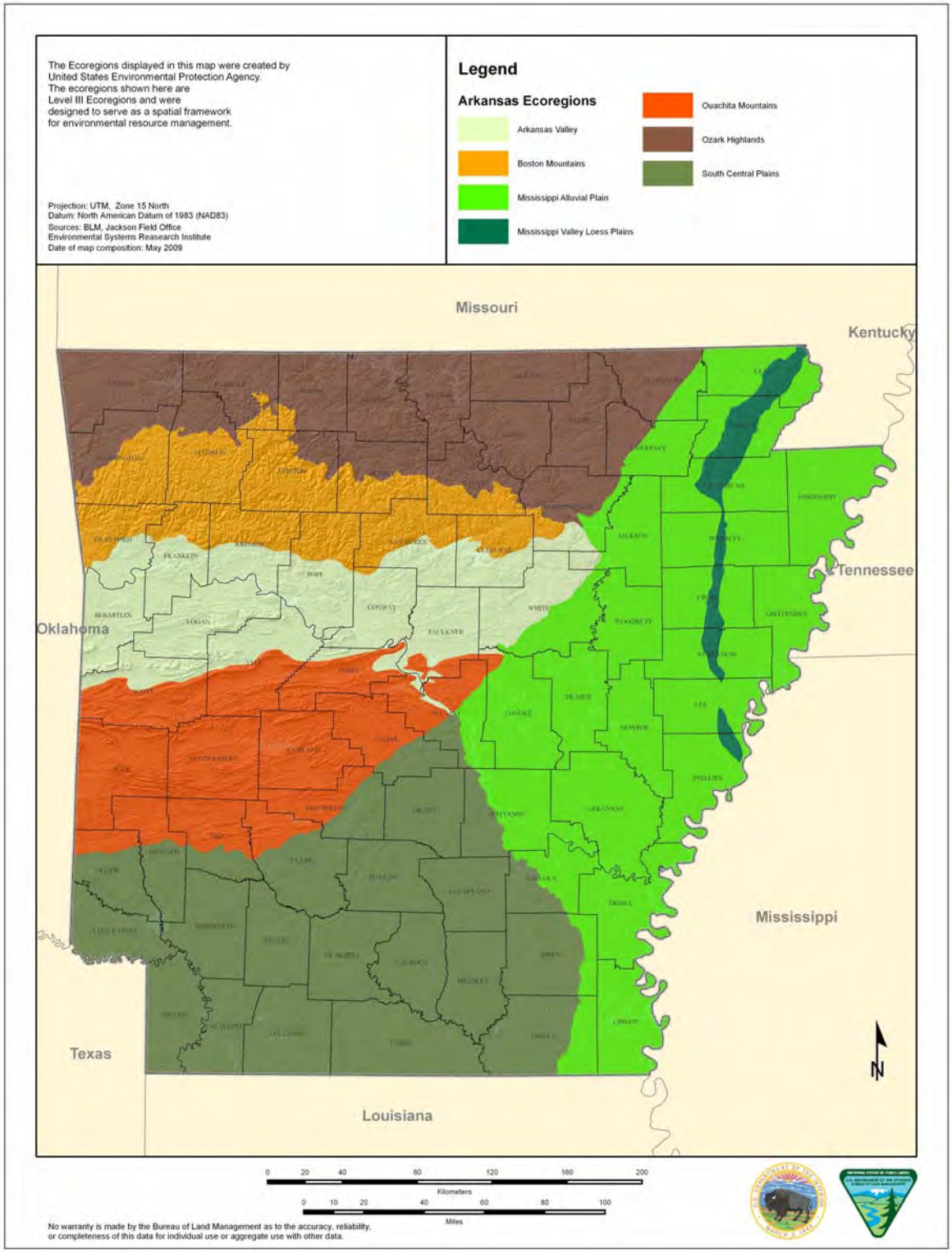
This Resource Management Plan (RMP) adopts by reference the protocols and standard operating procedures from BLM's 2007 Final Vegetation Treatments Using Herbicides Programmatic Environmental Impact Statement (EIS). BLM lands in the eastern United States were not covered by that document, but the majority of those protocols and standard operating procedures can be applied to eastern lands. All applications of herbicide on BLM lands are preceded by the preparation of a formal Pesticide Use Proposal that requires additional environmental review and includes disclosure of all herbicides and adjuvants, use rates (not to exceed the manufacturer's or BLM's use rates, whichever is lower), site-specific stipulations, and the standard operating procedures referenced above.

3.5.5 Arkansas

Arkansas Ecoregions

Map 3-7 depicts the EPA Level III ecoregions in the Arkansas, which were used in the Arkansas WAP.

Map 3-7. Ecoregions in Arkansas



There is FMO distributed across all of the seven ecoregions mapped in Arkansas. FMO in the areas of expected development for oil and gas is located primarily through the central portion of the state, including the Fayetteville Shale region, and the southern portion of the state in the North Louisiana Salt Basin. The surface tracts are clustered in the northern third of the state in the Ozark Highlands and Boston Mountains ecoregions. Table 3-23 illustrates the distribution of these acreages by ecoregion.

Table 3-23. Acres in Arkansas's Ecoregions

Ecoregion	FMO in the Decision Area (acres)	FMO in Area of Expected Development (acres)	BLM Surface Tracts (acres)
Arkansas Valley	208,861	182,972	0
Boston Mountains	28,403	22,604	615
Mississippi Alluvial Plains	42,321	27,555	0
Mississippi Valley Loess Plains	120	0	0
Ouachita Mountains	59,404	30,272	40
Ozark Highlands	15,961	1,110	420
South Central Plains	10,950	9,539	0
Totals	**366,020**	**274,052**	**1,075**

Acres of BLM surface tracts are included in FMO totals.

The following discussions provide a brief description of each of the ecoregions in Arkansas.

Arkansas Valley: This ecoregion covers the alluvial valley lying between the Ozark Highlands and Ouachita Mountains ecoregions. The topography is diverse and includes plains, hills, floodplains, terraces, and scattered mountains. Climax vegetation varies with topography within the ecoregion. Uplands contain a mix of forest, woodland, savanna, and prairie, whereas floodplains and lower terraces along the Arkansas River are suitable for bottomland deciduous forests. Pastureland or hay land is common in the less rugged upland areas.

This ecoregion has the majority of the FMO acreage at 208,861 acres, including 182,972 acres in the area of expected development.

Boston Mountains: This ecoregion is mountainous and underlain by Pennsylvanian sandstone, shale, and siltstone. Forests remain widespread in this ecoregion with oak-hickory and oak-hickory-pine being the dominant vegetation community. Northern red oak (*Quercus rubra*), southern red oak (*Quercus falcata*), white oak (*Quercus alba*), and hickory (*Carya* asp.) usually dominate the uplands, but shortleaf pine (*Pinus echinata*) grows on drier, south and west-facing slopes underlain by sandstone. Pastureland and hay land occur in valleys and on nearly level ridge tops.

There are 28,403 acres of FMO in this ecoregion, including 22,604 acres in the area of expected development for oil and gas. There is a total of 615 acres of surface tracts in this ecoregion.

Mississippi Alluvial Plains: The Mississippi Alluvial Plain ecoregion consists of the broad, nearly level Mississippi River floodplain, part of the largest continuous system of wetlands in North America. The ecoregion is veneered by alluvium, loess (windblown silt deposits), glacial washout, and lacustrine deposits. Limited topographic relief is provided by river terraces, swales, and levees, but most of the ecoregion is flat with poorly drained clayey soils. Climax vegetation is typically southern floodplain forest, but this ecoregion has been widely cleared and drained for the agriculture. The remaining natural vegetation communities provide important habitat for fish and wildlife, including serving as a major bird migration corridor.

There are 42,321 acres of FMO in this ecoregion, including 27,555 acres in the area of expected development for oil and gas.

Mississippi Valley Loess Plains: In Arkansas, the Mississippi Valley Loess Plains are nested within the Mississippi Alluvial Plains but distinguished by hills, ridges, bluffs, and irregular plains. The ecoregion is typically veneered with loess that is underlain by erosion-prone, unconsolidated coastal plain sediments. On those substrates, and in contrast to the surrounding Mississippi Alluvial Plains, the climax vegetation is typically oak-hickory forest and oak-hickory-pine forest.

There are only 120 acres of FMO in this ecoregion, none of which are located in the area of expected development for oil and gas.

Ouachita Mountains: The Ouachita Mountains, originally a continuation of the Appalachians, are ridges, hills, and valleys formed by the erosion of folded and faulted Paleozoic sandstone, shale, and chert, known locally as novaculite. The Ouachita Mountains are more rugged than the Boston Mountains and physiographically distinct from the other ecoregions. Climax vegetation is typically oak-hickory-pine forest with glades occurring on novaculite substrates. Today, commercial pine forests are common in parts of the ecoregion, and pastureland and hay land occur in the broader valleys.

There are 59,404 acres of FMO in this ecoregion, including 30,272 acres in the area of expected development for oil and gas. The 40-acre Henderson Mountain tract in Washington County is in the western portion of this ecoregion.

Ozark Highlands: This ecoregion is largely underlain by highly soluble and fractured limestone and dolomite. Soils of this ecoregion are often cherty and developed from carbonate rocks or interbedded chert, sandstone, and shale. Topographically, the ecoregion ranges from level to highly dissected. Portions of the ecoregion are forested, and karst features, such as caves, sinkholes, and underground drainage, are common. The karst features heavily influence surface water availability and water temperature. Many small dry valleys also occur. Climax vegetation is typically oak–hickory forest with shortleaf pine on steep, cherty escarpments and shallow soils derived from sandstone. Currently, open forest dominates the rugged areas, and pastureland and hay land are common on nearly level sites. Glades dominated by grasses and eastern red cedar (*Juniperus virginiana*) occur on shallow, droughty soils, especially over dolomite.

There are 15,961 acres of FMO in this ecoregion, including 1,110 acres in the area of expected development for oil and gas. There are 420 acres of surface tracts in the northern portion of this ecoregion.

South Central Plains: The ecoregion is composed of rolling plains that are broken by nearly flat fluvial terraces, bottomlands, sandy low hills, and low cuestas or ridges with a steep face on one side and a long gentle slope on the other. Poorly consolidated coastal plain deposits and marginal marine sediments underlie the ecoregion's uplands, but bottomlands and terraces are layered with alluvium or loess. Climax

vegetation is typically oak-hickory-pine forest on uplands and southern floodplain forest on bottomlands. Today, more than 75 percent of the ecoregion remains wooded, but loblolly pine (*Pinus taeda*)-shortleaf pine plantations are extensive.

There are 10,950 acres of FMO in this ecoregion, including 9,539 in the area of expected development for oil and gas.

Arkansas Vegetation Communities/Habitats

Table 3-24 displays the acreage of vegetation communities on FMO statewide, as well as in areas of expected development, and on surface tracts. Brief descriptions of these vegetation communities follow. More detailed descriptions of vegetation on the surface tracts are provided in Appendix B.

Table 3-24. Arkansas Vegetation Communities/Habitats

Vegetation Community/Habitat	FMO in Decision Area (acres)	FMO in Area of Expected Development (acres)	BLM Surface Tracts (acres)
Lower Mississippi Alluvial Plain Grand Prairie	9,455	9,395	0
Lower Mississippi Flatwoods Woodland and Forest	7,645	6,953	0
Lower Mississippi River Bottomland Depression and Forest	6,545	3,269	0
Lower Mississippi River Dune Woodland Forest	43	22	0
Lower Mississippi River High Bottomland and Riparian Forest	3,940	1,590	0
Mississippi River Alluvial Plain Loess Slope Forest	113	0	0
Ozark-Ouachita Dry-Mesic Oak Forest	60,194	30,108	421
Ozark-Ouachita Mesic Hardwood Forest	140	11	94
Ozark-Ouachita Novaculite/Central Interior Calcareous Dry Acidic Glade and Barrens /Dry Oak Woodland	6,934	1,559	359
Ozark-Ouachita Pine Bluestem Woodland	25,534	20,047	16
Ozark-Ouachita Pine Oak Woodland and Forest	29,846	23,464	174
Ozark-Ouachita Riparian/South Central Interior Large Floodplain	33,393	30,225	0
West Gulf Coastal Plain Dry and Wet Pine Hardwood Flatwoods	616	175	0
West Gulf Coastal Plain Large River Floodplain Forest	431	123	0
West Gulf Coastal Plain Pine Hardwood Forest	2,948	2,614	0
West Gulf Coastal Plain Red River Floodplain Forest	847	847	0

Vegetation Community/Habitat	FMO in Decision Area (acres)	FMO in Area of Expected Development (acres)	BLM Surface Tracts (acres)
West Gulf Coastal Plain Sandhill Oak Shortleaf Pine Forest-Woodland	4,630	4,597	0
West Gulf Coastal Plain Small Stream River Forest	480	362	0
Agriculture/Pasture	83,534	59,527	11
Developed	853	392	0
Water	87,900	78,773	0
Totals	**366,021**	**274,053**	**1,075**

Acres of BLM surface tracts are included in FMO totals.

Lower Mississippi Alluvial Plain Grand Prairie: The Lower Mississippi Alluvial Plain Grand Prairie consists of prairies and woodlands that occur on the oldest substantial land surfaces in the Mississippi River Alluvial Valley and the highest land surface in the river-deposited portions of the Mississippi Alluvial Plain ecoregion. This vegetation community occupies a very flat region up to 20 miles wide and 60 miles long bounded by present-day rivers. The combination of droughty soils, very flat topography, and the lack of major stream corridors in the region create conditions suitable for the ignition and spread of fires. The vegetation includes both wet and dry prairies as well as “slashes” dominated by green ash (*Fraxinus pennsylvanica*) and hawthornes (*Crataegus* spp).

There are 9,455 acres of this vegetation community on FMO, with 9,395 of these acres in the area of expected development for oil and gas.

Lower Mississippi Flatwoods Woodland and Forest: The Lower Mississippi Flatwoods Woodland and Forest is composed of forests, prairies, and woodlands on Pleistocene terraces in the Mississippi Alluvial Plain ecoregion. They are found above modern floodplains but have poor internal drainage and are flat with poor runoff. They also often have a clay pan that restricts both internal drainage and water availability. These areas are generally wet in the winter and spring and dry in the summer. Because of this moisture regime, the vegetation communities are variable, ranging from willow oak (*Quercus phellos*) flats to post oak (*Quercus stellata*) flats to prairies. These communities have a large variety of upland and lowland tree species, including post oak and overcup oak *(Quercus lyrata*).

There are 7,645 acres of this vegetation community on FMO, with 6,953 of these acres in the area of expected development for oil and gas.

Lower Mississippi River Bottomland Depression and Forest: The Lower Mississippi River Bottomland Depression and Forest represents semi-permanently flooded to saturated depression areas. The depression areas associated with this vegetation community are typically created by changes in channels of meandering streams. Depending on the time since abandonment by the river, the character may vary from large oxbow swamps to small, saturated swales. These vegetation communities may occur both within and outside the frequently flooded bottoms where the river flows. Prolonged flooding dominates this system, and its duration is greater than in the adjacent Mississippi River Riparian Forest. Overcup oak is the characteristic dominant species.

There are 6,545 acres of this vegetation community on FMO, with 3,269 acres of these acres in the area of expected development for oil and gas.

Lower Mississippi River Dune Woodland and Forest: The Lower Mississippi River Dune Woodland and Forest system makes up the vegetation of sand dunes and related features. These dunes are located near Crowley's Ridge and the Black and White rivers, which are above the normal flood level of the Mississippi River. The uppermost portions of the dunes support a xeric community similar to sandhills of the South Central Plains but are outside the natural range of some species in that ecoregion. The dunes support open post oak woodlands with an herbaceous layer of little bluestem (*Schizachyrium scoparium*) and lichen cover. Distinctive wetlands are also present in this system. These wetlands or "sand ponds" contain depressions with silty bottoms and perched water tables.

There are 43 acres of this vegetation community on FMO, with 22 of these acres in the area of expected development for oil and gas.

Lower Mississippi River High Bottomland and Riparian Forest: The Lower Mississippi River High Bottomland and Riparian Forest is often temporarily flooded on older Holocene point bars and natural levees, with flooding less frequent than every five years. These floodplains are of particular conservation interest because they have been cleared to a greater extent than riparian or low floodplains. Many of these sites are adjacent to uplands or non-flooded hydro-xeric flatwoods and therefore experience a much higher typical fire frequency than lower bottomlands, which support a dominance of oak species. The lower Mississippi riparian forest habitat is generally temporarily flooded on point bars and natural levees with high water directly from the stream. These habitat types occur along the lower Mississippi River and its tributaries. Flooding is of lower duration than in adjacent areas behind natural riverfront levees. Flooding is, however, of longer duration than on high bottomlands that are typically temporarily flooded. Soils within this habitat are typically sandier than those of low bottomlands. Giant cane (*Arundinaria gigantea*) is a common understory in these forests on natural levees and higher point bars, and may become dominant after thinning or removal of overstory. Willow (*Salix* spp) and cottonwood (*Populus deltoides*) sandbars may have an open-canopy (woodland-type) structure.

There are 3,940 acres of this vegetation community on FMO, with 1,590 of these acres in the area of expected development for oil and gas.

Mississippi River Alluvial Plain Loess Slope Forest: The vegetation community is composed of mesic upland forests and confined to a series of narrow ridges along the western margin of the lower Mississippi River on Crowley's Ridge. The vegetation within this habitat is quite distinct from that of the adjacent alluvial plain and may represent the only forested terrain in a largely agricultural landscape. These habitats are generally mesic and dry-mesic forests that occupy narrow, "finger" ridges and slopes in a highly dissected landscape. In many cases, these slopes and ravines provide habitat for plant species that are rare or absent from other parts of the alluvial plain. This vegetation community consists of forests that are typically dominated by white oak, northern red oak, southern red oak, black hickory (*Carya texana*), shortleaf pine, and eastern black oak (*Quercus velutina*).

There are 113 acres of this vegetation community on FMO, but none are in the area of expected development.

Ozark–Ouachita Dry-Mesic Oak Forest: This vegetation community occurs on dry-mesic to mesic, gentle to moderately steep slopes with moderately drained to well-drained soils. The closed canopy forest is dominated by northern red oak and white oak and often associated with hickory species. Sugar maple (*Acer saccharum* or A. *barbatum*) may occur on more mesic sites. Although this vegetation community can be influenced by drought, the primary mechanisms affecting it are fire and timber management. Burns

occurring at three- to seven-year intervals during the early/late growing season help to reduce fuel loads and limit woody understory encroachment.

There are 60,288 acres of this vegetation community on FMO, with 30,108 of these acres in the area of expected development for oil and gas.

Ozark-Ouachita Mesic Hardwood Forest: The Ozark-Ouachita Mesic Hardwood Forest system is found on toeslopes, valley bottoms, and north slopes. Northern red oak is in greater abundance than in dry-mesic habitats, and sugar maple is sometimes a leading dominant. On more alkaline moist soils, chinquapin oak (*Quercus muehlenbergii*), American basswood (*Tilia americana*), and Eastern rosebud (*Cercis canadensis*) may be common. In the Boston Mountains, mesic forests may also be common on protected slopes and terraces next to streams. American beech (*Fagus grandifolia*) is the leading dominant along with sugar maple, sweetgum (*Liquidambar styraciflua*), American basswood, cucumber tree (*Magnolia acuminate*), and many others. Similar vegetation communities often occur in the western Ouachita Mountains.

There are 46 acres of this vegetation community on FMO, with 11 of these acres in the area of expected development for oil and gas.

Ozark-Ouachita Novaculite/Central Interior Calcareous Dry Acidic Glade and Barrens/Dry Oak Woodland: The Ozark-Ouachita Novaculite and Central Interior Calcareous Dry Acidic Glade and Barrens and Dry Oak Woodlands communities occur along moderate-to-steep slopes or valley walls of rivers along most aspects. Parent material includes chert, shale and/or sandstone bedrock with well-drained to excessively well-drained, shallow soils interspersed with rock and boulders. These soils are typically dry during the summer and autumn, becoming saturated during the spring and winter. Grasses such as little bluestem and indiangrass (*Sorghastrum nutans*) dominate this system with stunted oak species, such as post oak and blackjack oak (*Quercus marilandica*), and shrub species, such as *Vaccinium* spp. These glades and woodland are influenced by drought and infrequent-to-occasional fires. Prescribed fires help manage this system by maintaining an open glade structure, encouraging herbaceous species and removing invasive woody growth, particularly eastern red cedar.

There are 6,934 acres of these vegetation communities on FMO, with 1,559 of those acres in the area of expected development for oil and gas. There are 143 acres of glades on surface tracts; almost 97 acres are in degraded condition, primarily because of lack of fire and eastern red cedar intrusion.

Ozark–Ouachita Pine Bluestem Woodland: Ozark–Ouachita Pine Bluestem Woodland vegetation community is a shortleaf pine dominated woodland with intermittent canopy and an abundant herbaceous ground. Common herbaceous species include big bluestem (*Andropogon gerardii*) and little bluestem. Hardwoods such as red maple (*Acer rubrum*), sourwood (*Oxydendrum arboretum*), blackgum (*Nyssa sylvatica*), and dogwood (*Cornus florida*) are few or absent in the canopy. The vegetation community exhibits early successional stages as well as components of mature pine forest conditions. Fire is an important component for maintaining the open character of the woodland.

There are 25,534 acres of this vegetation community on FMO, with 20,047 of these acres in the area of expected development for oil and gas.

Ozark-Ouachita Pine-Oak Woodland and Forest: The Ozark-Ouachita Pine Oak Woodland and Forest vegetation community consist of forests and woodlands in which shortleaf pine is an important or dominant component. The Ozark-Ouachita Pine-Oak Woodland is composed of pine, pine-oak, or oak-pine dominated woodlands with intermittent canopy and abundant herbaceous groundcover. The open

canopy and herbaceous diversity are maintained by frequent fires. Sites occupied by this vegetation community are less rugged and more fire-prone than the Ozark-Ouachita Dry Mesic Oak Forest.

There are 29,846 acres of this vegetation community on FMO, with 23,464 of these acres in the area of expected development for oil and gas.

Ozark-Ouachita Riparian/South Central Interior Large Floodplain: The Ozark-Ouachita Riparian vegetation community occurs along streams and small rivers. In contrast to larger floodplain systems, these systems have little to no floodplain development and often contain cobble bars and steep banks. They typically have a higher gradient than larger floodplains and experience periodic, strong flooding. Flooding and scouring strongly influence these areas and prevent the floodplain development found on larger rivers. Typical tree species include sweetgum, sycamore (*Platanus occidentalis*), river birch (*Betula nigra*), maple species (*Acer* spp.), and oaks (*Quercus* spp.). The richness of the herbaceous layer can vary significantly, ranging from species-rich to poor. Likewise, the shrub layer can vary considerably, but typical species may include northern spicebush (*Lindera benzoin*), hazel alder (*Alnus serrulata*), and Ozark witch-hazel (*Hamamelis vernalis*). Small seeps and fens are found within this habitat type, especially at the headwaters and terraces of streams. These areas are dominated by wetland obligate species of sedges (*Carex* spp.) and ferns (*Osmunda* ssp.).

The South Central Interior Large Floodplain occurs along large rivers where topography and alluvial processes have resulted in a well-developed floodplain. A single occurrence may extend from river's edge across the outermost extent of the floodplain or to where it meets a wet meadow or upland system. Many examples of this system will contain well-drained levees, terraces and stabilized bars, herbaceous sloughs, and shrub wetlands. A variety of soil types may be found within the floodplain from very well drained sandy substrates to very dense clays. It is this variety of substrates, in combination with different flooding regimes, that creates the mix of vegetation. Examples of this broadly defined system may include silver maple (*Acer saccharinum*), sycamore, American sweetgum, and various oak species. Understory species are mixed but include shrubs, such as common buttonbush (*Cephalanthus occidentalis*) and giant cane, and sedges. This habitat type likely floods at least once annually and can be altered by occasional severe floods.

There are 33,393 acres of these vegetation communities on FMO, with 30,225 of these acres in the area of expected development for oil and gas.

West Gulf Coastal Plain Dry and Wet Pine Hardwood Flatwoods: The West Gulf Coastal Plain Dry Pine Hardwood Flatwoods represent predominately dry flatwoods usually found on Pleistocene high terraces, typically outside the floodplain. Soils are fine-textured, and hardpans may be present in the subsurface. The limited permeability of these soils contributes to shallowly perched water tables during portions of the year when precipitation is greatest and evapotranspiration is lowest. Soil moisture fluctuates from saturated to very dry throughout the growing season. Saturation occurs not from overbank flooding but typically whenever precipitation events occur. Drier sites support loblolly pine and post oak; more mesic sites have loblolly pine with willow oak and species such as sweetleaf (*Symplocos tinctoria*) and southern arrowwood (*Viburnum dentatum*).

The Wet Pine Hardwood Flatwoods are similarly situated but most examples support hardwood forests or swamps, which are often heavily oak-dominated. Important species are tolerant of inundation. They include willow oak and laurel oak (*Quercus laurifolia*) with sparse coverage of wetland herbs such as southern waxy sedge (*Carex glaucescens*).

There are 616 acres of these vegetation communities on FMO, 175 of these acres located in the area of expected development.

West Gulf Coastal Plain Large River Floodplain Forest: The West Gulf Coastal Plain Large River Floodplain Forest system represents broad bottomlands that include northern red oak and overcup oak, and lie along larger rivers. Several distinct plant communities are recognized within this system that may be related to the array of different geomorphic features present within the floodplain. Some of the major geomorphic features associated with different community types include natural levees, point bars, meander scrolls, oxbows, and sloughs. Vegetation generally includes forests dominated by bottomland hardwood species and other trees tolerant of flooding.

There are 431 acres of this vegetation community on FMO, with 123 of these acres in the area of expected development.

West Gulf Coastal Plain Pine Hardwood Forest: The West Gulf Coastal Plain Pine Hardwood Forest consists of forests and woodlands dominated by loblolly pine and/or shortleaf pine in combination with dry to dry-mesic site hardwood species. This vegetation community was historically present on nearly all uplands in the region except on the most edaphically limited sites (droughty sands, calcareous clays, and shallow soil barrens/rock outcrops). These habitats are underlain by loamy to fine-textured soils of variable depths. They are located on upland sites, ridgetops, and adjacent side slopes, with moderate fertility and moisture retention.

There are 2,948 acres of this vegetation community on FMO, with 2,614 of these acres in the area of expected development.

West Gulf Coastal Plain Red River Floodplain Forest: The West Gulf Coastal Plain Red River Floodplain Forest is restricted to the main stem of the Red River in southwestern Arkansas. Several distinct plant communities can be recognized within this system that may be related to the array of different geomorphic features present within the floodplain. Some of the major geomorphic features associated with different community types within the system include natural levees, point bars, meander scrolls, oxbows, and sloughs. Vegetation generally includes forests dominated by bottomland hardwood species and other trees tolerant of flooding, such as bald cypress (*Taxodium distichum*) and water tupelo (*Nyssa aquatica*).

There are 847 acres of this vegetation community on FMO, and all of this acreage is in the area of expected development.

West Gulf Coastal Plain Sandhill Oak Shortleaf Pine Forest and Woodland: The West Gulf Coastal Plain Sandhill Oak Shortleaf Pine Forest and Woodland occurs on uplands underlain with deep, coarse sandy soils. These areas typically have low fertility and moisture retention, which contribute to open tree canopies with usually less than 60-percent canopy closure. Sparse understory vegetation and abundant patches of bare soil are indicative of this system. Vegetation indicators are species tolerant of droughty sites, especially blackjack oak and Arkansas oak (*Quercus arkansana*). The vegetation community typically supports a large concentration of vascular plant endemics and a number of plant species common to sandhills in the region. It is also characterized by relatively open wooded canopies. Fire is a critical natural disturbance process that affects the vegetation structure and likely the species composition of communities in this habitat.

There are 4,630 acres of this vegetation community on FMO, with 4,597 of these acres in the area of expected development.

West Gulf Coastal Plain Small Stream River Forest: The West Gulf Coastal Plain Small Stream River Forest system is a forested vegetation community associated with small rivers and creeks. Bottomland hardwood tree species typically dominate, including northern red oak and overcup oak. Flooding occurs

annually, but the water table usually is well below the soil surface throughout most of the growing season. Areas affected by beaver (*Castor canadensis*) impoundments are included in this system.

There are 480 acres of this vegetation community on FMO, with 362 of these acres in the area of expected development.

Condition of Vegetation Communities on Surface Tracts in Arkansas

The condition of vegetation on surface tracts was assessed to identify the needs associated with restoring vegetation communities to good condition. There is no assessment of the condition of vegetation communities on FMO where BLM is not the surface manager because this is outside BLM's management responsibility. The condition of the vegetation communities on surface tracts was assessed using the following criteria:

- Good condition: vegetation communities show little change from historical species composition and community structure or excellent recovery from historical permutations.
- Fair condition: vegetation communities show visible permutations from historical species composition and community structure but will improve with appropriate management and time.
- Poor condition: vegetation communities are depauperate in expected plant species and show visible permutations in community structure.

Table 3-25 provides a summary of the condition of the vegetation communities found on surface tracts.

Table 3-25. Condition of Vegetation Communities/Habitats on Surface Tracts in Arkansas

Vegetation Community/Habitat	Good Condition (acres)	Fair Condition (acres)	Poor Condition (acres)	Total (acres)
Ozark–Ouachita Dry-Mesic Oak Forest	170	215	36	421
Ozark-Ouachita Dry Oak Woodland	25	98	92	216
Ozark-Ouachita Mesic Hardwood Forest	82	12	0	94
Ozark-Ouachita Novaculite/Central Interior Calcareous Dry Acidic Glade and Barrens	20	26	97	143
Ozark–Ouachita Pine Bluestem Woodland	0	1	15	16
Ozark-Ouachita Pine-Oak Woodland and Forest	31	101	42	174
Agriculture/Pasture (acres not ranked)	-	-	-	11
Totals	**328**	**453**	**282**	**1075**

Acres of BLM surface tracts are included in FMO totals.

3.5.6 Arkansas Priority Plant Species

Table 3-26 lists those plant species ranked by the state natural heritage program (i.e., Arkansas Natural Heritage Commission) as either Critically Imperiled (S1) or Imperiled (S2) with occurrence records either on or within one mile of FMO in the area of expected development or on surface tracts. Several plants listed as Vulnerable (S3) have been added to the list because they are endemic species with very narrow ranges that occur in substantial numbers on surface tracts. For instance, the Campbell Hollow surface tract supports one of the state's largest populations known of Moore's larkspur (*Delphinium newtonianum*), a species limited to the mesic forests in six counties in the Arkansas Ozarks region. Several other surface tracts support Trelease's larkspur (*Delphinium treleasei*), another Ozark endemic species that is restricted to glades, a rare fire-dependent plant community often degraded by lack of management. More detailed information on priority species found on surface tracts is available in Appendix B. Arkansas adopts the federal listing status for species occurring in the state, so listed plant species are discussed as federally listed under Special Status Species.

Table 3-26 Arkansas Priority Plant Species

Species	Natural Heritage Rank	Occurrence Record Within 1 Mile of FMO or Surface Tract	Occurrence on FMO or Surface Tract	Habitat/Occurrence Records
Field pussytoes *Antennaria neglecta*	S1	X		Prairies, open woodlands, and abandoned fields across northern Arkansas.
Curly threeawn *Aristida desmantha*	S1	X		Sandy fields and dry pine woods. Occurrence records in Nevada County, associated with Poison Springs Park/Forest.
Wooly threeawn *Aristida lanosa*	S2	X		Dry fields, pine-oak woods and uplands, typically in sandy soils. Occurrence records in Nevada County, associated with Poison Springs Park/Forest.
Savannah milkweed *Asclepias obovata*	S2	X		Sandy soils in pine and oak forests. Occurrence records in central and southeastern areas of Arkansas.
Slimpod milkvetch *Astragalus leptocarpus*	S2	X	X	Sandy soils. Occurrence records in Nevada County, associated with Poison Springs Park/Forest.
Soxman's milkvetch *Astragalus soxmaniorum*	S2	X		Xeric sandhills, abandoned fields, and roadsides. Occurrence records in Nevada County, associated with Poison Springs Park/Forest.
Texas bergia *Bergia texana*	S2	X	X	Wetlands in mud and moist soils along edges of rivers and pools. Occurrence records from the southeast and central areas of

Species	Natural Heritage Rank	Occurrence Record Within 1 Mile of FMO or Surface Tract	Occurrence on FMO or Surface Tract	Habitat/Occurrence Records
				Arkansas
Oklahoma grass-pink *Calopogon oklahomensis*	S2	X	X	Prairie, savannas, wetlands savanna borders, moderately open woodlands, edges of bogs, and acidic wet barrens. Occurrence records scattered southeast and northwest portions of Arkansas.
A caric sedge *Carex laxiculmis var. laxiculmis*	S2S3	X		Low, wet, deciduous or mixed deciduous-evergreen forests, along edges of springs, seeps, and streams, usually with clay soils. Occurrence records across central western portions of Arkansas.
Threadstem caric sedge *Carex leptalea var. harperi*	S2S3	X		Wetlands. Occurrence records across the state.
A caric sedge *Carex opaca*	S2S3		X	Low areas in prairies, roadside ditches, and poorly drained sites. Occurrence records scattered across the central and northern portions of Arkansas.
A caric sedge *Carex radiata*	S1	X		Mesic to wet-mesic deciduous and mixed forests, often in seasonally wet areas. Occurrence records in north central portions of Arkansas.
Blue cohosh *Caulophyllum thalictroides*	S2	X		Wide range of mesic deciduous forest communities. Occurrence records in north central and northwest portions of Arkansas.
Ozark spring beauty *Claytonia ozarkensis*	S2	X	X	Dry, shaded sandstone bluffs, often under rock overhangs. Occurrence records limited to Boston Mountains and Arkansas Valley ecoregions.
A tickseed *Coreopsis basalis*	S2	X		Sandy soils in open areas. Occurrence records associated with Poison Springs State Park/Forest.
Scratch-daisy *Croptilon hookerianum var.*	S2	X	X	Sand, sandy gravel, dunes, stream terraces, and sandstone outcrops, often in areas of oak

Species	Natural Heritage Rank	Occurrence Record Within 1 Mile of FMO or Surface Tract	Occurrence on FMO or Surface Tract	Habitat/Occurrence Records
validum				woodlands, roadsides, and road banks. Occurrence records along the length of the Arkansas River.
Mohlenbrock's flatsedge *Cyperus grayoides*	S1	X		Sandy soils. Occurrence records near Poison Springs StatePark/ Forest.
Downy oatgrass *Danthonia sericea*	S1	X		Well-drained sandy soils. Occurrence record associated with Poison Springs State Park/Forest.
Carolina larkspur *Delphinium carolinianum ssp. vimineum*	S2	X		Limestone and dolomite glades, open rocky woods, and prairies. Occurrence records in southwest Arkansas.
Moore's larkspur *Delphinium newtonianum*	-	X	X	Slopes of deciduous forests. Occurs only in Arkansas with occurrence records clustered in 7 counties in the north central and southwestern portions of Arkansas.
Trelease's larkspur *Delphinium treleasei*	-		X	Limestone and dolomite glades, outcrops, and bluffs. Occurs in the Ozark Highlands ecoregion in Arkansas.
Hay-scented cup fern *Dennstaedtia punctilobula*	S2	X		Rocky slopes, meadows, woods, stream banks, and roadsides in acid soils. Occurrence records across northwestern half of Arkansas.
Open-ground whitlow-grass *Draba aprica*	S2	X		Glades, barrens, and dolomite and sandstone areas. Occurrence records in the mountain ecoregions of central and western Arkansas.
Three-way sedge *Dulichium arundinaceum var. arundinaceum*	S2S3	X		Open wet areas, lake and pond edges, marshes, and stream edges. Occurrence records across state.
Twisted spike rush *Eleocharis tortilis*	S1	X		Wet soils, freshwater, seeps, bogs, and ditches. Occurrence records associated with Poison Springs State Park and Forest.
Smooth scouring rush	S1	X		Moist prairies, riverbanks, and roadsides. Occurrence records in

Species	Natural Heritage Rank	Occurrence Record Within 1 Mile of FMO or Surface Tract	Occurrence on FMO or Surface Tract	Habitat/Occurrence Records
Equisetum laevigatum				Arkansas limited to Sebastian County.
Small-headed pipewort *Eriocaulon koernickianum*	S2	X		Acid seeps and glades in sand hillsides, as well as tallgrass prairies. Occurrence records are scattered across western Arkansas.
Six-angled spurge *Euphorbia hexagona*	S2	X		Dry to mesic prairies. Only occurrence record is in Arkansas along the Arkansas River in Yell County.
Wedgeleaf spurge *Euphorbia longicruris*	S1	X		Grasslands and open prairie sites with calcareous soils. Few occurrence records scattered in west central portions of Arkansas.
Texas fescue *Festuca versuta*	S1		X	Moist shaded sites on rocky slopes in open woods, and mesic woodlands on limestone-derived soils on stream terraces. In Arkansas, occurrence records in Sebastian, Yell, and Saline counties.
Texas bedstraw *Galium texense*	S1	X		Glades and barrens. In Arkansas, there is a single occurrence record on the boundary of Franklin and Logan counties.
Shortleaf skeletongrass *Gymnopogon brevifolius*	S2		X	Dry to somewhat moist sand pine woodlands and tall grass prairie. Occurrence records in Arkansas across central Arkansas.
Browne's waterleaf *Hydrophyllum brownei*	S2		X	Shaded riparian areas, although may grow up to 100 meters (328 feet) from stream channels. Occurrence records are restricted to the Ouachita Mountains in Arkansas.
Engelmann's quillwort *Isoetes engelmannii*	S1	X		Ephemeral pools, bogs, and marshes and in and along streams and wet roadsides; also found as emergent in shallow lakes and ponds. Only occurrence record in Arkansas is in Cleburne County, although could occur in northeastern portion of state.

Species	Natural Heritage Rank	Occurrence Record Within 1 Mile of FMO or Surface Tract	Occurrence on FMO or Surface Tract	Habitat/Occurrence Records
A crabapple *Malus coronaria*	S2S3	X		Open woodlands, woodland edges, savannas, and thickets. Occurrence records across entire state.
Yellow monkey flower *Mimulus floribundus*	S2S3	X		Moist low areas and along streams and creeks across the Ozarks.
A sandwort *Minuartia drummondii*	S2S3		X	Open, grassy woodlands and sandy soils. Occurrence records in locations across state.
Nuttall's pleat-leaf *Nemastylis nuttallii*	S2	X		Limestone barrens, bluffs, and wet prairies. Occurrence records scattered across the Ozarks.
Prairie evening primrose *Oenothera pilosella ssp. sessilis*	S2	X		Remnant tall grass prairies. Occurrence records clustered in east central Arkansas.
Scarlet beard-tongue *Penstemom murrayanus*	S2	X	X	Open, sandy ground. Occurrence records associated with Poison Springs State Park/Forest.
Robbin's scorpionweed *Phacelia strictiflora var. robbinsii*	S1S2	X		Sandy soils. Occurrence records associated with Poison Springs State Park/Forest.
Rough-seeded fameflower *Phemeranthus rugospermus*	S1	X		Open, exposed sites with minimal competition, xeric prairies, and barrens. Occurrence record associated with Poison Springs State Park/Forest.
Southern tubercled-orchid *Platanthera flava var. flava*	S2S3	X		Wet mesic prairie and wet bottomland forests. Occurrence records are located across much of the state.
Clammyweed *Polanisia erosa ssp. erosa*	S1S2	X		Sandhills, prairies, and open woods. Occurrence records associated with Poison Springs State Park/Forest.
Yellow mandarin *Prosartes lanuginosa*	S2	X		Mesic deciduous woods. Occurrence records in Arkansas are limited to 3 counties in the Boston Mountain ecoregion.
Scarlet oak *Quercus coccinea*	S2S3	X		Dry upland forests. Occurrence records located primarily in South

Species	Natural Heritage Rank	Occurrence Record Within 1 Mile of FMO or Surface Tract	Occurrence on FMO or Surface Tract	Habitat/Occurrence Records
				Central Plain ecoregion.
Laurel oak *Quercus laurifolia*	S2S3	X		Sandy floodplains and bottoms, riverbanks, and terraces; occasionally on poorly drained uplands.
California bulrush *Schoenoplectus californicus*	S1S2		X	Brackish to fresh water marshes, and shores; often emergent in water. Occurrence records are scattered across state.
Redberry greenbrier *Smilax walteri*	S2S3	X	X	Wet thickets, low pinelands, swamps, and boggy areas. Occurrence records associated with Poison Springs State Park/Forest.
White-flowered goldenrod *Solidago ptarmicoides*	S1S2	X		Rocky prairies, glades, bluffs, and rocky open woods. Occurrence records limited to the Ozark region.
Fragrant ladies' tresses *Spiranthes odorata*	S1		X	Cypress and hardwood swamp, marshes, prairies, riverbanks, and ditches in seasonally inundated sites. Occurrence records located across state.
A twistflower *Streptanthus hyancinthoides*	S2	X		Sandy soils, prairies, open glades, and grassy roadsides. Occurrence records associated with Poison Springs State Park/Forest.
Patterson's dawnflower *Stylisma pickeringii var. pattersonii*	S2	X		Sandhills and dry prairies. Occurrence records associated with Poison Springs State Park/Forest.
Silky aster *Symphyotrichum sericeum*	S2	X		Rocky prairies, glades, and gravel hill prairies. Occurrence records in Ozark region.
Appalachian filmy fern *Trichomanes boschianum*	S2S3		X	Deeply sheltered grottoes on non-calcareous rocks. Occurrence records primarily in the Boston Mountain ecoregion.
White flowered trillium *Trillium flexipes*	S1	X		Intact mesic deciduous woodlands, wooded slopes, shady ravines, and rocky bluffs. All occurrence records in Stone County.

Species	Natural Heritage Rank	Occurrence Record Within 1 Mile of FMO or Surface Tract	Occurrence on FMO or Surface Tract	Habitat/Occurrence Records
Nuttall's cornsalad *Valerianella nuttallii*	S2		X	Open shale glades and prairies with a shale substrate; also in open woodlands, scrub woods, rocky open hillsides, and roadsides. Occurrence records in Ouachita and Arkansas Valley ecoregions, including Fort Chafee.
A yellow-eyed grass *Xyris difformis var. difformis*	S2	X		Acidic swamps, pond shores, and bogs. Occurrence records in Boston Mountains and Mississippi Alluvial Plain ecoregions.
Rain lily *Zephyranthes chlorosolen*	S1S2		X	Wide range of soils and conditions. Occurrence records scattered across western portions of state.

3.5.7 Arkansas Invasive Plant Species

Table 3-27 lists invasive plant species in Arkansas of particular management concern in the areas of expected development or on surface tracts, as well as those species with high potential to invade those areas in the near future.

Table 3-27. Arkansas Invasive Plant Species

Common Name Scientific Name	Vegetation Communities/Habitats
Autumn-olive *Elaeagnus umbellata*	Old fields, woodland edges, and other disturbed areas
Chinese privet *Ligustrum sinense*	Dense thickets in fields or in the understory of forests
Garlic mustard *Alliaria petiolata)*	Wooded areas
Japanese honeysuckle *Lonicera japonica*	Forest floors, canopies, edges, roadsides, wetlands, fence rows, and disturbed areas
Japanese stiltgrasss *Microstegium vimineum*	Forested floodplains, ditches, forest edges, fields, and trails
Johnsongrass *Sorghum halepense*	Open forests, old fields, ditches, and wetlands
Kudzu	Roadsides, rights-of-way (ROW), forest edges, and old fields

Common Name Scientific Name	Vegetation Communities/Habitats
Pueraria montana var. lobata	
Mimosa *Albizia julibrissin*	Old fields, stream banks, and roadsides
Sericea lespedeza *Lespedeza cuneata*	Open areas and old fields
Shrubby lespedeza *Lespedeza bicolor*	Open areas and old fields
Spotted knapweed *Centaurea stoebe ssp. micranthos*	Pastures, open forests, prairies, meadows, old fields, and disturbed areas
Tall fescue *Festuca arundinacea*	Open habitats, including fields, forest margins, roadsides, forest openings, and savannas
Tree of heaven *Ailanthus altissima*	Disturbed sites, roadsides, and forest edges

3.5.8 Florida Vegetation

Florida Ecoregions

The ecoregion classification system used for the Florida WAP was adapted from Bailey (1995). There is FMO across all of the Florida ecoregions; however, the areas of expected development for both oil and gas and phosphate are located in the Florida Peninsula and Tropical Florida ecoregions. There are also 10 surface tracts scattered from the Florida Panhandle to the Keys (Map 3-8). Table 3-28 shows the distribution of these acreages by ecoregion.

Table 3-28. Acreage in Florida's Ecoregions

Ecoregion	FMO in Decision Area (acres)	FMO in Area of Expected Development—Oil and Gas (acres)	FMO in Area of Expected Phosphate Development (acres)	BLM Surface Tracts (acres)
East Gulf Coastal Plain	35,105	0	0	185
Florida Peninsula	61,106	4,910	1,887	98
South Atlantic Coastal Plain	1,784	0	0	0
Tropical Florida	578	375	0	91
Totals	**98,573**	**5,285**	**1,887**	**374**

Acres of BLM surface tracts are included in FMO totals.

The following discussion provides a brief description of each of the ecoregions in Florida.

East Gulf Coastal Plain: The East Gulf Coastal Plain ecoregion is located within the Florida Panhandle and stretches across five states. The dominant ecological drivers of the terrestrial systems are soils (texture and chemistry), fire frequency, and hydrology. Habitats in the East Gulf Coastal Plain include barrier island systems with beaches, maritime grasslands and scrub, maritime shrub hammocks, and evergreen forests (both broadleaf and needle leaf). These habitats grade through salt marshes to productive estuaries. Streams in this area are relatively low gradient and sandy bottomed.

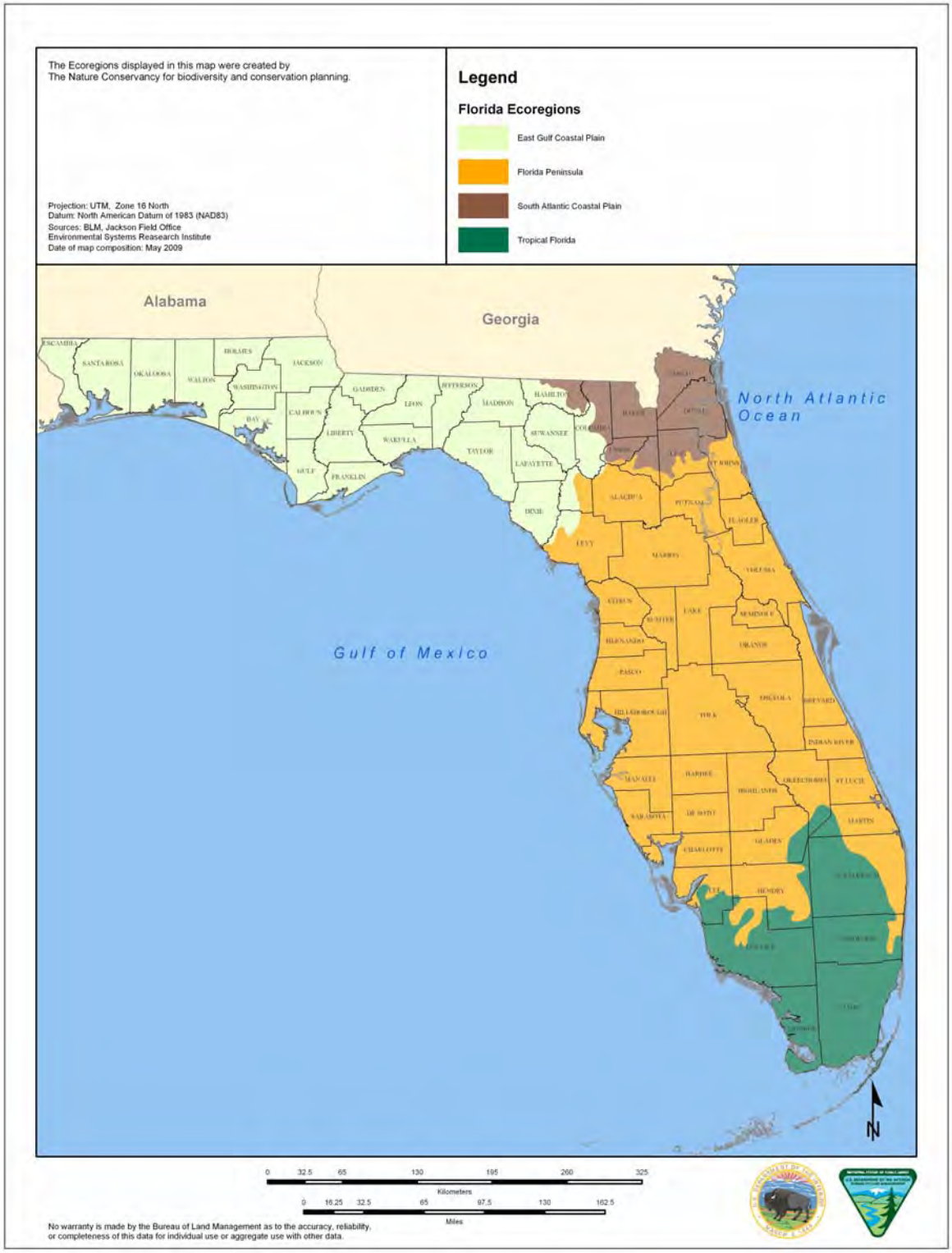
There are 35,105 acres of FMO in this ecoregion, none of which is in the areas of expected development.

Florida Peninsula: The Florida Peninsula ecoregion extends through much of central Florida and consists of mostly flat plains with numerous forested wetlands, swamps, marshes, and lakes. Most of the land base of the peninsula is derived from sediments deposited during the interglacial periods of the Pleistocene era when the majority of the ecoregion was repeatedly inundated. The species and communities of the Florida Peninsula were historically shaped by pronounced wet and dry seasons, once-frequent fires that swept unimpeded for miles across the landscape (and other large-scale disturbance factors like hurricanes), a high water table, and mucky or peaty soils that have developed in numerous depressional features on a karst limestone-based substrate.

Some upland areas are associated with a Pleistocene-deposited ridge system in the northern portion of the ecoregion. This includes an area of upland hardwood forest that extends southward to just north of the Tampa Bay area on the central Gulf coast. These areas are dominated by the longleaf pine (*Pinus palustris*), sandhill ecological system. Areas of lower topography than the Pleistocene-deposited ridge systems (but not low enough to sustain marsh or swamp vegetation) are composed of flatwoods. Flatwoods are a matrix community characterized by a pine canopy composed of either longleaf pine or slash pine (*Pinus elliottii*) depending upon the soils and hydrology, and a thick, low shrub stratum and highly diverse groundcover vegetation.

There are 61,106 acres of FMO in the ecoregion, including 4,910 acres of FMO in the oil and gas area of expected development and all of the acreage in the phosphate area of expected development.

Map 3-8. Ecoregions in Florida



South Atlantic Coastal Plain: The South Atlantic Coastal Plain ecoregion is located in northeastern Florida and consists of mostly flat plains with numerous swamps, marshes, and lakes. Physically characterized by subtle topography, the ecoregion has a wide range of landforms, including sandhills and rolling longleaf pine-dominated uplands to pine flatwoods and savannas, seepage bogs, and bottomland hardwood forests.

There are 1,784 acres of FMO in this ecoregion, none of which is in the areas of expected development.

Tropical Florida: The frost-free climate makes this ecoregion distinct from other ecoregions in the conterminous United States. In the Tropical Florida ecoregion, flooded marshes and swamps (both saltwater and freshwater) are widespread, with characteristic mangrove vegetation found in coastal zones. This ecoregion includes the vast Everglades, a watershed that begins near Orlando and flows southward to Florida Bay.

There are 578 acres of FMO within the Tropical Florida ecoregion, which include 375 acres in the oil and gas area of expected development.

Florida Vegetation Communities/Habitats

The FMO in Florida occurs in virtually all of the counties across this diverse state and includes almost all of the vegetation communities mapped in the state, including six of the eight terrestrial habitats the WAP identified as most threatened: Beach/Surf Zone, Coastal Strand, Dry Prairie, Freshwater Marsh and Wet Prairie, Natural Pineland, and Scrub. The following are brief descriptions of the vegetation communities/habitats found on BLM lands in Florida. Table 3-29 displays the acreage of vegetation community by FMO statewide, as well as in areas of expected development, and on surface tracts. More detailed descriptions of vegetation on surface tracts are provided in Appendix B.

Table 3-29. Florida Vegetation Communities/Habitats

Vegetation Community/Habitat	FMO in the Decision Area (acres)	FMO in Area of Expected Development—Oil and Gas (acres)	FMO in Area of Expected Development—Phosphate (acres)	BLM Surface Tracts (acres)
Bay Swamp	398	0	0	2
Bottomland Hardwood Forest	213	0	0	0
Coastal Strand	122	19	0	19
Cypress Swamp	2,439	121	7	1
Disturbed/Transitional	12,375	412	51	0
Dry Prairie	6,039	253	141	0
Freshwater Marsh and Wet Prairie	2,985	52	119	3
Grassland/Improved Pasture	12,395	429	823	0
Hardwood Hammock Forest	3,255	133	31	27
Hardwood Swamp/Mixed	5,449	72	66	8

Vegetation Community/Habitat	FMO in the Decision Area (acres)	FMO in Area of Expected Development—Oil and Gas (acres)	FMO in Area of Expected Development—Phosphate (acres)	BLM Surface Tracts (acres)
Wetland Forest				
Hydric hammock	71	0	0	0
Industrial/Commercial pineland	7,866	0	0	0
Mangrove swamp	285	219	0	10
Mixed hardwood -pine forest	2,438	31	26	0
Natural Pineland	9,280	371	28	185
Salt Marsh	870	25	0	15
Beach/Surf Zone	228	7	0	19
Sandhill	4,247	0	0	0
Scrub	3,598	0	0	66
Shrub Swamp	1,232	43	105	0
Tidal Flat	10	0	0	<1
Tropical Hardwood Hammock	18	2	0	18
Agriculture	6,737	138	419	0
Urban/Developed	12,623	2,582	64	0
Water	3,215	376	7	0
Not Classified	185	0	0	0
Totals	**98,573**	**5,285**	**1,887**	**374**

Acres of BLM surface tracts are included in FMO totals.

Bay Swamp: Bay Swamps are hardwood swamps dominated by evergreen shrubs and trees, including sweet bay (*Magnolia virginiana*), loblolly bay (*Gordonia lasianthus*), black gum, cypress (*Taxodium* spp.), and/or mixtures of sweet bay, loblolly bay, and red bay (*Persea borbonia*). Scattered longleaf pine and pond pine (*Pinus serotina*) and occasionally Atlantic white cedar (*Chamaecyparis thyoides*) are also found in this community depending on the location within the state. Shrubby and herbaceous species composing the understory and groundcover may include greenbriars (*Smilax* spp.), wax myrtle (*Myrica cerifera*), fetterbush (*Lyonia lucida*), royal fern (*Osmunda regalis*), cinnamon fern (*Osmunda cinnamomea*), holly (*Ile*x spp), and sphagnum (*Sphagnum* spp.). This community is found in shallow, stagnant drainages often within depressions in pine flatwoods, or on hillsides, or as strips along edges of creeks. Bay Swamps occupy peat-filled depressions and are mostly acidic; remaining saturated for long periods of time with little water level fluctuation.

There are 398 acres of Bay Swamp habitat on FMO, including two acres on the Lake Marion Tract in Polk County. None of the acreage occurs in the areas of expected development.

Bottomland Hardwood Forest: Bottomland Hardwood Forests are forested, alluvial wetlands that occur within the broad floodplain areas adjacent to several Panhandle river systems, including the Apalachicola, Choctawhatchee, and Escambia rivers. Species composing the overstory of this habitat include water hickory (*Carya aquatica*), overcup oak, swamp chestnut oak (*Quercus michauxii*), river birch, American sycamore red maple, Florida elm (*Ulmus americana var. floridana*), bald cypress, blue beech (*Carpinus caroliniana*), and swamp ash (*Fraxinus* spp.). Species composing the understory and groundcover of this habitat can include bluestem palmetto (*Sabal minor*), hackberry (*Celtis laevigata*), swamp azalea (*Rhododendron viscosum*), pink azalea (*Rhododendron periclymenoides*), greenbriars, poison ivy (*Toxicodendron radicans*), peppervine (*Ampelopsis arborea*), rattanvine (*Berchemia scandens*), indigo bush (*Amorpha fruticosa*), white grass (*Leersia virginica*), plume grass (*Saccharum* spp), redtop panicum (*Panicum rigidulum*), caric sedges, silverbells (*Halesia* spp), crossvine (*Bignonia capreolata*), and wisteria (*Wisteria* sp.).

There are 213 acres of this vegetation community on FMO; none of that acreage is in the areas of expected development, or on surface tracts.

Coastal Strand: Coastal Strand is the vegetated zone encompassing dunes and more landward areas, including upper beach and coastal rock formations. This habitat occurs on deep, well-drained, sandy soils located between open beach and maritime hammock habitats that receive high-energy wave action. In the more protected landward areas, woody plant species are more common, whereas early successional herbaceous vegetation typically characterizes the foredune and upper beach. Species diversity is relatively low and limited by wind, wave action, and salt spray. Common species found include vines, grasses, and other herbaceous plants and salt-tolerant shrub species. Beach morning glory (*Ipomoea imperati*), railroad vine (*Ipomoea pes-caprae*), sea oats (*Uniola paniculata*), saw palmetto (*Serenoa repens*), Spanish bayonet (*Yucca harrimaniae*), yaupon holly (*Ilex vomitoria*), wax myrtle, and sea grape (*Coccoloba uvifera*), as well as more tropical species such as cocoplum (*Chrysobalanus icaco*) and nickerbean (*Entada gigas*) are typical.

There are 122 acres of Coastal Strand habitat on FMO; 19 of those acres are in the oil and gas area of expected development. There are an additional 19 acres on the Egmont Key tract.

Cypress Swamp: Cypress Swamp consists of frequently inundated wetlands that form forested borders along water bodies such as rivers, creeks, and lakes. The dominant canopy vegetation includes bald cypress and/or pond cypress (*Taxodium ascendens*) with a lower occurrence of scattered blackgum, red maple, and sweetbay. Understory and groundcover vegetation may include lizard's tail (*Saururus cernuus*), and various ferns; however, groundcover is frequently limited because of constant inundation and because the dense canopy blocks the majority of sunlight.

There are 2,439 acres of Cypress Swamp habitat on FMO, including 121 acres in the oil and gas area of expected development and seven acres in the phosphate area of expected development. There is one acre of cypress swamp on the Citrus County surface tract.

Disturbed/Transitional: Disturbed areas are upland areas that have lost nearly all of the vegetation community because of extensive human or natural disturbance, and are demonstrating natural successional processes toward recovery. Examples of disturbance may be clear-cutting, land clearing, or severe fire. These areas can range from bare soil to recently denuded areas where mixed cover of primarily herbaceous vegetation may be present, often similar to preexisting species composition.

Transitional areas are composed primarily of exotic invasive species in either upland or wetland sites. These invasive species can be mixed with native plants or can form monocultures. Some of the more

prevalent include melaleuca (*Melaleuca quinquenervia*), Australian pine (*Casuarina equisetifolia*), Brazilian pepper (*Schinus terebinthifolius*), and eucalyptus (*Eucalyptus cinerea*).

There are 12,375 acres of Disturbed/Transitional areas on FMO, including 412 acres in the oil and gas area of expected development and 51 in the phosphate area of expected development.

Dry Prairie: The Dry Prairie ecosystem occurs on very flat terrain located primarily just north of Lake Okeechobee. Dry Prairie is essentially treeless, consisting mainly of grass- and shrub-lands interspersed with scattered cypress domes and strands, bayheads, isolated freshwater marshes, and hardwood hammocks. Saw palmetto, fetterbush, staggerbush (*Lyonia fruticosa*), tar flower (*Bejaria racemosa*), gallberry (*Ilex coriacea*), blueberry (*Vaccinium* spp), wiregrass (*Aristida beyrichinia*), carpet grasses (*Axonopus* spp), and various bluestems (*Andropogon* spp.) are a few of the grasses, sedges, and shrubs that characterize this habitat. Palmetto prairies are also included in this category throughout central and south Florida. Palmetto prairies consist of former pine flatwoods, and approximately 10 to 15 percent of these sites are covered with scattered pines.

There are 6,039 acres of Dry Prairie habitat on FMO, including 253 acres in the oil and gas area of expected development and 141 acres in the phosphate area of expected development.

Freshwater Marsh and Wet Prairie: This is a wetland community dominated by herbaceous plant species. Freshwater Marsh habitat occurs in inundated areas and typically consists of tall emergent and floating-leaved species. Wet Prairies are dominated by grasses and sedges, and are subject to periodic inundation.

There are 2,985 acres of Freshwater Marsh and Wet Prairie habitat on FMO, including 52 acres in the oil and gas area of expected development, 119 acres in the phosphate area of expected development, and three acres of Freshwater Marsh habitat at Lathrop Bayou and Citrus County tracts.

Grassland/Improved Pasture: This is an upland community dominated by perennial low-growing grasses and forbs. The vegetation is most commonly in monocultures of non-native, noninvasive species. Improved Pastures are lands that have been altered—typically cleared, tilled, reseeded with primarily non-native grasses, and periodically improved with fertilizer application and brush control.

There are 12,395 acres of Grassland/Improved Pasture habitat on FMO, including 429 acres in the oil and gas area of expected development and 823 acres in the phosphate area of expected development.

Hardwood Hammock Forest: The composition of this community varies across the state in part because of differences in soil moisture regimes, soil type, and geographic location. Hardwood Hammock Forest is found on relatively rich sandy soils, including mesic (moderately moist soil) and xeric (dry soil) variation as well. The mesic hammock communities in north Florida include American beech, southern magnolia (*Magnolia grandiflora*), Shumard oak (*Quercus shumardii*), white oak, mockernut hickory (*Carya tomentosa*), pignut hickory (*Carya glabra*), sourgum, basswood, white ash (*Fraxinus americana*), mulberry (*Morus rubra*), and spruce pine (*Pinus glabra*). Species composition shifts in the southern part of the state include laurel oak, hop horn bean (*Ostrya virginiana*), blue beech, sweetgum, cabbage palm (*Sabal palmetto*), American holly (*Ilex opaca*), and southern magnolia.

Xeric hammocks are much drier and more open than mesic hardwood hammocks and occur on deep, well-drained, sandy soils where fire has not occurred for an extensive period of time. Some species found throughout this habitat include live oak (*Quercus virginica*), sand-live oak (*Quercus geminata*), bluejack oak (*Quercus incana*), blackjack oak, southern red oak, sand-post oak (*Quercus margaretta*), and pignut hickory. Xeric hammocks include the category cabbage palm-live oak hammocks. The understory in these

hammocks is mostly open, including such species as wax myrtle, water oak (*Quercus nigra*), and saw palmetto.

There are 3,255 acres of Hardwood Hammock Forest habitat on FMO, including 133 acres in the oil and gas area of expected development and 31 acres in the phosphate area of expected development. There are 27 acres of Hardwood Hammock Forest habitat on surface tracts, including the Lake Marion, Egmont Key, and Citrus County tracts.

Hardwood Swamp/Mixed Wetland Forest: This habitat is composed of either a mixture of hardwoods and cypress where hardwoods are dominant or pure stands of hardwoods. This habitat occurs on the organic soils of rivers, creeks, and broad lake basins forming forested floodplains. The overstory of this habitat includes blackgum, water tupelo, bald cypress, dahoon holly (*Ilex cassine*), red maple, swamp ash, cabbage palm, and sweetbay.

Mixed Wetland Forest forms when neither hardwoods nor conifers dominate and usually represents a transitional site from hardwoods to conifers on hydric/mesic sites. The dense canopy in this habitat allows little sunlight penetration and little air movement, which creates a humid environment and makes burning very infrequent. Hardwood Swamp/Mixed Wetland Forests occur on low-lying flatlands in basins and depressions and flood only in extreme conditions.

There are 5,449 acres of Hardwood Swamp/Mixed Wetland Forest habitat on FMO, including 72 acres in the oil and gas area of expected development and 66 acres in the phosphate area of expected development. There are eight acres of this habitat on the Citrus County tract.

Hydric Hammock: Hydric Hammock occurs on soils that are poorly drained or have high water tables and typically have a layer of limestone present. Hydric Hammocks are not flooded as frequently as mixed hardwood and cypress swamps even though they are associated as a still-water wetland. Overstory is relatively dense, with canopy closure of about 75 to 90 percent. Common species include laurel oak, live oak, cabbage palm, southern red cedar (*Juniperus virginiana var. salicicola*), and sweetgum. The sub-canopy and ground layer vegetation is highly variable and is dominated by wax myrtle. Other species include yaupon, dahoon holly, and swamp dogwood. Groundcover is sometimes absent but sometimes includes dense ferns, sedges, grasses, and greenbriars. Hydric Hammock is usually found near wet prairie, marsh, and between mesic hammocks/pine flatwoods and river swamp. Hydric Hammock is found extended along the edge of coastal salt marshes in narrow bands along the Gulf Coast and along the St. Johns River.

There are 71 acres of Hydric Hammock habitat on FMO; none occurs in the areas of expected development or on surface tracts.

Industrial/Commercial Pineland: These areas are characterized by high-density, even-aged, single-species stands, planted in rows at regular intervals across large areas. These stands are mostly longleaf pine and loblolly pine tracts. On sites with poorer soils, sand pine (*Pinus clausa*) plantations are more common, which require much more preparation. Understory vegetation varies greatly within pineland depending on the age of the pine trees and what management strategies are used at the site. Palmetto, gallberry (*Illex glabra*), and wax myrtle can be found growing excessively dense on recently planted sites. Groundcover decreases as trees mature and the canopy becomes denser.

There are 7,866 acres of Industrial/Commercial Pinelands habitat on FMO; none occurs in the areas of expected development or on surface tracts.

Mangrove Swamp: These dense, brackish water swamps occur along low-energy shorelines and in protected, tidally influenced bays of southern Florida. This community is composed of freeze-intolerant tree species that are distributed south of a line from Cedar Key on the Gulf Coast to St. Augustine on the Atlantic Coast. These swamp communities are usually dominated by red (*Rhizophora mangle*), black (*Avicennia germinans*), and white mangroves (*Laguncularia racemosa*) that progress in a series from seaward to landward areas, respectively, while buttonwood trees (*Conocarpus erectus*) occur in areas above high tide. Mangrove Swamps may progress in zones of single species from landward (white mangrove) to seaward (red mangrove) depending on the slope and level of disturbance.

There are 285 acres of Mangrove Swamp habitat on FMO, including 219 acres in the oil and gas area of expected development. There are 10 acres of Mangrove Swamp habitat at Jupiter Inlet and on the Florida Keys surface tracts.

Mixed Hardwood-Pine Forest: This community occurs mainly on the hills of sandy clay soils on the northern Panhandle and makes up the southern extension of the Piedmont southern mixed hardwoods. Stands usually begin as mostly young pines, and as the stands age, they gradually shift to a complex of various co-dominate hardwoods. Shortleaf and loblolly pine, American beech, mockernut hickory, southern red oak, and water oak make up the canopy, with American holly, and dogwood (*Cornus* spp) represented in the mid-story. Other upland forest dominated by conifers and hardwoods can be found in this category. These communities contain well-developed associations with other hardwood species characteristic of the hardwood hammock forest community, such as live oak, laurel oak, and water oak. This habitat usually has a moist (mesic) ground layer because of a thick layer of leaf litter and a thick canopy with low airflow and light penetration. Because of the mesic condition of this habitat, burning seldom occurs.

There are 2,438 acres of Mixed Hardwood-Pine Forest habitat on FMO, including 31 acres in the oil and gas area of expected development and 26 acres in the phosphate area of expected development.

Natural Pineland: Before human settlement, much of north and central Florida was covered by Natural Pineland, including mesic, hydric, and scrubby flatwoods, and upland pines. Agriculture, conversion to pine plantations, introduction of new species, change in fire regime, and other human influences have altered much of this habitat. The type of pineland habitat present varies with slight change in soil regime, hydroperiod, and topography. Pine flatwoods occur on flat sandy terrain where the canopy consists mainly of longleaf, slash, and pond pine. Well-drained sites are generally dominated by slash pine, moderately moist areas are dominated by longleaf pine, and pond pine usually dominates poorly drained areas. These three communities are generally dominated by the same groundcover and understory, including saw palmetto, gallberry, wax myrtle, and a variety of grasses and herbs. Generally, longleaf pine sites are dominated by wiregrass and runner oak (*Quercus margarettae*), fetterbush and bay trees are found in pond pine areas, and longleaf pine flatwoods are dominated by saw palmetto, gallberry, and rusty lyonia (*Lyonia ferruginea*). Scrubby flatwoods occur on drier ridges that were originally formed on or near old coastal dunes. The overstory of scrubby flatwoods is dominated by longleaf and slash pine, and the groundcover is similar to that of xeric oak scrub habitat. Cypress domes, bay heads, titi swamps, and freshwater marshes are often found interspersed in isolated depressions found throughout Natural Pineland habitat. Fire is a key factor in maintaining and shaping this habitat, and the majority of plant and animal species found here are adapted to fire occurrence every one to eight years.

There are 9,280 acres of Natural Pineland habitat on Florida FMO, including 371 acres in the oil and gas area of expected development and 28 acres in the phosphate area of expected development. There are 168 acres of Natural Pineland habitat in a mature longleaf/slash pine flatwood at Lathrop Bayou.

Salt Marsh: Salt Marshes are coastal wetlands that occur in the zone between low and high tides known as the intertidal zone. These marshes vary in frequency of inundation by salt or brackish water and occur only in areas where wave energy is low and where mangroves are absent. Mangroves must be absent because they out-compete shade-intolerant plants (mostly grasses, sedges, and rushes) that characterize salt marsh vegetation. Salt marshes of larger sizes are usually dissected by numerous tidal creeks. Because of all these variables, species distribution is usually highly uneven within Salt Marsh.

In lower elevation salt marshes adjacent to tidal creeks and pools, smooth cordgrass (*Spartina alterniflora*) makes up the dominant vegetation. The slightly less inundated salt marsh is dominated by needlerush (*Juncus roemerianus*). Vegetation at the higher elevations forms transitional areas to uplands and may contain species such as marsh-hay (*Spartina patens*), glassworts (*Salicornia* spp), saltwort (*Batis maritima*), saltgrass (*Distichlis spicata*), sea ox-eye daises (*Borrichia frutescens*), marsh-elder (*Iva frutescens*), and saltbush (*Atriplex* sp.), as well as many other species. Salt Marshes vary in extent and species composition throughout Florida.

There are 870 acres of Salt Marsh habitat on FMO, including 25 acres in the oil and gas area of expected development. There are 15 acres of Salt Marsh habitat on surface tracts, primarily needlerush marsh surrounding Lathrop Bayou.

Sand Beach/Surf Zone: This habitat category spans the transition zone between terrestrial and marine systems. Daily flooding by salt water and high wave action prevent vegetation from becoming established, except for small isolated areas of algae growth. Beach dunes, which are mounds of windblown sand, are characteristic of beaches. Vegetation on these dunes is limited to highly specialized terrestrial species. Low-energy beaches are important spawning and feeding habitat for multiple species of shorebirds.

There are 228 acres of Sand Beach/Surf Zone habitat on FMO, including seven acres in the oil and gas area of expected development. There are 19 acres of this habitat on the Egmont Key and Gasparilla surface tracts.

Sandhill: Sandhills are upland, savanna-like habitats found in dry, well-drained, mostly yellow, sterile sands on gently rolling terrain. These communities are found mainly in north and central Florida. This habitat has an open overstory of longleaf pines, and mixed in among the tall pines are turkey oak (*Quercus laevis*), sand post oak, and bluejack oak. The grassy groundcover consists of various grasses and herbs, including wiregrass, lopsided indiangrass (*Sorghastrum secundum*), bluestem, blazing stars (*Liatris* spp), partridge pea (*Chamaecrista fasciculata*), beggars tick (*Bidens* spp.), milk pea (*Galactia* spp), queen's delight (*Stillingia sylvatica*), and others. Because of the open canopy and well-drained soils in this habitat, the temperature and humidity fluctuate rapidly and frequently compared with conditions in a high-moisture closed-canopy forest. Despite its overall poor water retention properties, many temporary wetlands are found throughout this landscape and are an integral part of this habitat type. These wetland depressions provide valuable breeding and foraging habitat for many species. These pyrogenic (fire-dependent) communities require frequent, low-intensity fires to reduce competition from hardwoods and stimulate flowering and seed germination of many grasses and herbs. Sandhill is typically the precursor to xeric hammock habitat in the absence of fire.

There are 4,247 acres of Sandhill habitat on FMO. None of this acreage occurs in the areas of expected development or on surface tracts.

Scrub: This habitat occurs in patches on typically white or near white sandy soils that are deep and well-drained. Scrub can be found in both inland and coastal areas, from the Panhandle through subtropical regions of the peninsula. Scrub is usually dominated by various evergreen oaks and/or Florida rosemary

(*Ceratiola ericoides*), with or without a sand pine overstory. Scrub communities are fire-adapted, usually experiencing fires about every 10 to 20 years. Scrub fires tend to result in stand replacement of sand pines, with oak resprouting vigorously.

Oak scrub is dominated by low-growing oaks interspersed with patches of bare, white sand. The most common species are myrtle oak (*Quercus myrtifolia*), Chapman's oak (*Quercus chapmanii*), sand-live oak, inopina oak (*Quercus inopina*), scrub holly (*Ilex opaca var. arenicola*), scrub plum (*Prunus geniculata*), scrub hickory (*Carya floridana*), rosemary, scrub palmetto, and saw palmetto. Sand pine scrub includes a sand pine component with an understory of myrtle oak, Chapman's oak, sand-live oak, rusty lyonia, wild olive (*Cordia boissieri*), scrub bay (*Persea humilis*), and scrub holly. In mature stands, groundcover is typically sparse. Rosemary scrub has few or no sand pines or scrub oaks but is dominated by rosemary with scattered lichen cover, scrub hypericum (*Hypericum cumulicola*), and paper nailwort (*Paronychia chartacea*).

There are 3,598 acres of Scrub habitat on FMO. None of these acres are in the areas of expected development. There are 66 acres of Scrub habitat on surface tracts, including 62 acres at the Jupiter Inlet ONA, and four acres at the Lake Marion surface tract.

Shrub Swamp: Shrub Swamps are wetland areas usually experiencing environmental change and are typically dominated by dense, low-growing, woody shrubs or small trees. Environmental changes may have been anthropogenic or natural (e.g., increased or decreased hydroperiod, fire, clear-cutting, and siltation), and Shrub Swamps are usually in early to mid-succession in habitat and species structure. Shrub Swamps are sometimes dominated by species such as willow, but sometimes multiple opportunistic plants may form the dense, low canopy. Mainly hydric tree species indicative of wooded wetlands are found in this habitat, including willow, wax myrtle, primrose willow (*Ludwigia peruviana*), buttonbush, and red maple sapling, sweetbay, and blackgum. In northern Florida, some Shrub Swamps are a fire-maintained subclimax of bay swamps. Common species found in these areas are black titi *(Cliftonia monophylla*), swamp cyrilla *(Cyrilla racemiflora)*, fetterbush, sweet pepperbush *(Clethra alnifolia*), doghobble (*Leucothoe fontanesiana*), large gallberry, and myrtle-leaf holly (*Ilex myrtifolia*).

There are 1,232 acres of Shrub Swamp habitat on FMO, including 43 acres in the oil and gas area of expected development and 105 acres in the phosphate area of expected development.

Tidal Flat: Tidal flats are non-vegetated areas of sand or mud protected from wave action and composed primarily of mud transported by tidal channels.

There are 10 acres of Tidal Flat habitat on FMO, none of which occurs in the areas of expected development. There is a small area of Tidal Flat habitat associated with the Park Key tract.

Tropical Hardwood Hammock: These upland hardwood forests occur in extreme south Florida and are characterized by tree and shrub species on the northern edge of a range that extends south into the Caribbean. These communities are sparsely distributed, starting from south of Vero Beach on the Atlantic coast to Sarasota on the Gulf coast. This habitat is also found throughout uplands on the Florida Keys and on many tree islands in the Everglades. This tropical community is rich in species diversity, with more than 35 species of trees and about 65 species of shrubs in some areas. Tropical plant characteristics of this habitat include strangler fig (*Ficus aurea*), gumbo-limbo (*Bursera simaruba*), mastic (*Pistacia lentiscus*), bustic (*Dipholis salicifolia*), lancewood (*Nectandra coriacea*), poisonwood (*Metopium toxiferum*), pigeon plum (*Coccoloba diversifolia)*, Jamaica dogwood (*Piscidia piscipula*), and Bahama lysiloma (*Lysiloma latisiliquum*), as well as live oak and cabbage palm. In addition, in the Florida Keys lignum–vitae (*Guaiacum officinale*), mahogany (*Swietenia mahagoni*), thatch palms (*Thrinax radiata*), and manchineel (*Hippomane mancinella*) can also be found, which are extremely rare in the United States.

There are 18 acres of Tropical Hardwood Hammock habitat on FMO, with two of those acres occurring on FMO in the oil and gas area of expected development.

Condition of Vegetation Communities on Surface Tracts in Florida

The condition of vegetation on surface tracts was assessed to identify the needs associated with restoring vegetation communities on surface tracts to good condition. There is no assessment of the condition of vegetation communities on FMO where BLM is not the surface manager because this is outside BLM's management responsibility. The condition of the vegetation communities on surface tracts was assessed using the following criteria:

- Good condition: vegetation communities show little change from historical species composition and community structure or excellent recovery from historical permutations.
- Fair condition: vegetation communities show visible permutations from historical species composition and community structure but will improve with appropriate management and time.
- Poor condition: vegetation communities are depauperate in expected plant species and show visible permutations in community structure.

Table 3-30 provides a summary of the condition of the vegetation communities found on surface tracts in Florida. Additional information on the surface tracts is available in Appendix B.

Table 3-30. Condition of Vegetation Communities/Habitats on Surface Tracts in Florida

Vegetation Community/Habitat	Good Condition (acres)	Fair Condition (acres)	Poor Condition (acres)	Total (acres)
Bay Swamp		2		2
Coastal Strand		19		19
Disturbed Transitional			2	2
Freshwater Marsh/Wet Prairie	2	1		3
Hardwood Hammock Forest		23	4	27
Hardwood Swamp	8			8
Mangrove Swamp	6	4		10
Natural Pineland	169	8	8	185
Salt Marsh	14	1		15
Sand Beach		19		19
Scrub	52		14	66
Tropical Hardwood Hammock	5		13	18
Totals	**256**	**77**	**41**	**374**

3.5.9 Florida Priority Plant Species

Table 3-31 lists priority plant species ranked by the state's natural heritage program, Florida Natural Areas Inventory, as either Critically Imperiled (S1) or Imperiled (S2) with occurrence records either on or within one mile of FMO in the area of expected development, or on surface tracts. This list also includes

plant species that occur on surface tracts that are listed by the State of Florida as endangered (E) or threatened (T) (Florida Department of Agriculture and Consumer Services via Chapter 5B-40, F.A.C.) and Vulnerable (S3) endemic plants with narrow distributions that are known to occur on surface tracts.

Table 3-31. Florida Priority Plant Species

Common Name Scientific Name	Natural Heritage Rank[1]	State Listing	Occurrence Record Within One Mile of FMO	Occurrence Record on FMO or Surface Tract	Habitat/Occurrences Records
Curtiss' milkweed *Asclepias curtissii*	S3	E		X	Found only in Florida in scrub, sand pine scrub, and scrubby flatwoods. Occurrence records in central and southern Florida. Occurs on Jupiter Inlet ONA.
Southern milkweed *Asclepias viridula*	S2	T		X	Moist, acidic pineland savannas, pine flatwoods, and borders of shrub-tree bays and bogs. Occurrence records in 2 separate populations in the Florida Panhandle and in northeastern Florida. Occurs on Lathrop Bayou tract.
Iguana hackberry *Celtis iguanaea*	S1	E	X		Shell mounds and tidal swamps. Occurrence records in Lee and Collier counties.
Sand-dune spurge *Chamaesyce cumulicola*	S2	E	X		Coastal dunes and coastal scrub. Occurrence records on both coasts of peninsula Florida.
Piedmont jointgrass *Coelorachis tuberculosus*	S3	T		X	Moist to wet areas, depressions, marshy sites, and lake borders. Occurrence records throughout the state north of the Everglades. Occurs on the Lathrop Bayou tract.
Large-flowered rosemary *Conradina grandiflora*	S3	T		X	Scrub habitats on the eastern coast of the Florida peninsula. Occurs on the Jupiter Inlet ONA.
Florida pinewood privet *Forestiera segregata var. pinetorum*	S2		X		Shell mounds and coastal habitats. Occurrence records in tropical regions of Florida.
Wiregrass gentian *Gentiana pennelliana*	S3	E		X	Open treeless savannas or wet prairies. Restricted to the central Panhandle of Florida. Occurs on the Lathrop Bayou

Common Name Scientific Name	Natural Heritage Rank[1]	State Listing	Occurrence Record Within One Mile of FMO	Occurrence Record on FMO or Surface Tract	Habitat/Occurrences Records
					tract.
Joewood *Jacquinia keyensis*	S3	T	X	X	Coastal strand and coral exposures. Occurs on FMO at Cayo Costa State Park and on FMO in the Keys and within 0.3 miles of Sugarloaf Key tract.
Gulf Coast Florida lantana *Lantana depressa var. sanibelensis*	S1	E		X	Open grassy areas and in wet limestone prairies in the interior. Known from only 3 locations in Pinellas to Collier counties. Occurs on FMO at Cayo Costa State Park.
Nodding pinweed *Lechea cernua*	S3	T		X	Open sandy sparsely vegetated areas of oak scrub and disturbed scrub communities. Occurrence records from across Florida peninsula, excluding the Everglades. Occurs at the Jupiter Inlet ONA.
West's flax *Linum westii*	S2	E		X	Shallow pond margins in slash pine-saw palmetto flatwoods in the Panhandle and northeastern Florida. Occurs on the Lathrop Bayou tract.
Bog tupelo *Nyssa ursina*	S2	-		X	Open bogs, wet flatwoods, and swamps. Florida endemic restricted to 2 Bay and Gulf counties in the Florida Panhandle. Occurs on the Lathrop Bayou tract.
Giant water-dropwort *Oxypolis filiformis*	Not ranked	E		X	Wet flatwoods, bogs, and cypress swamps. Occurrence records in Florida clustered in Apalachicola region of the Panhandle. Occurs on the Lathrop Bayou tract.
Apalachicola dragon-head *Physostegia godfreyi*	S3	T		X	Bogs, wet flatwoods, wet pine flatwoods, and savannas. Florida endemic limited to the Apalachicola region of the Panhandle. Occurs on the Lathrop Bayou tract.
Florida thatch palm *Thrinax radiata*	S2	E	X		Pinelands and littoral hammocks and scrub on limestone soils. Occurrence records in tropical regions

Common Name Scientific Name	Natural Heritage Rank[1]	State Listing	Occurrence Record Within One Mile of FMO	Occurrence Record on FMO or Surface Tract	Habitat/Occurrences Records
					throughout the Keys. Occurrence near Rookery Bay Aquatic Preserve.
Banded air plant *Tillandsia flexuosa*	S3	T		X	Coastal hammocks. Occurrence records in tropical regions of Florida. Occurs on the Jupiter Inlet ONA.
Fuzzy-wuzzy air-plant *Tillandsia pruinosa*	S1	E	X		Hammocks and dry woods. Occurrence records limited to Collier County.
Chapman's crownbeard *Verbesina chapmanii*	S2	T		X	Wet flatwoods and prairies. Florida endemic limited to central Panhandle region. Occurs on Lathrop Bayou tract.
Karst pond xyris *Xyris longisepala*	S2-3	E		X	Margins of karst ponds, sinkhole lakes, seepage slopes, bogs, and wet prairies. Florida endemic with 8 populations across the Panhandle areas. Occurs on Lathrop Bayou tract.

3.5.10 Florida Invasive Plant Species

Natural areas in Florida, particularly southern Florida, deal with a great onslaught of invasive plant species. The Florida Invasive Pest Plant Council has identified 76 invasive exotic plants as Category I species. These species are altering native plant communities by displacing native species, changing community structure or ecological functions, or hybridizing with natives. An additional 74 plant species are listed as Category II, which are those that have increased in abundance or frequency but have not yet altered Florida plant communities to the extent shown by Category I species (http://www.fleppc.org/).

Table 3-32 lists invasive plant species in Florida of particular management concern to BLM in the areas of expected development or on surface tracts, as well as those species with high potential to invade those areas in the near future.

Table 3-32. Florida Invasive Plant Species

Common Name Scientific Name	Vegetation Communities/Habitats
Air potato *Dioscorea bulbifera*	Hardwood forests, pinelands, and disturbed areas.
Australian pine *Casuarina equisetifolia*	Sandy shores, pineland, sawgrass marshes, coastal dunes, roadsides, and disturbed areas.

Common Name Scientific Name	Vegetation Communities/Habitats
Brazilian pepper *Schinus terebinthifolius*	Disturbed areas, hammocks, pinelands, and mangrove forests.
Camphor tree *Cinnamomum camphora*	Disturbed areas, roadsides, mesic hammocks, upland pine woods, and scrublands.
Carrotwood *Cupaniopsis anacardioides*	Beach dunes, marshes, mangrove and cypress swamps, tropical hammocks, pinelands, scrub habitat, and coastal strand.
Chinese privet, hedge privet *Ligustrum sinense*	Forest understory with moist soils.
Chinese tallow tree *Triadica sebifera*	Fresh or saline water, roadsides, coastal areas, streams, shade to full sun.
Cogon grass *Imperata cylindrica (I. brasiliensis misapplied)*	Disturbed areas, including roadsides, building sites, timber harvesting areas; upland pine forests with dry or moist soils.
Giant salvinia *Salvinia molesta*	Slow-moving fresh water: lakes, ponds, ditches, and marshes.
Glossy privet *Ligustrum lucidum*	Roadsides, disturbed areas, and natural areas.
Guava *Psidium guajava*	Hammocks, pinelands, and roadsides.
Hydrilla *Hydrilla verticillata*	Freshwater aquatic habitat.
Japanese climbing fern *Lygodium japonicum*	Disturbed areas: roadsides and ditches; undisturbed areas, forests, and stream and swamp edges
Japanese honeysuckle *Lonicera japonica*	Fields, forests, wetlands, barrens, and areas of disturbance.
Johnsongrass *Sorghum halepense*	Roadsides, pastures, and hayfields.
Kudzu *Pueraria montana var. lobata, (= P. lobata)*	Open, disturbed areas: roadsides, ROWs, forest edges, old fields, and streams.
Lather leaf *Colubrina asiatica*	Coastal areas, hammocks, buttonwood and mangrove forests, roadsides, and disturbed areas.
Lead tree *Leucaena leucocephala*	Roadsides, hammock margins, coastal strand, canopy gaps, and, disturbed areas.
Laurel fig *Ficus microcarpa (F. nitida and F. retusa var. nitida misapplied)*	Tropical hammocks and coastal areas.
Melaleuca, paper bark *Melaleuca quinquenervia*	Open forest, woodland, shrubland, pine flatwoods, sawgrass marshes, cypress swamps, and stream and swamp edges.

Common Name Scientific Name	Vegetation Communities/Habitats
Mexican petunia *Ruellia brittoniana, (= R. tweediana misapplied)*	Creek beds, pine flatwoods, hardwood hammocks, prairies, rivers, and pastures.
Mimosa, silk tree *Albizia julibrissin*	Disturbed areas, roadsides, and forest edges.
Nandina, heavenly bamboo *Nandina domestica*	Woodlands.
Napier grass *Pennisetum purpureum*	Disturbed areas, roadsides, canal banks, fields, scrub, pine rockland, hammock, sink, lake shore, swamp, and prairies.
Natal grass *Melinis repens (= Rhynchelytrum repens)*	Disturbed dry areas, abandoned fields, and scrub habitat.
Old World climbing fern *Lygodium microphyllum*	Pinelands, cypress swamps, and open wetland marshes.
Orchid tree *Bauhinia variegata*	Disturbed areas, hammock margins, and pine rocklands.
Para grass *Urochloa mutica, (= Brachiaria mutica)*	Disturbed low areas, canals, river and lake shorelines, marshes, swamps, and fresh and brackish water.
Peruvian primrosewillow *Ludwigia peruviana*	Margins of swamps, lakes, and ponds.
Popcorn tree, Chinese tallow tree *Sapium sebiferum (= Triadica sebifera)*	Roadside ditches, closed canopy forests, bottomland hardwood forests, and shores of water bodies.
Rosary pea *Abrus precatorius*	Pinelands, hammocks, pine rocklands, roadsides, and disturbed areas.
Sapodilla *Manilkara zapota*	Disturbed areas and hammocks.
Sansevieria *Sansevieria hyacinthoides*	Disturbed areas and hammocks.
Scaevola, half-flower, beach naupaka *Scaevola taccada, (= Scaevola sericea, S. frutescens)*	Beach dunes, coastal berms, coastal rock barrens, coastal strands, along saline shores, and coastal hammocks.
Schefflera, Queensland umbrella tree *Schefflera actinophylla (= Brassaia actinophylla)*	Cypress strands, sand pine scrub, beach dunes, hammocks, full sun to full shade.
Seaside mahoe	Shore hammocks, sand dunes, mangroves, and beaches.

Common Name Scientific Name	Vegetation Communities/Habitats
Thespesia populnea	
Shoebutton ardisia *Ardisia elliptica (= A. humilis misapplied)*	Hammocks, abandoned fields, disturbed wetlands, tree islands in marshes, and cypress and mangrove swamps.
Skunk vine *Paederia foetida*	Disturbed areas, sandhill, floodplain, and upland mixed forest.
Small-leaf spiderwort *Tradescantia fluminensis*	Hammocks, sandy woods, bottomland forests, disturbed areas, and shady areas.
Strawberry guava *Psidium cattleianum (= P. littorale)*	Disturbed areas, floodplain forest, hydric hammock, mesic flatwoods, rockland hammock, and wet flatwoods.
Suckering Australian-pine, gray sheoak *Casuarina glauca*	Roadsides, disturbed areas, barrier islands, sandy shores, pineland, and sawgrass marshes.
Surinam cherry *Eugenia uniflora*	Disturbed areas, hammocks, coastal strand, pine rockland, scrub, scrubby flatwoods, shell mounds, and sinkholes.
Sword fern *Nephrolepis cordifolia*	Partial or full shade in hammocks, pine rocklands, flatwoods, and marsh edges.
Torpedo grass *Panicum repens*	Marshes, freshwater, disturbed areas, scrub, and flatwoods.
Tropical soda apple *Solanum viarum*	Disturbed, open areas, roadsides, edges of pineland and hammocks, scrub, and scrubby flatwoods.
Water spangles *Salvinia minima*	Wetlands, swamps, and lakes.
Water-hyacinth *Eichhornia crassipes*	Freshwater lakes and ponds.
Water-spinach *Ipomoea aquatica*	Freshwater canals, ditches, and lake shallows,
Wetland nightshade, aquatic soda apple *Solanum tampicense (= S. houstonii)*	Wetlands, cypress swamps, and river margins.
Wild taro *Colocasia esculenta*	Streams, marsh areas, canals, ditches, and wetlands.
Winged yam *Dioscorea alata*	Hammocks, pine rockland, and disturbed areas.
Woman's tongue *Albizia lebbeck*	Tropical hammocks, pine rocklands, rockland hammocks, disturbed areas, coastal strand, and scrub.

Common Name Scientific Name	Vegetation Communities/Habitats
Wright's nutrush *Scleria lacustris*	Disturbed areas.

3.5.11 Kentucky Vegetation

FMO in the *decision area* in Kentucky is associated with 14 U.S. Army Corps of Engineers (USACE) managed reservoirs and lakes, as well as Pennyrile and Kentucky Ridge State Forests. A list of these facilities is provided in Appendix L. There are no BLM surface tracts in Kentucky.

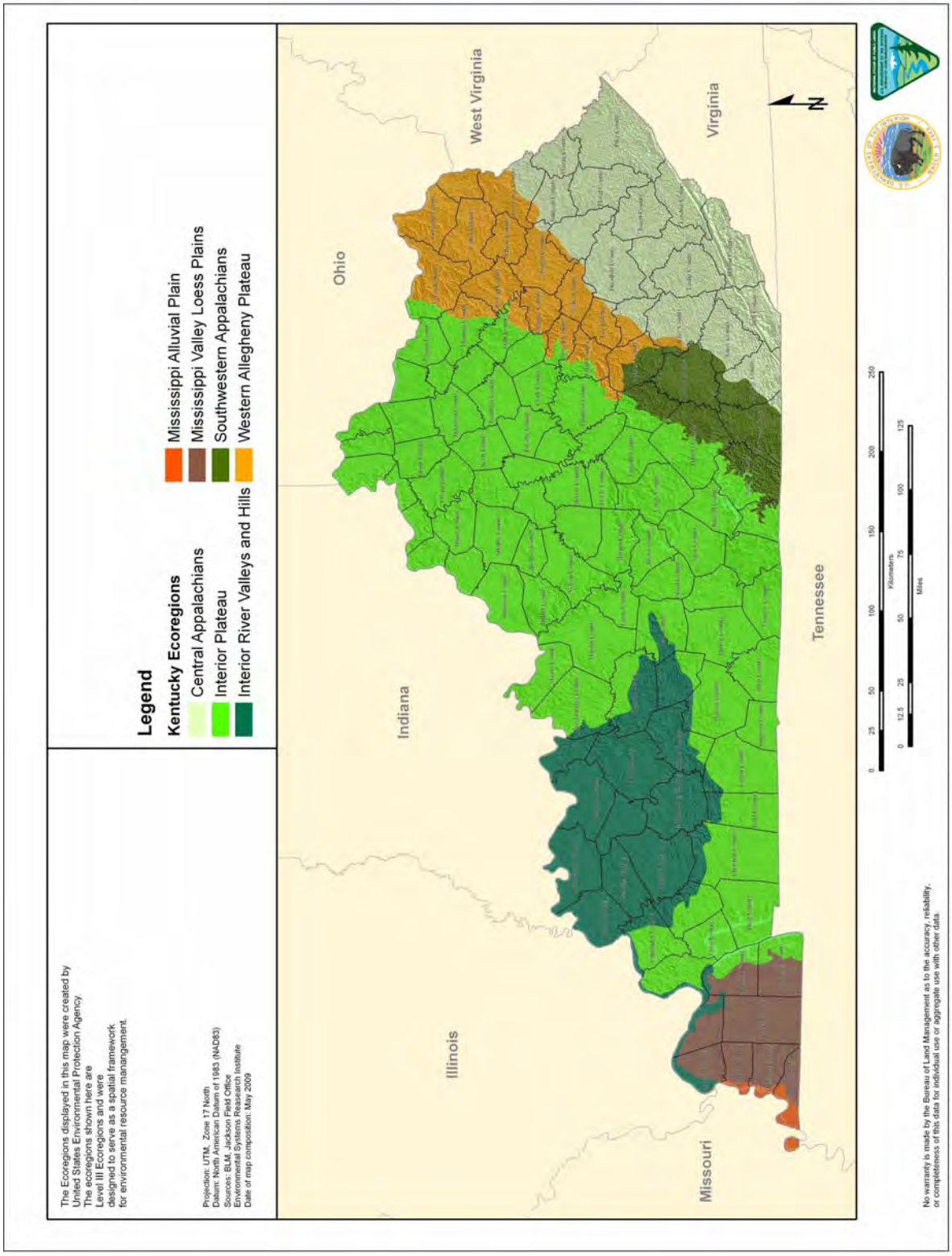
Kentucky Ecoregions

Table 3-33 provides the acres of FMO by ecoregion (Map 3-9).

Table 3-33. FMO Acreage in Kentucky's Ecoregions

Ecoregion	FMO Minerals in the Decision Area (acres)	FMO in Area of Expected Development (acres)
Central Appalachians	63,710	60,918
Interior Plateau	211,353	161,408
Interior River Valleys and Hills	20,695	13,451
Southwestern Appalachians	5,882	0
Western Allegheny Plateau	37,116	37,116
Totals	**338,756**	**272,893**

Map 3-9. Ecoregions in Kentucky



A brief description of each of the Kentucky's five ecoregions in the areas of expected development is provided below.

Central Appalachians: The Central Appalachian ecoregion, stretching from northern Tennessee to central Pennsylvania, is primarily a high, dissected, rugged plateau composed of sandstone, shale, conglomerate, and coal. The rugged terrain, cool climate, and infertile soils limit agriculture, resulting in a mostly forested land cover. A mixed mesophytic forest, consisting of areas of Appalachian oak and northern hardwoods forest, covers the high hills and low mountains.

There are 63,710 acres of FMO located in the Central Appalachians ecoregion, with 60,918 acres in the area of expected development.

Interior Plateau: The Interior Plateau is a diverse ecoregion extending from southern Indiana and Ohio to northern Alabama. Rock types are distinctly different from the coastal plain sands of western Tennessee ecoregions, and elevations are lower than the Appalachian ecoregions to the east. The landforms are open hills, irregular plains, and tablelands. The natural vegetation is primarily oak-hickory forest, with some areas of bluestem prairie and cedar glades.

There are 211,353 acres of FMO in the Interior Plateau ecoregion, with 161,408 acres in the area of expected development.

Interior River Valleys and Hills: The Interior River Lowland ecoregion is composed of many wide, flat-bottomed terraced valleys, forested valley slopes, and dissected glacial till plains. In contrast to the generally rolling to slightly irregular plains in adjacent ecological regions to the north, east, and west, where most of the land is cultivated for corn and soybeans, a little less than half of this area is in cropland, about 30 percent is in pasture, and the remainder is in forest. Bottomland deciduous forests and swamp forests were common on wet lowland sites, with mixed oak and oak-hickory forests on uplands. Paleozoic sedimentary rock is typical, and coal mining occurs in several areas (EPA 2009c).

There are 20,695 acres of FMO in the Interior River Valleys and Hills ecoregion, with 13,451 acres in the area of expected development.

Southwestern Appalachians: The Southwestern Appalachian ecoregion consists of open low mountains containing a mosaic of forest and woodland with some cropland and pasture, and stretches from Kentucky to Alabama. Mixed mesophytic forest is restricted mostly to the deeper ravines and escarpment slopes, and the upland forests are dominated by mixed oaks with shortleaf pine.

There are 5,882 acres of FMO in the Southwestern Appalachians ecoregion, with no acres in the area of expected development.

Western Allegheny Plateau: The Western Allegheny Plateau ecoregion contains hilly and wooded terrain. Extensive mixed mesophytic forests and mixed oak forests originally grew in the Western Allegheny Plateau and, today, most of its rounded hills remain in forest. Livestock, general farms, and residential developments are concentrated in the valleys.

There are 37,116 acres of FMO in the Western Allegheny Plateau ecoregion, with all of the acreage in the area of expected development.

Kentucky Vegetation Communities/Habitats

Table 3-34 displays the acreage of vegetation communities on FMO in the *decision area*, as well as in areas of expected development. Brief descriptions of these vegetation communities/habitats follow.

Table 3-34. Vegetation Communities/Habitats in Kentucky

Vegetation Community/Habitat Type	FMO in Decision Area (acres)	FMO in Area of Expected Development—Oil and Gas (acres)
Caves, Rock Shelters, and Clifflines	963	618
Forested Wetland	4,690	4,176
Savanna/Shrub/scrub	645	531
Upland Forest	192,735	161,925
Developed	7,219	5,938
Water	117,396	87,414
Agriculture	15,107	12,291
Totals	**338,755**	**272,893**

Caves, Rock Shelters, and Clifflines: The Caves, Rock Shelters, and Clifflines habitat have been formed through a combination of geologic upheavals, cutting by streams and rivers through rock, and collapse of cavernous limestone systems. While Caves are found throughout much of Kentucky, most of the Rock Shelter and Cliffline areas are restricted to the Appalachian Mountain region of eastern Kentucky. Also included in this classification are boulder fields, talus slopes, shale cliffs, abandoned underground quarries, mine portals, and rock cuts associated with mining, quarrying, road construction, and railroads.

There are 963 acres of Caves, Rock Shelters, and Clifflines habitat on FMO, with 618 acres of this habitat in the area of expected development.

Forested Wetland: The Forested Wetland habitat is a combination of swamp forests and floodplain forests. Forested Wetland habitats include cypress swamps, tupelo swamps, bottomland hardwood communities, and green ash swamps. These include forested vegetation communities occurring in deep, permanent standing water, or having saturated soils throughout most of the growing season, or in seasonally and temporarily flooded areas. Forested Wetlands are one of the most severely affected and endangered community types in Kentucky.

There are 4,690 acres of this habitat type on FMO, with 4,176 acres in the area of expected development.

Savanna/Shrub-Scrub: The Savanna/Shrub-Scrub habitat includes those areas that are transitional zones from grassland to forest, early successional stages of forest, and previously mined areas currently in the Shrub-Scrub successional stage.

There are 645 acres of this habitat on FMO, with 531 acres in the area of expected development.

Upland Forest: The Upland Forest habitat includes all forest types that are not regularly affected by high water or flood events. This includes forests that are transitions between floodplain and upland habitats, which typically have noticeably different tree species. Upland Forests occur throughout Kentucky, and their species composition varies based on soils, topography, moisture, and aspect. Nearly all of Kentucky's Upland Forests have been disturbed repeatedly, which has altered the forest community to varying degrees.

There are 192,735 acres of this habitat type on FMO, with 161,925 acres in the area of expected development.

3.5.12 Kentucky Priority Plant Species

Table 3-35 lists priority plant species ranked by the commonwealth's natural heritage program, Kentucky State Preserves Commission, as either Critically Imperiled (S1) or Imperiled (S2) with occurrence records either on or within one mile of FMO in the areas of expected development. Kentucky lists plant species under the Kentucky Rare Plant Recognition Act, 1994, ranking them as endangered (E) or threatened (T).

Table 3-35 Kentucky Priority Plant Species

Common Name Scientific Name	Natural Heritage Rank[1]	State Listing	Occurrence Record within 1 mile of FMO	Occurrence Record on FMO	Vegetation Community/ Habitat
Blue monkshood *Aconitum uncinatum*	S2	T	X		Low, moist woods and slopes and alluvial soils along streams in the Cumberland Plateau.
Red buckeye *Aesculus pavia*	S2S3	T		X	Swamp forests, usually stagnant; rich damp woods and thickets.
Lake-cress *Armoracia lacustris*	S1S2	T	X	X	Quiet shores ore muddy waters of sloughs, cypress swamps, seasonal sloughs, or slow water.
Yellow wild indigo *Baptisia tinctoria*	S1S2	T		X	Sandhills, pine flatwoods, xeric woodlands, ridges, woodland edges, and roadbanks.
Yellow screwstem *Bartonia virginica*	S2	T	x		Bogs, swamps, savannas, dry or wet acid soils, and in Kentucky mossy seeps.
Brook saxifrage *Boykinia aconitifolia*	S2	T	X		Streambanks, riverbanks, in crevices in spray cliffs around waterfalls, and seepage.
Glossy red byrum moss *Bryum miniatum*	S1?	E	X		Wet rocks, especially in or near brooks or on cliffs.

Common Name Scientific Name	Natural Heritage Rank[1]	State Listing	Occurrence Record within 1 mile of FMO	Occurrence Record on FMO	Vegetation Community/ Habitat
Tuberous grass-pink *Calopogon tuberosus*	S1	E		X	Sphagnous bogs, fens, savannas, and wet shores; in Kentucky, dry sandy pine (-oak) woods and swamps.
Sweet shrub *Calycanthus floridus var. glaucus*	S2	T	X		Rich mountain woods, hillsides, and streambanks.
Allegheny chinquapin *Castanea pumila*	S2	T		X	Xeric forests and woodlands, generally fire-maintained habitats.
Prairie redroot *Ceanothus herbaceus*	S2	T	X		Sandy or rocky soil, plains, and prairies; in Kentucky, associated with sandstone boulder-cobble bars and limestone cobble bars.
Red turtlehead *Chelone obliqua var. obliqua*	S1	E		X	Streambanks, swamp forests, alluvial swamps, and wet woods.
Sweet-fern *Comptonia peregrina*	S1	E	X		River bars, open woods, clearings, pastures, often on sandy soils.
Star tickseed *Coreopsis pubescens*	S2S3	-	X	X	Open woods, dry slopes and cliffs, and back edges of boulder-cobble bars near riverbank.
Southern lady's-slipper *Cypripedium kentuckiense*	S1S2	E	X	X	Mesophytic forests on annually inundated floodplain of mid-sized to rarely large streams in sandy alluvium.
Small yellow lady's-slipper *Cypripedium parviflorum*	S2	T		X	Bogs, mossy swamps and woods, wet shores; in Kentucky, rich mesic forested slopes.
Dicranodon-tium moss *Dicranodontium asperulum*	S1?	E		X	On damp or wet, acid rock, especially on cliffs: rarely on thin soil or hummus over rock or on bark at the base of trees.
Yellow spikerush *Eleocharis flavescens*	S1?	-		X	Streambanks, open wet areas, and marshes.
Yellow trout-lily	S2S3	-	X	X	Mesic ravine forests.

Common Name Scientific Name	Natural Heritage Rank[1]	State Listing	Occurrence Record within 1 mile of FMO	Occurrence Record on FMO	Vegetation Community/ Habitat
Erythronium rostratum					
Small-flower thoroughwort *Eupatorium semiserratum*	S1?	E		X	Wet woods and openings.
Mercury spurge *Euphorbia mercurialina*	S1S2	T		X	Rich soil on wooded slopes of ravines, and dry-mesic woods in mountains.
Rockcastle wood-aster *Eurybia saxicastellii*	S1S2	T	X	X	Thickets in transition from open boulder-cobble bars to adjacent slope forest.
Mountain silverbell *Halesia tetraptera*	S1S2	E	X	X	Rich woods and edges of sloughs and oxbow lakes.
Eggert's sunflower *Helianthus eggertii*	S2	T	X		Open oak hickory forest on highland rim in Kentucky; and rocky hills and barrens and roadside remnants of this habitat.
Blue mud-plantain *Heteranthera limosa*	S2S3	-	X		Sloughs, pond margins, and mud flats.
Michaux's bluets *Houstonia serpyllifolia*	S1	E	X		Streambanks, grassy balds, moist forests, seepy rock outcrops, spray cliffs, moist disturbed areas, and moist soil in mountains.
American water-pennywort *Hydrocotyle americana*	X	E		X	Bogs, marshes, seepage, cliffs and ledges where wet by seepage or spray from waterfalls, meadows, and damp woods.
John's-cabbage *Hydrophyllum virginianum*	S2?	T	X		Moist or wet woods, and open wet places.
St. Peter's-wort *Hypericum crux-andreae*	S2S3	T	X		Moist or dry sandy woods, meadows and barrens; also pine flatwoods.
Jointed rush *Juncus articulatus*	S2S3	-	X	X	Bogs, wet meadows, beaches, and shores.
Ground juniper *Juniperus*	S2	T	X		Sandy cliff edges and in adjacent pine-oak

Common Name Scientific Name	Natural Heritage Rank[1]	State Listing	Occurrence Record within 1 mile of FMO	Occurrence Record on FMO	Vegetation Community/ Habitat
cummunis. var. depressa					woodlands.
Vetchling peavine *Lathyrus palustris*	S2	T	X	X	Wet meadows, swamps, and wet woods; in Kentucky boulder cobble bars along creeks and rivers.
Wood lily *Lilium philadelphicum*	S2S3	T		X	Openings in seasonally moist forests, prairies, and roadsides.
Loesel's twayblade *Liparis loeselii*	S2S3	T		X	Bogs, peaty meadows, and damp seeping thickets or mesic slopes: has been found in abandoned strip mines.
Small-flowered false-helleborne *Melanthium parviflorum*	S2	E	X		Rich, moist deciduous woods on mountain slopes and crests.
Sweet pinesap *Monotropsis odorata*	S2	T	X		Sandstone ridgetops, chiefly pine woods, but also mesophytic woods.
Plains muhlenbergia *Muhlenbergia cuspidata*	S2	T		X	Barrens in south central part of commonwealth.
Thread-like naiad *Najas gracillima*	S2S3	-		X	Aquatic, in muddy or sandy ponds and lake shores.
Largeleaf grass-of-parnassus *Parnassia grandifolia*	S1	E		X	Wet calcareous soil in mountains, herbaceous seepage areas.
Canby's mountain-lover *Paxistima canbyi*	S2	T		X	Calcareous rocks and slopes (generally near the top of cliffs or bluffs), rocky woods in mountains, usually above major streams.
Mock orange *Philadelphus inodorus*	S1S2	T	X		Limestone bluffs/rocky slopes, streambanks, and river bluffs; also rich forests and woodlands.
Mock bishopweed *Ptilimnium capillaceum*	S1S2	T		X	Marshes, wet meadows, and open wetlands.
Nuttall's mock	S1S2	E		X	Damp prairies, glades,

Common Name Scientific Name	Natural Heritage Rank[1]	State Listing	Occurrence Record within 1 mile of FMO	Occurrence Record on FMO	Vegetation Community/ Habitat
bishopweed *Ptilimnium nuttallii*					shores, and wet soil.
Smooth blackberry *Rubus canadensis*	S1?	E	X		Forests, woodlands, grassy balds, and woodland edges and openings.
Bay starvine *Schisandra glabra*	S1	E	X		Mesic wooded slopes.
Rock skullcap *Scutellaria saxatilis*	S2S3	T	X	X	Rocky mixed mesophytic woods, talus slopes, and bluffs, usually sandstone substrate.
Buckley's goldenrod *Solidago buckleyi*	S2S3	-	X		Dry to mesic woods.
Virginia goldenrod *Solidago gracillima*	S2?	-	X	X	Swamps and wet open rocky river banks.
Eastern featherbells *Stenanthium gramineum*	S2S3	T		X	Mesic forests on river bluffs and in seeps and ridge tops, ephemeral stream banks, wet boulder-cobble bars, and riverbanks.
Round fameflower *Talinum teretifolium*	S1	E	X		Sandstone glades, dry shallow soil seasonally wet by seepage, often between vegetation and open rock.
Spiked hoary-pea *Tephrosia spicata*	S1S2	E	X	X	Sandy fields, open woods, and barrens.
Cutleaf meadow-parsnip *Thaspium pinnatifidum*	S2S3	T		X	Dry mesic forests with limestone outcropping.
Northern white cedar *Thuja occidentalis*	S2S3	T	X	X	Limestone bluffs and ledges along streams.
Least trillium *Trillium pusillum*	S1	E		X	Depression swamps and slopes of thin-canopied oak-hickory forest.
Rock grape *Vitis rupestris*	S2	T	X	X	Sandy deposits of rocky river shores.

3.5.13 Kentucky Invasive Plant Species

The invasive plant species identified in Table 3-36 have been identified as occurring on facilities in the areas of expected development.

Table 3-36. Kentucky Invasive Plant Species

Common Name Scientific Name	Vegetation Community/Habitat
Amur/bush honeysuckle, Morrow's/tartarian honeysuckle *Lonicera maackii, L. morrowi, L. tatarica*	Disturbed areas, open woodlands, and old fields.
Asian bittersweet *Celastrus orbiculatus*	Disturbed areas, forest edges, woodlands, and fields.
Autumn olive *Elaeagnus umbellata*	Disturbed areas, woodland edges, and old fields.
Beefsteak plant *Perilla frutescents*	Roadsides, pastures, fields, woodlands, gravel bars, stream sides, on rich soils, alluvial soils, or dry soils.
Bigleaf periwinkle *Vinca major*	Moist woods, wood edges, and stream sides.
Black nightshade *Solanaum ptycanthum*	Disturbed areas.
Bull thistle *Cirsium vulgare*	Disturbed areas, forest clearcuts, riparian areas, and pastures.
Burning bush Euonymus alatus	Forest edges, old fields, and roadsides.
Callery pear *Pyrus calleryana*	Roadsides, ROWs, and old fields.
Canada thistle *Cirsium arvense*	Disturbed areas, pasture, rangeland, and roadsides.
Chickweed *Stellaria media*	Disturbed areas, roadsides, trails, forests, and cultivated fields.
Chicory *Cichorium intybus*	Shady moist locations.
Chinese clematis *Clematis orientalis*	Moist areas in full sun, fence rows, and wood edges.
Chinese privet *Ligustrum sinense*	Forest understory with moist soils, fencerows, disturbed forest edges, and roadsides.
Chinese silver grass *Miscanthus sinensis*	Disturbed areas, roadsides, and forest margins.
Chinese yam *Dioscorea oppositifolia*	Disturbed areas, roadsides, fencerows, forests, and streamsides.
Common periwinkle	Open to shady woods, often around old homesites.

Common Name Scientific Name	Vegetation Community/Habitat
Vince minor	
Common reed *Phragmites australis*	Disturbed areas, roadsides, ditches, wetlands, riverbanks, lakeshores, and undisturbed areas.
Crown vetch *Coronilla varia*	Roadsides and ROWs.
English ivy *Hedera helix*	Woodlands, fields, and other upland areas.
Eurasian water-milfoil *Myriophyllum spicatum*	Aquatic in stagnant or slow-moving water.
Garlic mustard *Alliaria petiolata*	Disturbed areas, roadsides, forest edges, forests, and trail edges.
Giant foxtail *Setaria faberi*	Roadsides, fencerows, and ROWs.
Hydrilla *Hydrilla verticillata*	Aquatic in slow-moving or still water.
Indian goosegrass *Eleusine indica*	Disturbed, compacted areas in full sun.
Japanese stilt grass *Microstegium vimineum*	ROWs, ditches, stream banks, and moist woodlands.
Japanese honeysuckle *Lonicera japonica*	Disturbed areas, roadsides, wetlands, and forests.
Japanese knotweed *Polygonum cuspidatum*	Near saline and freshwater waterways, ROWs, and disturbed areas.
Johnson grass *Sorghum halepense*	Roadsides, pastures, and hayfields.
Kentucky 31/Tall fescue *Festuca arundinacea (= Lolium arundinaceum)*	Disturbed areas, roadsides, ditches, and forest margins and openings.
Korean stipulacea *Kummerowia stipulacea*	Disturbed areas, old fields, pastures, and roadsides.
Kudzu *Pueraria montana var. lobata*	Open, disturbed areas: roadsides, ROWs, forest edges, and old fields.
Mimosa tree *Albizia julibrissin*	Open areas, woodland edges, and disturbed sites.
Multiflora rose *Rosa multiflora*	Pastures, fields, prairies, savannas, open woodlands, and forest edges.
Musk thistle *Carduus nutans*	Meadows, disturbed areas, and pasture.
Oriental bittersweet	Disturbed areas, forest edges, and woodlands.

Common Name Scientific Name	Vegetation Community/Habitat
Celastrus orbiculata	
Ox-eye daisy *Leucanthemum vulgare*	Wide variety of situations in sun to partial shade.
Periwinkle *Vinca major*	Well-drained, open, disturbed ground of shaded woods, edges, and roadsides.
Poison hemlock *Conium maculatum*	Disturbed areas, roadsides, ROWs, hiking trails, ditches, field borders, stream banks, and floodplains.
Princess tree *Paulownia tomentosa*	Roadsides, stream banks, and forest edges.
Privet *Ligustrum sinense, L. vulgare*	Disturbed areas, forests, and native habitat of all types.
Purple loosestrife *Lythrum salicaria*	Freshwater wetlands, including wet meadows, river and stream banks, lakeshores, and ditches.
Purple star thistle *Centaurea calcitrapa*	Roadsides, pastures, and disturbed areas.
Queen Anne's lace Daucus carota	Disturbed dry grasslands, meadows, pastures, ditches, and roadsides.
Scotch thistle *Onopordum acanthium*	Dry pastures, disturbed fields, and roadsides.
Sericea lespedeza *Lespedeza cuneata*	Disturbed areas, roadsides, fence rows, wetland borders, woodlands, and prairies.
Shrub lespedeza *Lespedeza bicolor*	Disturbed areas, roadsides, fencerows, wetland borders, woodlands, and prairies.
Spotted knapweed *Centaurea biefersteinii*	Open disturbed sites, old fields, banks, roadsides, forest edges, and stream banks.
Tree-of-heaven *Ailanthus altissima*	Disturbed areas, roadsides, woodland edges, fields, and forest openings.
Tropical soda apple *Solanum viarum*	Open forest, pastures, and fields.
White sweet clover *Melilotus alba*	Disturbed, open areas.
Wild cucumber *Sicyos angulatus*	Wooded areas, along stream banks, and roadsides.
Winter creeper *Euonymus fortunei*	Disturbed areas and forest edges.
Yellow sweet clover *Melilotus officinalis*	Disturbed, open areas, and roadsides.

3.5.14 Louisiana Vegetation

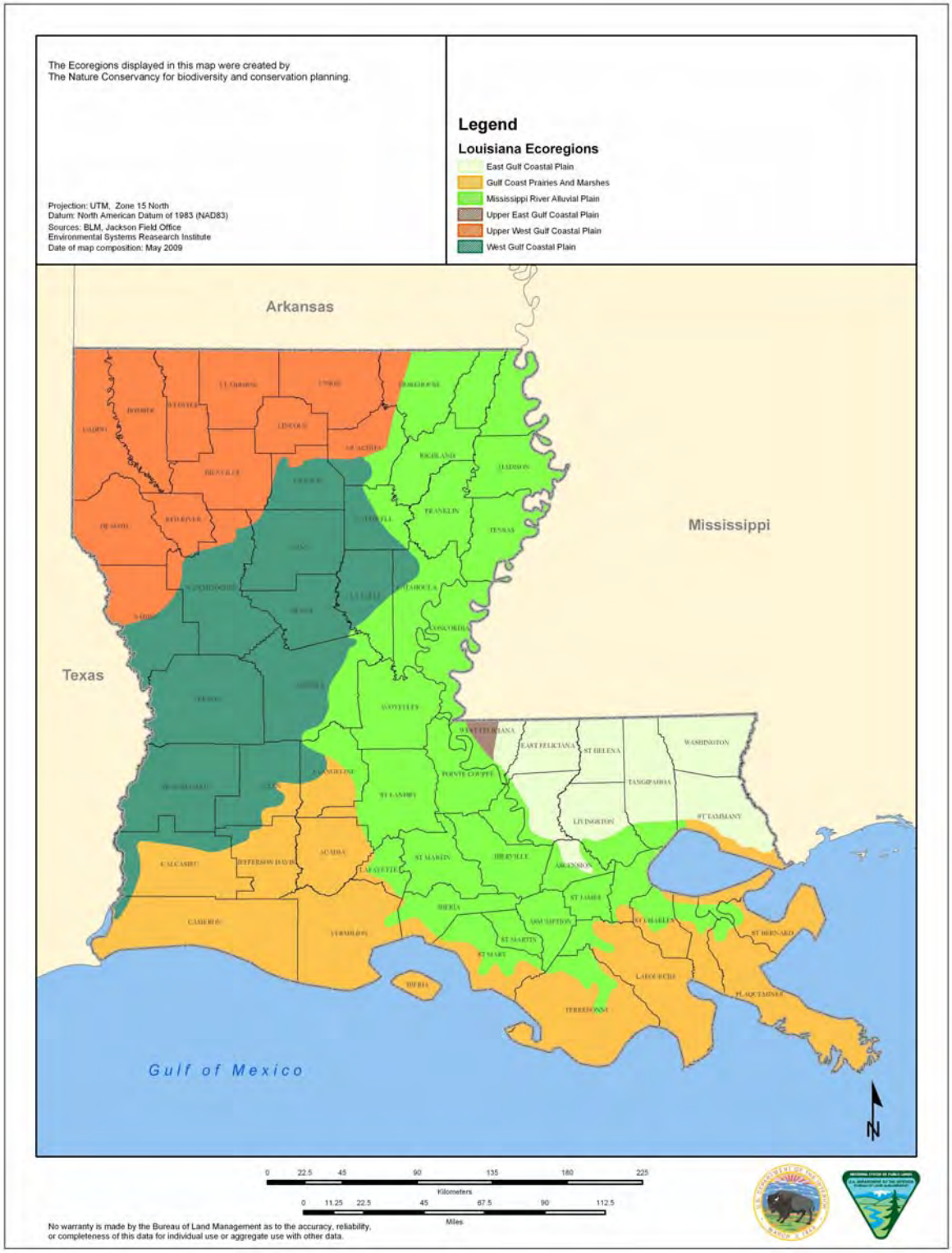
Louisiana Ecoregions

All of the ecoregions in Louisiana have FMO in the area of expected development. Table 3-37 identifies the acreage of FMO in the Louisiana ecoregions (Map 3-10). A brief description of each ecoregion follows the table.

Table 3-37. Acreage in Louisiana's Ecoregions

Ecoregion	FMO in Decision Area (acres)	FMO in Area of Expected Development (acres)	BLM Surface Tracts (acres)
East Gulf Coastal Plain	3,578	2,159	0
Gulf Coast Prairies and Marshes	56,942	55,750	0
Mississippi River Alluvial Plain	29,920	21,954	582
Upper East Gulf Coastal Plain	13	13	0
Upper West Gulf Coastal Plain	59,978	57,771	156
West Gulf Coastal Plain	6,456	3,645	0
Total	**156,887**	**141,292**	**738**

Map 3-10. Ecoregions in Louisiana



East Gulf Coastal Plain: The East Gulf Coastal Plain ecoregion in Louisiana contains bottomland hardwood forests that transition through spruce pine-hardwood flatwoods to longleaf pine savannahs. Eastern longleaf pine savannahs and eastern upland longleaf pine forests historically have been the dominant natural community types; however, live oak-pine-magnolia forests, eastern hillside seepage bogs, longleaf pine-pond cypress-hardwood forests, cypress swamps, small stream forests, and bayhead swamps all occur within the East Gulf Coastal Plain. Upland longleaf pine forest and eastern longleaf pine savanna occur only within the East Gulf Coastal Plain in Louisiana. It is estimated that between one and five percent of the pre-settlement acreage of eastern upland longleaf pine forest and less than one percent of the pre-settlement acreage of eastern longleaf pine savannah remain today.

There are 3,578 acres of FMO within the East Gulf Coastal Plain ecogregion in Louisiana, including 2,159 acres in the area of expected development.

Gulf Coast Prairies and Marshes: The Gulf Coast Prairies and Marshes ecoregion extends across the entire coastal area of Louisiana. This ecoregion is composed of coastal prairie and marsh community types. The coastal prairie remaining in Louisiana is considered critically imperiled, with most of the historical acreage already lost. Coastal marsh areas are composed of salt, brackish, intermediate, and fresh marshes. Natural communities associated with coastal marsh include cypress and cypress-tupelo swamps, coastal live oak hackberry forest (cheniers) of the southwest coast, live oak natural levee forests of the southeastern coast, and some bottomland hardwood forest. Unique to the south-central coast, salt dome hardwood forest occurs at the higher elevations on top of salt domes.

There are 56,942 acres of FMO within the Gulf Coast Prairies and Marshes ecoregion in Louisiana, 55,750 acres of which are within the area of expected development for oil and gas.

Mississippi River Alluvial Plain: The Mississippi River Alluvial Plain ecoregion extends from the southern tip of Illinois south through southeastern Missouri, eastern Arkansas, the delta region of Mississippi, and northeastern Louisiana, and continues along the Mississippi River through Louisiana until it intersects the coastal marshes. The Mississippi River Alluvial Plain is composed primarily of bottomland hardwood forest, with some cypress and cypress-tupelo swamps. The only threat considered high for bottomland hardwood forest is channelization of rivers and streams. Bottomland hardwood forest in the Mississippi River Alluvial Plain provides habitat for more species of concern than any other habitat.

There are 29,920 acres of FMO within this ecoregion in Louisiana, 21,954 acres of which are within the area of expected development for oil and gas

Upper East Gulf Coastal Plain: The Upper East Gulf Coastal Plain ecoregion extends from western Kentucky and Tennessee south through Mississippi and Alabama and into a small portion of Louisiana in East Feliciana Parish. Southern mesophytic hardwood forests are the dominant community type, with some hardwood slope forest and mixed hardwood-loblolly forest present on the loess hills, with steep ravines and intermittent or spring-fed streams. In the low-lying areas with more gentle topography, bottomland hardwood forest, small stream forest, and cypress swamps can be found.

Historically, the Upper East Gulf Coastal Plain was dominated by southern mesophytic forest, the only ecoregion in Louisiana where this habitat occurs. It is estimated that approximately 25 percent of the presettlement acreage of southern mesophytic forest remains today. Small stream forests and agricultural lands are other associated habitats in the Upper East Gulf Coastal Plain, both of which occur in several ecoregions in Louisiana, with approximately 25 to 50 percent of the small stream forest intact today.

There are 13 acres of FMO within this ecoregion in Louisiana, all of which is located in the area of expected development.

Upper West Gulf Coastal Plain: The Upper West Gulf Coastal Plain ecoregion extends from south-central Arkansas to southeastern Oklahoma and south into eastern Texas and northwestern Louisiana. This area, once recognized as the shortleaf pine-oak-hickory region, exists on sandy and clayey uplands above the range of the longleaf pine. Most of the shortleaf pine within the Upper West Gulf Coastal Plain was harvested when these areas were originally settled. The Upper West Gulf Coastal Plain currently is dominated by loblolly pine plantation, but some stands of shortleaf pine-oak-hickory forest do still exist.

There are 59,978 acres of FMO within the ecoregion in Louisiana 57,771 acres, of which are within the area of expected development for oil and gas.

West Gulf Coastal Plain: The West Gulf Coastal Plain ecoregion occurs in central Louisiana and eastern Texas. A broad range of community types occur in this ecoregion, but it is known primarily for its longleaf pine forest. Western upland longleaf pine forests are found in association with hardwood slope forest and mixed hardwood-loblolly forests in the central portions of the ecoregion; forested seeps and western hillside seepage bogs occur along slopes and at lower elevations.

Several unique geologic formations occur in the West Gulf Coastal Plain. These uplifted formations occur in bands, trending northeast to southwest, and include the Jackson, Catahoula, Cook Mountains, and Fleming Formations. The resulting distinctive soil types and conditions influenced the development of the natural community types along the bands. The calcareous forest, calcareous prairies, saline prairies, and sandstone glades/barrens all occur along these formations, depending on the type of formation and the degree of uplift. Western longleaf pine savannas and associated flatwoods ponds and seepage bogs occur in the southern and southwestern portions of the West Gulf Coastal Plain. This area serves as the transition zone between the coastal prairies and upland longleaf pine forest.

In Louisiana, there are 6,456 acres of FMO within with West Gulf Coastal Plain, 3,645 acres of which are the area of expected development for oil and gas.

Louisiana Vegetation Communities/Habitats

Table 3-38 identifies the statewide acreage of FMO, including surface tracts, by vegetation community/habitat type, as well as the acreage of FMO within the area of expected development for oil and gas. A brief description of each of these vegetation communities/habitats follows.

Table 3-38. Vegetation Communities/Habitats in Louisiana

Vegetation Community/Habitats	FMO in the Decision Area (acres)	FMO in Area of Expected Development—Oil and Gas (acres)	BLM Surface Tracts (acres)
Bottomland Hardwood Forest	27,444	24,070	592
Brackish Marsh	288	184	0
Calcareous Prairie	5	5	0
Cypress-Tupelo-Blackgum Swamp	229	14	2
Disturbed—Transitional	23,468	13	13

Vegetation Community/Habitats	FMO in the Decision Area (acres)	FMO in Area of Expected Development—Oil and Gas (acres)	BLM Surface Tracts (acres)
Freshwater Marsh	16,146	15,923	28
Intermediate Marsh	671	670	0
Mixed Hardwood-Loblolly Pine/Hardwood Slope Forest	40,133	35,932	38
Salt Marsh	293	191	0
Sandbars	121	94	0
Southern Mesophytic Forest	12	12	0
Western Longleaf Pine Savannah	2	1	0
Agriculture/Grassland	23,481	18,167	30
Urban	3,021	2,590	0
Water	45,041	43,426	35
Total	**156,887**	**141,292**	**738**

Acres of BLM surface tracts are included in FMO totals.

Bottomland Hardwood Forests: Bottomland Hardwood Forests are forested, alluvial wetlands that occur within the broad floodplain areas adjacent to large river systems. Although large tracts of Bottomland Hardwood Forest habitat remain, most are either second- or third-growth stands. These forests are found throughout Louisiana in all parishes but are the predominant natural community type of the Mississippi River Alluvial plain ecosystem. Typical vegetation includes species such as water oak, Shumard oak, willow oak, American elm (*Ulmus americana*), and green ash.

There are 27,444 acres of this vegetation community on FMO, with 24,070 acres in the areas of expected development.

Brackish Marsh: Brackish Marsh habitat is typically located between salt marsh and intermediate marsh, although it can occur directly adjacent to the Gulf of Mexico. This community is occasionally tidally flooded and is dominated by salt-tolerant grasses, sedges, and rushes. Small pools or ponds may be scattered throughout.

There are 288 acres of this vegetation community on FMO, with 184 of those acres in the areas of expected development.

Calcareous Prairies: Calcareous Prairies are typically small, naturally treeless areas dominated by a diverse population of grasses, composites, and legumes that occur on calcareous substrata in the uplands of central, western, and northwestern Louisiana. Typical species in Calcareous Prairies include honey locust (*Gleditsia triacanthos*), white ash, eastern red cedar, rough-leaf dogwood (*Cornus drummondii*), persimmon (*Diospyros virginiana*), hawthorns, indigos (*Baptisia* spp), prairie acacia (*Acacia angustissima*), blazing stars, big bluestem, and dropseeds (*Sporobolus* spp). Calcareous Prairies can range in size from less than one acre up to 80 or more acres, and occur in a mosaic with calcareous forests.

There are five acres of Calcareous Prairies on FMO, all of which occur in the areas of expected development.

Cypress-Tupelo-Blackgum Swamps: Cypress-Tupelo-Blackgum Swamps are forested, alluvial swamps growing on exposed soils where they occur along rivers and streams and within back swamp depressions and swales. Cypress-Tupelo-Blackgum Swamps have relatively low floristic diversity. Bald cypress and tupelo gum are co-dominants. Common associates are swamp blackgum (*Nyssa sylvatica var. biflora*), swamp red maple (*Acer rubrum var. drummondii*), black willow (*Salix nigra*), pumpkin ash (*Fraxinus profunda*), green ash, water elm (*Planera aquatica*), water locust (*Gleditsia aquatica*), Virginia willow (*Itea virginica*), and buttonbush. Composition of associate species may vary widely from site to site. Undergrowth is often sparse because of low light intensity and long hydroperiod.

There are 229 acres of this vegetation community on FMO, with 14 acres in the areas of expected development.

Disturbed—Transitional: In Louisiana, this acreage is mapped only on surface tracts and includes cleared areas, roads, and other areas that do not support vegetation.

Freshwater Marsh: Freshwater Marsh typically occurs adjacent to intermediate marsh and along the northernmost extent of the coastal marshes. It can occur along coastal bays if freshwater is entering the bay, as occurs at Atchafalaya Bay. Small pools or ponds may be scattered throughout the marsh. Although a large number of plant species can be found in Freshwater Marsh, individual sites tend to be heterogeneous. Freshwater Marsh is frequently dominated by maiden cane (*Panicum hemitomon*). Other characteristic species include spikesedge (*Eleocharis* spp.), bulltongue (*Sagittaria lancifolia*), cattails (*Typha* spp), alligator weed (*Alternanthera philoxeroides*), wiregrass, roseau cane (*Phragmites communis*), coastal water hyssop (*Bacopa monnieri*), and pennyworts (*Hydrocotyle* spp.). A significant portion of freshwater marsh is floating marsh, which occurs in the Deltaic Plain of Louisiana.

There are 16,146 acres of this vegetation community on FMO, with 15,923 acres in the area of expected development.

Intermediate Marsh: Intermediate Marsh typically lies between Brackish Marsh and Freshwater Marsh, although it can be adjacent to the Gulf of Mexico. Intermediate Marsh is dominated by narrow-leaved, persistent species. Small pools or ponds develop in areas of lower elevation and are intermingled with the vegetated areas of higher elevation. Plant diversity and soil organic matter content is higher than in Brackish Marsh. This marsh is characterized by a diversity of species, including bulltongue, cattails, alligator weed, wiregrass, roseau cane, big cordgrass (*Spartina cynosuroides*), and gulf cordgrass (*Spartina spartinae*).

There are 671 acres of this vegetation community on FMO; all but one acre are in the areas of expected development for oil and gas.

Mixed Hardwood-Loblolly Pine/Hardwood Slope Forest: Mixed Hardwood-Loblolly Pine and Hardwood Slope Forest communities have similar species composition but occupy different topographic positions and have different soil moisture, with hardwood slope forests being more mesic. Both communities are more or less evenly distributed in the uplands statewide.

Hardwood Slope Forests occur at the base of slopes rising out of stream floodplains; Mixed Hardwood-Loblolly Pine Forests are found further upslope and potentially on low ridge tops, depending on moisture regime. Loblolly pine may be present, but infrequent, in a Hardwood Slope Forest but comprises 20 percent or more of the overstory, associated with various hardwood species, in a Mixed Hardwood-

Loblolly Pine Forest. In Hardwood Slope Forests, American beech and southern magnolia are typically canopy dominants. Other primary overstory species include white oak, shumard oak, swamp chestnut oak, water oak, laurel oak, cucumber tree, and big leaf magnolia (*Magnolia. macrophylla*).

Mixed Hardwood-Loblolly Pine Forest depends on frequent fire to prevent a succession toward hardwood dominance. On moist sites, sweetgum, beech, water oak, cherrybark oak (*Quercus pagoda*), white oak, yellow poplar (*Liriodendron tulipifera*), American elm, southern magnolia, and red maple are important hardwood components. On dryer upland sites protected from fire, overstory dominants in addition to loblolly are southern red oak, post oak, water oak, blackjack oak, blackgum, and shagbark hickory. Historically, the available pine needle fuel provided regular fire, maintaining a significant pine component. Other types of disturbances also may allow loblolly pine to remain a component of the forest. Fire may have occurred rarely in hardwood slope forests but is not a process required to maintain this community.

There are 40,133 acres of this vegetation community on FMO, with 35,932 acres in the area of expected development.

Salt Marsh: Salt Marsh occurs along the tidal beach rim of the Gulf of Mexico and typically is between one and 15 miles wide. They dominated by salt-tolerant grasses. Small, typically shallow, pools or ponds may be present throughout the habitat. The community is often totally dominated by smooth cordgrass. Other species that may be present include wiregrass, saltgrass, black needlerush, and saltwort.

There are 293 acres of this vegetation community on FMO, with 191 acres in the areas of expected development.

Sandbars: Sandbars are sand/gravel deposit formed from coarse to fine-grained alluvial sediments in or adjacent to permanently flowing freshwater within a natural channel. The structure of the community depends on the mix and stability of substrate, severity and depth of flooding, and permanent nature of the site. The hydrologic regime for this habitat varies from intermittently exposed to intermittently flooded. Vegetation, if present, typically consists of sparse to dense growth of shrubby or herbaceous plants. Buttonbush and elderberry (*Sambucus canadensis*) are common shrubs, and willow and cottonwood are common tree species. The community is successional in nature, but typically remains unforested as a result of repeated flood disturbance and are particularly vulnerable to invasive species.

There are 121 acres of Sandbars on FMO, with 94 acres in the areas of expected development.

S**outhern Mesophytic Forest:** The Southern Mesophytic Forest community in Louisiana occurs only in the northwestern Florida Parishes, primarily in the region known as Tunica Hills. Southern Mesophytic Forest develops on deep, fertile, neutral to slightly alkaline loessial deposits in areas of high, narrow ridges, steep slopes, and deep ravines, usually containing intermittent to permanent streams. This highly dissected landscape creates a relatively cool, moist micro-climate on the slopes and in the ravines. These dissected hills have localized populations of some characteristically Appalachian species. Overstory species include beech, shumard oak, white oak, swamp chestnut oak (*Quercus michauxii*) water oak, yellow poplar, southern magnolia, cucumber tree, American elm, and Florida sugar maple (*Acer floridanum*).

There are only 12 acres of this vegetation community on FMO, all of which is located in the areas of expected development.

Western Longleaf Pine Savannah: Western Longleaf Pine Savannahs are diverse, herb-dominated wetlands that are naturally sparsely stocked with longleaf pine, and include isolated flatwoods ponds.

Herbaceous vegetation of Pine Savannahs is very diverse, dominated by grasses, and similar to that occurring in hillside bogs. Common species found with longleaf pine include, sweet bay, blackgum, live oak, blackjack oak, laurel oak, swamp cyrilla, wax myrtles (*Morella* spp.), St. John's wort (H*ypericum* spp.), broomsedge (*Andropogon* spp), switchgrass (*Panicum* spp), three-awn grass (*Aristida* spp), plume grass (*Erianthus* spp), jointgrass (*Coelorachis* spp), beak-rush (*Rhynchospora* spp), and yellow-eyed grass (*Xyris* spp).

There are two acres of this vegetation community on FMO, with only one acre located in an area of expected development.

Condition of Vegetation Communities on Surface Tracts in Louisiana

The condition of vegetation on surface tracts was assessed to identify the needs associated with restoring vegetation communities to good condition. There is no assessment of the condition of vegetation communities on FMO where BLM is not the surface manager because this is outside BLM's management responsibility. The condition of the vegetation communities on surface tracts was assessed using the following criteria:

- Good condition: vegetation communities show little change from historical species composition and community structure or excellent recovery from historical permutations.
- Fair condition: vegetation communities show visible permutations from historical species composition and community structure but will improve with appropriate management and time.
- Poor condition: vegetation communities are depauperate in expected plant species and show visible permutations in community structure.

Table 3-39 provides a summary of the condition of the vegetation communities found on surface tracts in Louisiana.

Table 3-39. Condition of Vegetation Communities/Habitats on Surface Tracts in Louisiana

Vegetation Community/Habitat	Good Condition (acres)	Fair Condition (acres)	Poor Condition (acres)	Total (acres)
Bottomland Hardwood Forest	457	135	0	592
Cypress Swamp	2	0	0	2
Disturbed/Transitional	-	-	13	13
Freshwater Marsh	24	4	0	28
Mixed Hardwood-Loblolly Pine/Hardwood Slope Forest	15	18	5	38
Agriculture/Cropland/Grassland (acres not ranked)	-	-	-	30
Water (acres not ranked)	-	-	-	35
Totals	**498**	**157**	**18**	**738**

3.5.15 Louisiana Priority Plant Species

Table 3-40 lists those plant species ranked by the state natural heritage program (i.e., Louisiana Natural Heritage Program) as either Critically Imperiled (S1) or Imperiled (S2) with occurrence records either on or within one mile of FMO in the area of expected development or on surface tracts. Louisiana adopts the federal listing status for species occurring in the state, so listed plant species are discussed as federally listed under Special Status Species.

Table 3-40. Louisiana Priority Plant Species

Common Name Scientific Name	Natural Heritage Rank[1]	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO or Surface Tract	Vegetation Community/Habitat
White baneberry *Actaea pachypoda*	S2	X		Deciduous and mixed forests. Occurrence records associated with split-estate in West Feliciana Parish.
Tenpetal thimbleweed *Anemone berlandieri*	S2	X		Open grasslands, prairies, hillsides, and often limey substrate; also woods over thin shale in northern portion of the state.
Soxman milk-vetch *Astragalus soxmaniorum*	S2	X	X	Xeric sandhills, abandoned fields, and roadsides in Caddo, Natchitoches, Union, and Winn parishes.
Wine cup *Callirhoe digitata*	S1	X		Rocky, dryish, soils in limestone glades, meadows, and prairies, Occurrence records limited to Caddo Parish.
Golden aster *Chrysopsis gossypina ssp. hyssopifolia*	S1	X		Open sandy soils, pine woods, and roadsides. Occurrence records associated with split-estate in Washington Parish.
Evening rainlily *Cooperia drummondii*	S2	X		Prairie, meadows, pastures, savannas, and woodlands edge and openings. Occurrence records near FMO in Caddo and De Soto parishes.
Autumn coral-root *Corallorhiza odontorhiza*	S1		X	Upland hardwood dominated slopes and upland ridges, and in calcareous forests. Occurrence records in Caldwell and Ouachita parishes.
Golden wave tickseed *Coreopsis intermedia*	S2	X		Hardwood forests in extreme northwestern portion of state. Occurrence records near FMO in Caddo Parish.

Common Name Scientific Name	Natural Heritage Rank[1]	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO or Surface Tract	Vegetation Community/Habitat
Stiff tickseed *Coreopsis palmata*	S2		X	Prairie remnants. Occurrence records near FMO in Bossier Parish.
Silver croton *Croton argyranthemus*	S2		X	Sandhills and sandy roadsides. Occurrence records in Caddo, Sabine, and Vernon parishes.
An umbrella sedge *Cyperus grayoides*	S2		X	Sandy prairies and dune. Occurrence records in west central portions of state.
Slim-spike prairie-clover *Dalea phleoides*	S1	X		Sandy woodlands in Caddo Parish.
Summer-fairwell *Dalea pinnata*	S1	X		Sandhills and scrub. Occurrence record associated with split-estate in Washington Parish.
Prairie-clover *Dalea villosa var. grisea*	S2	X	X	Sandy woodlands. Occurrence records in Bienville and Caddo parishes.
Silvery glade fern *Deparia acrostichoides*	S2	X		Damp woods, often on slopes. Occurrence records in Florida parishes.
Glade fern *Diplazium pycnocarpon*	S2	X		Moist woods and slopes in neutral soils. Occurrence records associated with split-estate in West Feliciana Parish.
Common shooting-star *Dodecatheon meadia*	S2	X		Moist or dry woodlands, prairies, limestone slopes, and cliff faces. Occurrence records in Bossier, Caddo, and Natchitoches parishes.
Purple coneflower *Echinacea purpurea*	S2	X		Open woodlands, thickets, edge of prairie remnants, and glades. Occurrence records scattered across state.
Punctate cupgrass *Eriochloa punctata*	S2	X		Coastal marshes, along watercourses, moist swales, and ditches. Occurrence records in Cameron, Plaquemines, and Vermillion parishes.
Long-leaved wild-buckwheat *Eriogonum longifolium*	S2	X		Sandy soil mainly on the edges of pine and oak woodlands, calcareous clay or sandy soils. Occurrence records in

Common Name Scientific Name	Natural Heritage Rank[1]	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO or Surface Tract	Vegetation Community/Habitat
				Beauregard, Caddo, Natchitoches, Vernon, and Winn parishes.
White trout-lily *Erythronium albidum*	S2	X	X	Mesic hardwood forest slopes. Occurrence records in Bossier and Caddo parishes.
Thoroughwort *Eupatorium purpureum*	S1	X		Calcareous prairies. Occurrence records in Caldwell Parish.
American alumroot *Heuchera americana*	S2	X		Mature hardwood-dominated forests, often on slopes. Occurrence records in northwestern portions of state.
Hawkweed *Hieracium longipilum*	S1	X		Prairie, open woods, and sandy areas. Occurrence records in Caldwell Parish.
Large whorled pogonia *Isotria verticillata*	S1?	X	X	Dry to mesic forests and seeps. Occurrence records across northern portion of state.
June grass *Koeleria macrantha*	S1		X	Prairie, open woods, and rocky slopes. Occurrence records in Bossier and Winn parishes.
Southern red lily *Lilium catesbaei*	S1	X		Wet pine flatwoods and savannas, often with pitcher plants (*Sarracenia* spp.). Occurrence record associated with split-estate in Washington Parish.
Lady lupine *Lupinus villosus*	S2	X		Sandy soils. Occurrence record associated with split-estate in Washington Parish.
Stagger-bush *Lyonia mariana*	S1	X		Swamps and moist or dry forests, especially on sandy soils. Occurrence records in Caddo and Claiborne parishes.
Flame flower *Macranthera flammea*	S2	X		Bogs, wet thickets, edges of shrub-tree bays, ponds, and depressions. Occurrence records associated with split-estate in Washington Parish.
Pyramid magnolia *Magnolia pyramidata*	S2	X		Mesic woodlands along streams, ravine slopes, bluffs, and uplands. Occurrence records in the Florida parishes.

Common Name Scientific Name	Natural Heritage Rank[1]	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO or Surface Tract	Vegetation Community/Habitat
Barbara's buttons *Marshallia caespitosa var. signata*	S1	X		Limestone outcrops and sandy soils. Occurrence records in Bossier Parish.
Prairie milkvine *Matelea cynanchoides*	S1	X		Prairie remnants. Occurrence records in Caddo Parish.
Snow melanthera *Melanthera nivea*	S2	X		Rich soils of salt dome hardwood forests and bottomland hardwood forests. Occurrences in parishes along the Mississippi River but also includes Rapides Parish and coastal parishes. Small population occurs just off the Big Saline tract.
Square-stemmed monkey-flower *Mimulus ringens*	S2	X	X	Sand bars, banks, and battures of large rivers, such as the lower Atchafalaya and Mississippi rivers.
Pale umbrella-wort *Mirabilis albida*	S2		X	Xeric, sandhill woodlands. Occurrence records in Bossier, Caddo, De Soto, and Natchitoches parishes.
Saltflat grass *Monanthochloe littoralis*	S1	X		Coastal saline mud flats and salt marshes on bay shores and behind beaches. Occurrence records in Cameron Parish.
American pinesap *Monotropa hypopithys*	S2		X	Deep humus soils in dry to moist hardwood or pine dominated forests. Occurrence records in northwestern portion of Louisiana.
Prairie pleat-leaf *Nemastylis geminiflora*	S2S3	X	X	Prairies, woodlands, and pastures in Bossier, Caddo, Caldwell, and De Soto parishes.
Allegheny spurge *Pachysandra procumbens*	S2	X		Mesic forests of the Tunica Hills ravines in West Feliciana Parish.
Drummond nailwort *Paronychia drummondii*	S2	X		Sandy soil in dry oak and pine woodlands, clearings, and roadsides. Occurrence records in Allen, Bienville, Caddo, Natchitoches, Vernon, and Winn parishes.

Common Name Scientific Name	Natural Heritage Rank[1]	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO or Surface Tract	Vegetation Community/Habitat
Palm-leaf scarf-pea *Pediomelum digitatum*	S1		X	Xeric sandhills. Occurrence records in Caddo Parish.
Awl-shaped scarf-pea *Pediomelum hypogaeum var. subulatum*	S2	X		Open, mesic prairies. Occurrence records in Caddo and Natchitoches parishes.
Downy phlox *Phlox pilosa ssp. ozarkana*	S2?		X	Prairies, roadsides, and woods. Occurrence records in Bossier Parish.
Correll's false dragon-head *Physostegia correllii*	S1	X		Wetlands, wet roadsides, and canals. Occurrence records in Cameron Parish and southeastern Louisiana.
Woolly plantain *Plantago patagonica*	S2	X		Grasslands and woodlands. Occurrence records in Allen and Caddo parishes.
Green-fringe orchid *Platanthera lacera*	S1	X		Prairies and open woods, usually in damp ground. Occurrence records in Caddo and Vernon parishes.
Scalloped milkwort *Polygala crenata*	S2	X		Flatwoods, bogs, swamps. Occurrence records associated with split-estate in Tangiphoa Parish.
Shadow-witch orchid Ponthieva racemosa	S2	X		Moist shady ravines, wet savannas, and pine forests. Occurrence records associated with split-estate in West Feliciana and Caldwell parishes.
Oklahoma plum *Prunus gracilis*	S2	X	X	Sandy open woodlands, forest openings, and slopes. Occurrence records in Caddo Parish.
Arkansas oak *Quercus arkansana*	S2	X	X	Rolling, sandy areas across the very northern portion of state.
Turkey oak *Quercus laevis*	S1	X		Sandhill and dry sites. Single occurrence record near split-estate in Washington Parish.
Mexican hat *Ratibida peduncularis*	S2S3	X		Coastal dune grassland, Gulf beach, coastal prairie. Occurrence records primarily in Cameron Parish.

Common Name Scientific Name	Natural Heritage Rank[1]	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO or Surface Tract	Vegetation Community/Habitat
Yellow coneflower *Ratibida pinnata*	S2?	X	X	Prairies, savannas, wood edges, and roadsides. Occurrence records in central and northwestern portions of state.
Flat-fruit beakrush *Rhynchospora compressa*	S2	X		Flatwoods and bogs. Occurrence records associated with split-estate in Washington Parish.
Granite gooseberry *Ribes curvatum*	S2	X		Open woods along intermittent streams and slopes. Occurrence records in Caddo parish.
Bloodroot *Sanguinaria canadensis*	S2	X		Rich hardwood dominated forests on hillsides and on infrequently flooded terraces. Occurrence records in northern portions of state.
Tumble grass *Schedonnardus paniculatus*	S1	X		Saline prairies. Occurrence records in Caddo and De Soto parishes.
Delta bulrush *Scirpus deltarum*	S1?	X		Brackish water, coastal shores, marshes, and ditches. Occurrence records along Gulf coast.
Heart-leaved skullcap *Scutellaria cardiophylla*	S2	X		Rocky open woods, savannas, and wooded slopes along streams. Occurrence records in Caddo Parish.
Narrowleaf aster *Sericocarpus linifolius*	S2	X		Open deciduous and pine woods, oak and pine barrens, and roadsides. Occurrence records associated with split-estate in Tangipahoa and Washington parishes.
Starry campion *Silene stellata*	S2	X	X	Rich, deciduous woods, river flats, and tall grass prairies. Occurrence records across central and northern Louisiana.
Fire pink *Silene virginica*	S2		X	Older slope forests and mixed hardwood loblolly pine forests. Occurrence records in Ozark region.
Eared goldenrod	S2		X	Rocky wooded slopes, alluvial

Common Name Scientific Name	Natural Heritage Rank[1]	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO or Surface Tract	Vegetation Community/Habitat
Solidago auriculata				soils near streams, and woods. Occurrence records across northern portion of state.
Smooth twistflower *Streptanthus hyacinthoides*	S2		X	Sandy prairies, open glades in woods, and grassy roadsides. Occurrence records in northwestern portions of Louisiana.
Texas aster *Symphyotrichum drummondii var. texanum*	S1?	X	X	Bottomlands, open deciduous woods, and oak and juniper woodlands. Occurrence records in Caddo and Bossier parishes.
Yellow pimpernell *Taenidia integerrima*	S2		X	Open hardwood dominated calcareous forests, on lower slopes or near small, intermittent streams. Occurrence records in the central and northwestern portions of Louisiana.
Prairie flameflower *Talinum rugospermum*	S1	X		Xeric open prairies, sand barrens, rocky outcrops, and open sandy woods. Occurrence records in Caddo Parish.
Windflower *Thalictrum revolutum*	S1		X	Dry open woods, brushy banks, thickets, barrens, and prairies. Occurrence records in Bossier, Claiborne and Acadia parishes.
Dwarf filmy-fern *Trichomanes petersii*	S2	X		On tree trunks, and noncalcareous rocks in deep narrow gorges. Occurrence records associated with split-estate in the Florida parishes.
Reflexed trillium *Trillium recurvatum*	S2	X		Rich, moist woods and bluffs, often inundated while in flower. Occurrence records in northwestern portions of Louisiana
Texas trillium *Trillium texanum*	S1	X		Forested seepage areas and along banks of small streams draining sandy wetlands. Occurrence records in Caddo Parish. Occurrence records across northern portion of Louisiana.
Yellowleaf tinker's-weed	S2	X		Dry, open woods and

Common Name Scientific Name	Natural Heritage Rank[1]	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO or Surface Tract	Vegetation Community/Habitat
Triosteum angustifolium				savannas. Occurrence records across northern portion of Louisiana.
Nodding pogonia *Triphora trianthophora*	S2	X	X	Humus soils in hardwood dominated forests. Occurrence records across central and northwestern potions of Louisiana.
Perennial sandgrass *Triplasis americana*	S1	X		Sandy soils in prairies and woods. Occurrence records associated with split-estate in Washington Parish.
Sea oats *Uniola paniculata*	S2	X		Coastal dunes. Occurrence records along Gulf Coast.
Sessile-leaved bellwort *Uvularia sessilifolia*	S2	X		Mesic woods. Occurrence records in central and northwestern portions of Louisiana.
Downy yellow violet *Viola pubescens*	S1	X		Rich, moist hardwood dominated calcareous forest, often along small stream bottoms. Occurrence records in Bossier and Caddo parishes.
Northern prickley ash *Zanthoxylum americanum*	S1	X		Open woods, slopes, and thickets. Occurrence records in Caldwell Parish.
Nuttall death camas *Zigadenus nuttallii*	S1	X		Usually found in dry, open areas. Occurrence records in Bossier, Caddo, and Caldwell parishes.

3.5.16 Louisiana Invasive Plant Species

Table 3-41 lists invasive plant species in Louisiana of particular management concern in the areas of expected development or on surface tracts, as well as those species with high potential to invade those areas in the near future.

Table 3-41. Louisiana Invasive Plant Species

Common Name Scientific Name	Vegetation Communities/Habitats
Alligator weed *Alternanthera philoxeroides*	Slow-moving fresh and brackish water.

Common Name Scientific Name	Vegetation Communities/Habitats
Chinese privet *Ligustrum sinese*	Forest understory with moist soils.
Chinese tallow tree *Triadica sebifera*	Fresh or saline water; roadsides, coastal areas, streams, and shade to full sun.
Cogongrass *Imperata cylindrica*	Disturbed areas: roadsides, building sites, timber harvesting areas; and upland pine forests with dry or moist soils.
Common salvinia *Salvinia minima*	Slow moving freshwater.
Giant salvinia *Salvinia molesta*	Slow moving freshwater: lakes, ponds, ditches, and marshes.
Hydrilla *Hydrilla verticillata*	Freshwater aquatic found in still or slow-moving water.
Japanese climbing fern *Lygodium japonicum*	Disturbed areas: roadsides and ditches; undisturbed areas, forests, stream, and swamp edges.
Japanese honeysuckle *Lonicera japonica*	Fields, forests, wetlands, barrens, and areas of disturbance.
Johnsongrass *Sorghum halepense*	Roadsides, pastures, and hayfields.
Kudzu *Pueraria montana var. lobata*	Open, disturbed areas: roadsides, ROWs, forest edges, and old fields.
Purple loosestrife *Lythrum salicaria*	Freshwater wetlands, including wet meadows, river and stream banks, lakeshores, and ditches.
Water hyacinth *Eichhorina crassipes*	Freshwater lakes and ponds.

3.5.17 Tennessee Vegetation

In Tennessee, the FMO in the area of expected development is associated with Dale Hollow Reservoir or Standing Stone State Park/Forest. There are no BLM surface tracts in Tennessee.

Tennessee Ecoregions

The Tennessee WAP identified five ecoregions shown on Map 3-11. All of the FMO in the area of expected development falls in the Interior Low Plateau ecoregions, as illustrated in Table 3-42

Map 3-11. Ecoregions in Tennessee

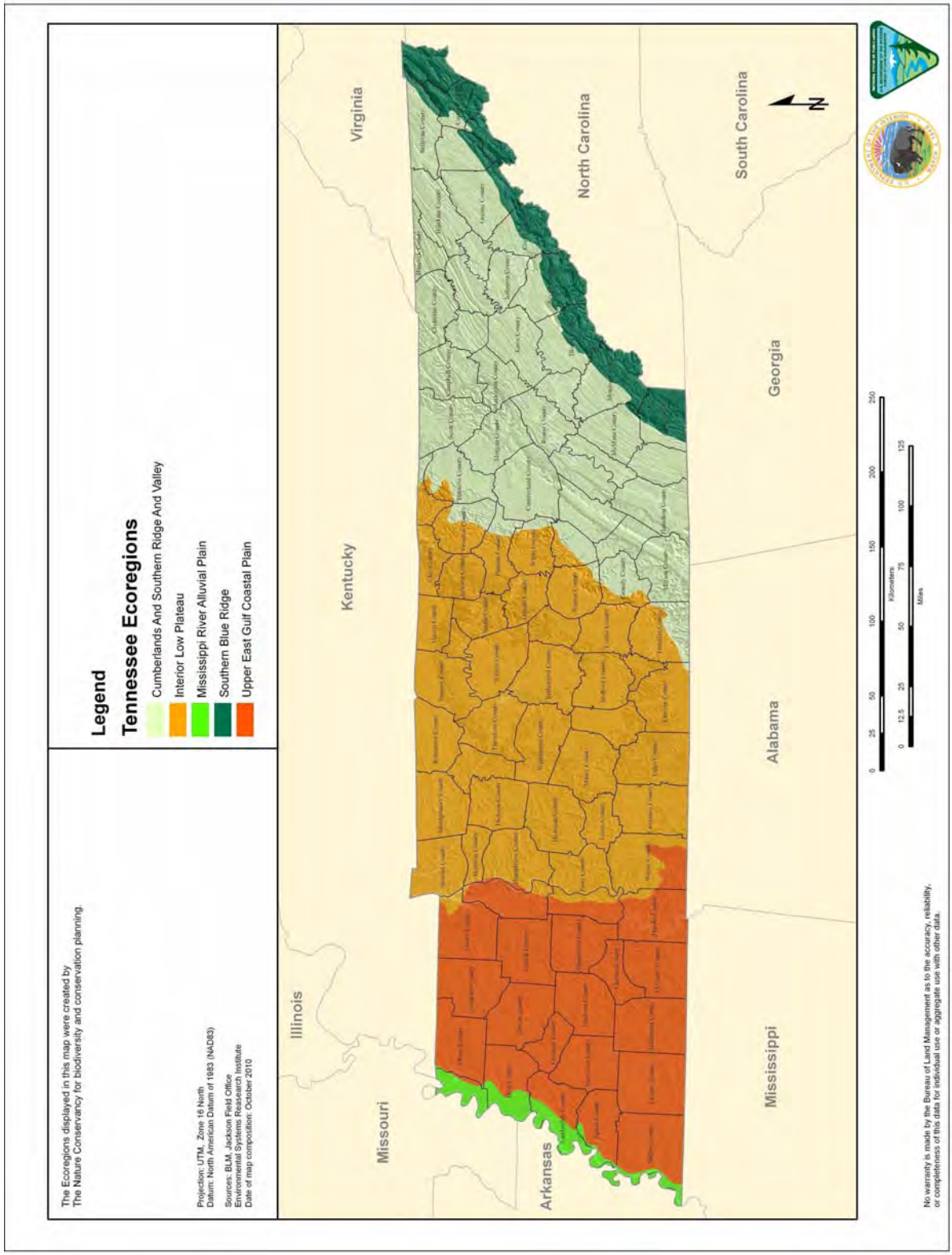


Table 3-42. Acres in Tennessee's Ecoregions

Ecoregion	FMO in the Decision Area (acres)	FMO in Area of Expected Development (acres)
Cumberland Plateau and Mountains	67	0
Interior Low Plateau	52,491	38,400
Totals	**52,558**	**38,400**

Cumberland Plateau and Mountains: This ecoregion is the extension of the Southern Appalachian Mountain chain and cuts diagonally across Tennessee. This mountain region entails plateaus with rolling uplands surrounded by deep gorges, especially where rivers cut the plateau. Mixed forests can be found on the plateaus, while hemlocks are confined to the ravines.

There are 67 acres of FMO in this ecoregion, none of which is in the area of expected development.

Interior Low Plateau: The Interior Low Plateau is a diverse ecoregion that includes the Central Basin and the Highland Rim. The Highland Rim surrounds the Central Basin making up the heart of Middle Tennessee. The interior of the Central Basin tends to be flat with rolling hills, shallow soils, and many karst features, while the Outer Central Basin has greater relief with narrow ridges and deeper soils. The Highland Rim is a remnant of an ancient massive upland dome dissected by many river and creek valleys. This region supports rich forest communities and woodland streams along with some barrens found in the Highland Rim.

There are 52,491 acres of FMO within this ecoregion in Tennessee, with 38,400 acres in the area of expected development.

Tennessee Vegetation Communities/Habitats

Table 3-43 identifies the acreage of FMO by vegetation community/habitat type.

Table 3-43. Vegetation Communities/Habitats in Tennessee

Vegetation Community/Habitat	FMO in the Decision Area (acres)	FMO in Area of Expected Development (acres)
Forest Plantation	596	543
Pasture	359	335
South-Central Interior Large Floodplain	28	28
South-Central Interior Mesophytic Forest	2,036	78
South-Central Interior Small Stream and Riparian	358	0
Southern Interior Low Plateau Dry Oak Forest	27,961	17,181
Agriculture	121	81
Developed	368	318

Vegetation Community/Habitat	FMO in the Decision Area (acres)	FMO in Area of Expected Development (acres)
Water	20,731	19,836
Totals	**52,558**	**38,400**

Forest Plantation: Forest Plantations are commercial pinelands subject to periodic silvicultural maintenance, such as burnings and clearing. Young stands of pine produce cover and forage for many species with the understory decreasing as pines mature.

There are 596 acres of this vegetation community on FMO, with 543 acres in the area of expected development.

Pasture: Pastures include mixed grasses or monocultures of grasses that are managed for grazing, or production of seed or hay crops.

There are 359 acres of pasture on FMO, with 335 acres in the area of expected development.

South-Central Interior Large Floodplain: These floodplains occur along large rivers or streams where topography and alluvial processes have resulted in well-drained levees, terraces, and stabilized bars, and includes herbaceous sloughs and shrub wetlands resulting from beaver activity. This system likely floods at least once annually and can be altered by occasional severe floods. Impoundments and conversion to agriculture can also affect this system.

There are 28 acres of these floodplains on FMO, all located in the area of expected development.

South-Central Interior Mesophytic Forest: The South-Central Interior Mesophytic Forest consists of predominately deciduous forests on deep and enriched soils usually in somewhat protected landscape positions such as coves or lower slopes. Trees may grow very large in undisturbed areas. The herb layer is very rich, often with abundant spring ephemerals. Many examples are bisected by small streams.

There are 2,036 acres of this vegetation community on FMO, with 78 acres in the area of expected development.

South-Central Interior Small Stream and Riparian: This habitat includes areas along small streams and floodplains with low to moderately high gradients. There may be little to moderate floodplain development. Flooding and scouring both influence this system, and the nature of the landscape prevents the kind of floodplain development found on larger rivers. This system may contain cobble bars with adjacent wooded vegetation and rarely has any marsh development, except through occasional beaver impoundments.

There are 358 acres of this community on FMO, with none of it occurring in the area of expected development.

Southern Interior Low Plateau Dry Oak Forest: This vegetation community is upland hardwood-dominated forests that occur in along ridgetops and slopes of various aspects. The system includes essentially all upland hardwood stands of the region except for mesic hardwood forests. The canopy closure of this habitat type ranges from closed to somewhat open in the drier situations. Historically, these areas may have been more open as a result of higher fire frequency.

There are 27,961 acres of this vegetation community on FMO, with 17,181 acres in the area of expected development.

3.5.18 Priority Plant Species

Table 3-44 lists plant species that have occurrence records on or within one mile of FMO in areas of expected development, and are ranked by the state natural heritage program (i.e., Tennessee Natural Heritage Program) as either Critically Imperiled (S1) or Imperiled (S2), or are listed by the State of Tennessee. State listing status is also included. Plants listed by the State of Tennessee are protected by the Rare Plant Protection and Conservation Act of 1985 with rankings determined by the Tennessee Rare Plant Scientific Advisory Committee, including endangered (E), threatened (T), and species of special concern (S).

Table 3-44. Tennessee Priority Plant Species

Common Name Scientific Name	Natural Heritage Rank	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Vegetation Community/Habitat
Ouachita sedge *Carex ouachitana*	S1	S	X		Mesic to dry-mesic, rocky deciduous or deciduous-pine forests, usually in loams on slopes or ridgetops. Occurrence records near FMO associated with Dale Hollow Lake.
Schreber's aster *Eurybia schreberi*	S1	S		X	Damp to mesic deciduous, mixed woods, thickets, and shaded roadbanks. Occurrence record on FMO associated with Dale Hollow Lake.
Starflower false Solomon's-seal *Maianthemum stellatum*	S1	E	X		Moist, especially sandy soils of woods, shores, and prairies. Occurrence record near FMO near Wolf River.
Shining ladies'-tresses *Spiranthes lucida*	S1S2	T		X	Bottomland hardwood forests and other wet forests, as well as wet grassy openings. Occurrence record on FMO near Wolf River.

3.5.19 Tennessee Invasive Plant Species

The Tennessee Exotic Pest Plant Council maintains a list of invasive exotic plant species that are or pose a threat to natural areas (http://www.tneppc.org/invasive_plants). Those species expected to be of management concern on facilities in the areas of expected development are listed in Table 3-45.

Table 3-45. Tennessee Invasive Plant Species

Common Name Scientific Name	Vegetation Community/Habitat
Asian bittersweet *Celastrus orbiculatus*	Disturbed areas, forest edges, and woodlands, fields.
Autumn olive *Elaeagnus umbellata var. parviflora*	Disturbed areas, forest edges, roadsides, and fields.
Bicolor lespedeza *Lespedeza bicolor*	Forests and forest openings.
Canada thistle *Cirsium arvense*	Disturbed areas: pasture, rangeland, and roadsides.
Cheat grass *Bromus tectorum*	Disturbed areas, roadsides, and abandoned fields.
Chinese lespedeza *Lespedeza cuneata*	Disturbed areas, meadows, prairies, open woodlands, wetland borders, and fields.
Chinese privet *Ligustrum sinense*	Forest understory with moist soils.
Chinese yam *Dioscorea oppositifolia*	Bottomland forests, streambanks, roadways, disturbed areas, and riparian edges.
Cogongrass *Imperata cylindrica*	Disturbed areas: roadsides, building sites, and timber harvesting areas; upland pine forests with dry or moist soils.
Common privet *Ligustrum vulgare*	Disturbed areas, roadsides, bottomland forests, and fields.
Giant salvinia *Salvinia molesta*	Lakes, ponds, rivers, streams, and freshwater wetlands.
Goatweed/common St. Johnswort *Hypericum perforatum*	Disturbed areas, forests, and fields.
Hydrilla *Hydrilla verticillata*	Freshwater aquatic.
Itchgrass *Rottboellia cochinchinensis*	Roadsides, pastures, and row crops.
Japanese honeysuckle *Lonicera japonica*	Fields, forests, wetlands, barrens, and areas of disturbance.
Japanese knotweed *Polygonum cuspidatum*	Disturbed areas, near water sources (saline or freshwater), and riparian areas.
Japanese stiltgrass *Microstegium vimineum*	Forest understories, along streambanks, floodplains, roadsides, disturbed areas, ditches, and shaded, moist areas.
Johnsongrass	Roadsides, pastures, and hayfields.

Common Name Scientific Name	Vegetation Community/Habitat
Sorghum halepense	
Korean clover *Kummerowia stipulacea*	Disturbed areas, old fields, open woodlands, stream banks, and savannas.
Kudzu *Pueraria montana var. lobata*	Open, disturbed areas: roadsides, ROWs, forest edges, and old fields.
Mimosa *Albizia julibrissin*	Roadsides and riparian areas.
Multiflora rose *Rosa multiflora*	Pastures, fields, prairies, savannas, open woodlands, and forest edges.
Princess tree *Paulownia tomentosa*	Disturbed areas, forest edges, streambanks, steep rocky slopes, and roadsides.
Purple loosestrife *Lythrum salicaria*	Freshwater wetlands, including wet meadows, river and stream banks, lakeshores, and ditches.
Sessile joyweed *Alternanthera sessilis*	Disturbed areas, ditches, wet headlands, and roadsides.
Tree of heaven *Ailanthus altissima*	Disturbed areas, roadsides, forest edges or openings, and grasslands.
Tropical soda apple *Solanum viarum*	Open forest, pastures, and fields.

3.5.20 Virginia Vegetation

In Virginia, the FMO in the oil and gas area of expected development is associated with the John W. Flannigan Dam and Reservoir and the Radford Army Ammunition Plant. In addition, the Meadowood SRMA is in Fairfax County outside the area of expected development.

Virginia Ecoregions

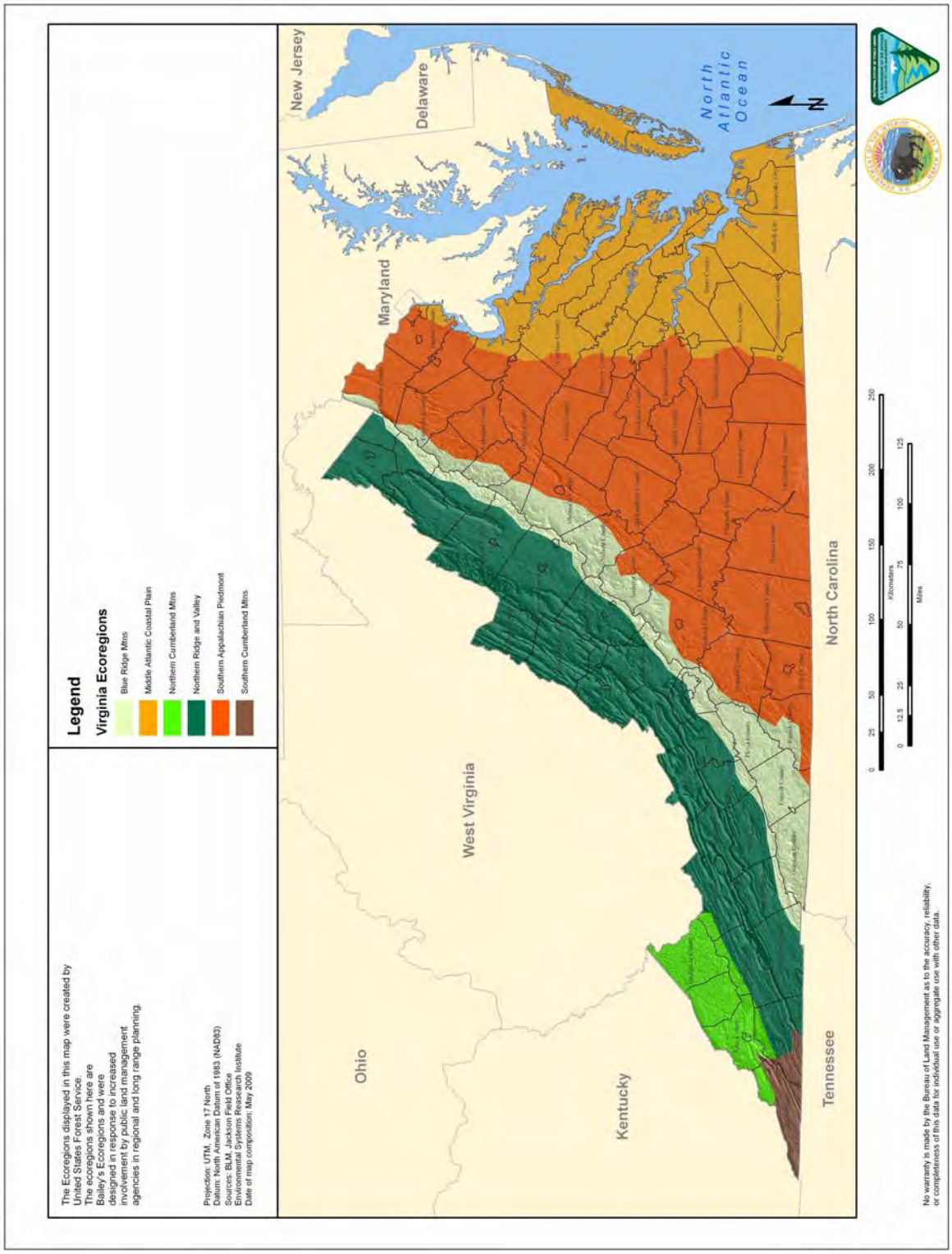
In Virginia, the FMO in the area of expected development is located in the Northern Cumberland, and Northern Ridge and Valley ecoregions, and the Meadowood SRMA is located in the Middle Atlantic Coastal Plain (Table 3-46 and Map 3-12).

Table 3-46. Acreage in Virginia's Ecoregions

Ecoregion	FMO in the Decision Area (acres)	FMO in Area of Expected Development (acres)	BLM Surface Tracts (acres)
Middle Atlantic Coastal Plain	804	0	804
Northern Cumberland Mountains	8,326	8,326	0

Ecoregion	FMO in the Decision Area (acres)	FMO in Area of Expected Development (acres)	BLM Surface Tracts (acres)
Northern Ridge and Valley	4,250	4,250	0
Total	**13,380**	**12,576**	**804**

Map 3-12. Ecoregions in Virginia



Middle Atlantic Coastal Plain: The topography of this ecoregion is mostly flat. Forest cover is primarily loblolly pine-hardwood mixtures, except in the southernmost portions of the ecoregion where longleaf and loblolly pine forests occur. Most streams in this ecoregion are small to intermediate in size and have very low flow rates.

The Meadowood SRMA (804 acres) occurs in the Middle Atlantic Coastal Plain.

Most of the land cover in the Middle Atlantic Coastal Plain is forest, followed by agricultural/open land, wetlands, developed areas, and water (VDGIF 2005a). Barren lands constitute less than 0.5 percent of the ecoregion. Approximately nine percent of the ecoregion's lands are managed as conservation lands, with the majority in forest and wetland land cover.

Northern Cumberland Mountains: The topography of the Northern Cumberland Mountains ecoregion is rugged and has many peaks of approximately 2,300 feet (VDGIF 2005a). Forests in this ecoregion are generally diverse and consist of a mixture of hardwood and conifer species. Small and medium perennial streams occur at moderate to high densities and have moderate flow rates.

Approximately 93 percent of the Northern Cumberland Mountains is forest, followed by agricultural/open lands, barren, and developed areas. Water and wetlands each comprise less than 0.5 percent of the ecoregion. Approximately 11 percent of the ecoregion is managed as conservation lands (VDGIF 2005a). The vast majority of conservation lands are forest, followed by water associated with the USACE John W. Flannagan Dam Reservoir.

There are 8,326 acres of FMO in this ecoregion, all of which are within the area of expected development for oil and gas.

Northern Ridge and Valley: The topography of the Northern Ridge and Valley ecoregion consists of parallel, northeast-to-southwest lines of mountains and valleys. Forest cover is mostly oak and oak-pine, with isolated patches of northern hardwoods and northern spruce-fir. Most streams in this ecoregion are small to intermediate in size, usually drying up during summer.

Approximately 90 percent of the Northern Ridge and Valley is montane and seven percent is submontane. Most of the land cover is forest, followed by agriculture/open lands, developed areas, and water. Water comprises nearly one percent of the ecoregion. Approximately 25 percent of the ecoregion's lands are managed as conservation lands (VDGIF 2005a), with the majority in forest cover.

There are 4,250 acres of FMO in the Northern Ridge and Valley ecoregion, all of which are within the area of expected development for oil and gas.

Virginia Vegetation Communities/Habitats

Table 3-47 provides the acreage of vegetation communities/habitats found on FMO, including BLM surface tracts in Virginia. A brief description of the vegetation communities/habitats follows.

Table 3-47. Vegetation Communities/Habitats in Virginia

Vegetation Community/Habitat	FMO in the Decision Area (acres)	FMO Area of Expected Development (acres)	BLM Surface Tracts (acres)
Bare Rock/Sand/Clay	14	14	0

Vegetation Community/Habitat	FMO in the Decision Area (acres)	FMO Area of Expected Development (acres)	BLM Surface Tracts (acres)
Deciduous Forest	8,229	7,704	523
Emergent Herbaceous Wetland	5	0	5
Evergreen Forest	207	207	0
Mixed Forest	255	255	0
Transitional	1,268	1,228	0
Woody Wetlands	133	87	48
Agriculture	571	409	161
Developed	1,497	1,469	66
Water	1,203	1,203	1
Total	**13,382**	**12,576**	**804**

Acres of BLM surface tracts are included in FMO totals.

Bare Rock/Sand/Clay: This includes perennially barren areas of bedrock, scarps, talus, slides, and other accumulations of earthen material.

There are 14 acres on FMO in Virginia, all of which are in the area of expected development.

Deciduous Forest: This is a hardwood-dominated forest community.

There are 8,229 acres on FMO, with 7,704 acres in the area of expected development.

Emergent Herbaceous Wetlands: This vegetation community includes areas where perennial herbaceous vegetation accounts for 75 to 100 percent of the cover and the soil or substrate is periodically saturated with or covered with water. There are five acres of Emergent Herbaceous Wetlands on FMO, none of which occurs in the area of expected development.

Evergreen Forest: There are 207 acres of this forest community on FMO, all of which are in the area of expected development.

Mixed Forest: This is a forest community where neither deciduous nor evergreen tree species represent more than 75 percent of the cover.

There are 255 acres of Mixed Forest on FMO, all of which is located in the area of expected development.

Transitional: This habitat type includes areas of sparse vegetation cover. Examples include forest clear-cuts, a transition phase between forest and agricultural land, the temporary clearing of vegetation, and changes owing to natural causes.

There are 1,268 acres of Transitional areas on FMO, with 1,228 acres in the area of expected development.

Woody Wetlands: This vegetation community includes areas where forest or shrub land vegetation accounts for 25 to 100 percent of the cover and the soil or substrate is periodically saturated with or covered with water.

There are a total of 133 acres of Woody Wetlands on FMO, with 87 acres in the area of expected development.

Condition of Vegetation Communities on Surface Tracts in Virginia

The condition of vegetation on surface tracts was assessed to identify the needs associated with restoring vegetation communities on surface tracts to good condition. There is no assessment of the condition of vegetation communities on FMO where BLM is not the surface manager because this is outside BLM's management responsibility. The condition of the vegetation communities on surface tracts was assessed using the following criteria:

- Good condition: vegetation communities show little change from historical species composition and community structure or excellent recovery from historical permutations.
- Fair condition: vegetation communities show visible permutations from historical species composition and community structure but will improve with appropriate management and time.
- Poor condition: vegetation communities are depauperate in expected plant species and show visible permutations in community structure.

Table 3-48 provides a summary of the condition of the vegetation communities found at Meadowood SRMA.

Table 3-48. Condition of Vegetation Communities/Habitats at Meadowood SRMA

Vegetation Community/Habitat	Good Condition (acres)	Fair Condition (acres)	Poor Condition (acres)	Total (acres)
Deciduous Forest	392	126	5	523
Emergent Herbaceous Wetland	1	4	-	8
Woody Wetlands	5	29	14	48
Agriculture (not ranked)	-	-		160
Developed/Transitional (not ranked)	-	-		64
Water (not ranked)	-	-	-	1
Totals	**398**	**159**	**19**	**804**

3.5.21 Virginia Priority Plant Species

Table 3-49 lists those plant species ranked by the Virginia natural heritage program (i.e., Virginia Natural Heritage Commission) as either Critically Imperiled (S1) or Imperiled (S2) with occurrence records either on or within one mile of FMO in the area of expected development or on surface tracts. Virginia adopts the federal listing status for species, so listed plant species are discussed as federally listed under Special Status Species.

Table 3-49. Virginia Priority Plant Species

Common Name Scientific Name	Natural Heritage Rank	State Listing	Occurrence Record Within 1 Mile of FMO or Surface Tract	Occurrence Record on FMO or Surface Tract	Vegetation Community/Habitat
Small spreading pogonia *Cleistes bifaria*	S2	-	X		Savannas, meadows, openings in oak or pine woodlands, mountain habitat often xeric, and in acidic soils. Occurrence records near FMO in Dickinson County.
River bulrush *Schoenoplectus fluviatilis*	S2	-	X		Freshwater shores, inland marshes, and coastal estuaries. Occurrence records in Fairfax County near Meadowood SRMA.
Nodding trillium *Trillium flexipes*	S1	-		X	Rich wooded slopes, and floodplains in deciduous forests, especially over limestone. Occurrence records on FMO at John W. Flannagan Reservoir.

[1] S1 = Extremely rare. Typically five or fewer estimated occurrences in the state, or only a few remaining individuals, may be especially vulnerable to extirpation.
S2 = Very rare. Typically between five and 20 estimated occurrences or with many individuals in fewer occurrences, often susceptible to becoming extirpated.

3.5.22 Virginia Invasive Plant Species

Table 3-50 lists those species of particularly concern on in the areas of expected development, or at Meadowood SRMA.

Table 3-50. Virginia Invasive Plant Species

Common Name Scientific Name	Habitats
Autumn olive *Elaeagnus umbellata*	Disturbed areas, roadsides, pastures, fields, grasslands, and sparse woodlands.
Beefsteak plant *Perilla frutescens*	Roadsides, pastures, fields, woodlands, gravel bars, stream sides, and on rich soils, alluvial soils, or dry soils.
Bull thistle *Cirsium vulgare*	Open, disturbed areas, roadsides, ditch banks, pastures, barrens, glades, savannahs, meadows, and dunes.
Canada thistle *Cirsium arvense*	Open, disturbed areas, roadsides, ditch banks, pastures, barrens, glades, savannahs, meadows, and dunes.
Chinese lespedeza *Lespedeza cuneata*	Fields or forest understory.

Common Name Scientific Name	Habitats
Chinese privet *Ligustrum sinense*	Forest understory with moist soils.
Chinese silver grass *Miscanthus sinensis*	Forest openings, edges, and adjacent disturbed sites.
Common reed *Phragmites australis*	Freshwater or brackish wetlands, riverbanks, lakeshores, disturbed areas, roadsides, and ditches.
English ivy *Hedera helix*	Woodlands, forest edges, and fencerows.
Fescue *Festuca elatior*	Roadsides, pastures, meadows, and disturbed areas.
Garlic mustard *Alliaria petiolata*	Disturbed areas, roadsides, trail edges, upland forests, and wooded streambanks.
Ground ivy *Glechoma hederacea*	Moist shaded wooded area, grasslands, and disturbed sites.
Hydrilla *Hydrilla verticillata*	Freshwater aquatic systems.
Japanese honeysuckle *Lonicera japonica*	Fields, forests, wetlands, barrens, and areas of disturbance.
Japanese knotweed *Polygonum cuspidatum*	Disturbed areas, roadsides, riverbanks, islands, wetlands, hillsides, and moist open habitats.
Japanese stilt grass *Microstegium vimineum*	Disturbed areas, marshes, ditches, floodplains, woodland borders, damp fields, woodland thickets, lawns, and along streamsides.
Johnsongrass *Sorghum halepense*	Disturbed areas, roadsides, pastures, hayfields, streambanks, and forest edges.
Kudzu *Pueraria montana var. lobata*	Open, disturbed areas: roadsides, ROWs, forest edges, and old fields.
Mile-a-minute *Polygonum perfoliatum*	Roadsides, ditches, streambanks, wet meadows, and clear-cut.
Multiflora rose *Rosa multiflora*	Pastures, fields, prairies, savannas, open woodlands, and forest edges.
Orchard grass *Dactylis glomerata*	Roadsides, pastures, meadows, and disturbed areas.
Oriental bittersweet *Celastrus orbiculata*	Roadsides, thickets, alluvial woods, and mesic or dry-mesic forests.
Sericea lespedeza *Lespedeza cuneata*	Roadsides, pastures, meadows, and disturbed areas.
Tree-of-heaven	Disturbed areas, roadsides, forest edges or openings, and grasslands.

Common Name Scientific Name	Habitats
Ailanthus altissima	
Wineberry *Rubus phoenicolasius*	Forest, field, stream and wetland edge habitats, open woods, savannas, and prairies.
Winged burning bush *Euonymus alatus*	Disturbed areas, forest edges, roadsides, and old fields.
White poplar *Populus alba*	Disturbed areas, roadsides, and woodland edges.

3.6 FISH AND WILDLIFE

The following section discusses fish and wildlife resources in the *decision area*, addressing priority fish and wildlife species, important bird areas (IBA), and game species. Additional details on fish and wildlife resources on the surface tracts are available in Appendix B. On FMO, where BLM is not the surface manager, BLM is responsible for managing wildlife habitat only as it relates to the development of federal minerals, including the assessment of the impacts of mineral development on wildlife. Active management to promote fish and wildlife resources would be limited to the BLM surface tracts.

3.6.1 Priority Fish and Wildlife Resources

Priority fish and wildlife species are rare, at-risk species that are not federally listed, proposed, or candidates for listing but are of management concern to ensure that BLM actions do not contribute to the need for federal listing. BLM's opportunities for proactive management of these species and their habitats are largely limited to the BLM-administered surface tracts. However, these species are considered as part of the environmental review of mineral leasing and development activities, where actions can be modified to reduce potential impacts. To identify these species, BLM reviewed each state's natural heritage database and screened for those species ranked by the state heritage programs as either Critically Imperiled (S1), or Imperiled (S2) with occurrence records on or within one mile of FMO in the areas of expected development, or on surface tracts. In addition, several states designate species under state laws as endangered, threatened, or other designation. These state-listed species are included as priority species and noted when they occur on surface tracts. While the natural heritage database occurrence records do not represent a complete survey, this method allows BLM to focus on those species most likely to be affected by future mineral development on FMO or by management of the surface tracts.

The S1 and S2 ranked species tend to be those species also identified in the state WAPs as Species of Greatest Conservation Concern. To illustrate the relative statewide importance of habitats, the WAPs often provided a summary of the numbers of SGCC associated with each of the habitats. This information is provided as a table in the beginning of the following priority species discussions. The tallies were either taken directly from the WAP or synthesized from information provided in the WAP.

3.6.2 Important Bird Areas

BLM addresses migratory birds to meet agency responsibilities under the Migratory Bird Treaty Act of 1929, as amended, and Executive Order 13186. These responsibilities are being further coordinated under a national Memorandum of Understanding between BLM and the USFWS signed in 2010. As with priority species, proactive management is limited to the surface tracts. On FMO, BLM strives to limit or avoid impacts on these bird species. Because of the scale of this planning effort, the Audubon Society's IBAs are the primary focus of the statewide discussions of avian resources, including migratory birds. More information on this program and specific areas is available at http://iba.audubon.org/iba/viewCountry.do. Bird species listed as Birds of Conservation Concern and Game Birds Below Desired Condition are addressed more site specifically as part of the surface tract write-ups in Appendix B. For complete lists of Birds of Conservation Concern visit (http://library.fws.gov/bird_publications/bcc2008.pdf). The national list of Game Birds Below Desired Condition can be viewed at http://library.fws.gov/bird_publications/gamebirds_conditions.pdf.

3.6.3 Game Species

In general, each state is responsible for management of wildlife in that state, including establishing and enforcing game and fishing laws and regulations. BLM will work with state agencies to support

management of game species through habitat enhancement and may recommend special rules for specific surface tracts.

3.6.4 Arkansas Fish and Wildlife Species

Arkansas Priority Fish and Wildlife Species

In the Arkansas WAP, the number Species of Greatest Conservation Need of (SGCN) was tallied by associated vegetation community/habitat. Table 3-51 provides this tally by vegetation community/habitat across FMO, including surface tracts.

Table 3-51. Arkansas SGCNs by Habitat Type and FMO Acreage

Vegetation Community/Habitat	Number of SGCNs	FMO in Decision Area (acres)	FMO in Area of Expected Development (acres)	BLM Surface Tracts (acres)
Ozark-Ouachita Riparian South Central Interior Large Floodplain	68	33,393	30,225	0
Lower Mississippi River High Bottomland and Riparian Forest	41	3,940	1,590	0
Ozark-Ouachita Mesic Hardwood Forest	40	140	11	94
Lower Mississippi Alluvial Plain Grand Prairie	38	9,455	9,395	0
Ozark-Ouachita Pine Oak Woodland and Forest	33	29,846	23,463	174
Lower Mississippi River Bottomland Depression and Forest	32	6,545	3,269	0
West Gulf Coastal Plain Large River Floodplain Forest	31	431	123	0
Ozark-Ouachita Novaculite Central Interior Calcareous Dry Acidic Glade and Barrens and Dry Oak Woodland	29	6,903	1,559	359
West Gulf Coastal Plain Red River Floodplain Forest	29	847	847	0
Lower Mississippi Flatwoods Woodland Forest	27	7,645	6,953	0
West Gulf Coastal Plain Small Stream River Forest	27	480	362	0
Ozark-Ouachita Dry-Mesic Oak Forest	26	60,194	30,014	421
West Gulf Coastal Plain Dry and Wet Pine Hardwood Flatwoods	24	616	175	0
Mississippi River Alluvial Plain	20	113	0	0

Vegetation Community/Habitat	Number of SGCNs	FMO in Decision Area (acres)	FMO in Area of Expected Development (acres)	BLM Surface Tracts (acres)
Loess Slope Forest				
West Gulf Coastal Plain Pine Hardwood Forest	20	2,948	2,614	0
Ozark-Ouachita Pine Bluestem Woodland	16	25,534	20,047	16
West Gulf Coastal Plain Sandhill Oak Shortleaf Pine Forest-Woodland	12	4,630	4,597	0
Lower Mississippi River Dune Woodland Forest	10	43	22	0

Table 3-52 lists those species ranked by the state natural heritage program (i.e., Arkansas Natural Heritage Commission) as either Critically Imperiled (S1) or Imperiled (S2) with occurrence records either on or within one mile of FMO in the area of expected development, or on surface tracts. Arkansas does not maintain a separate state-designated list of endangered or threatened species.

Table 3-52. Arkansas Priority Fish and Wildlife Species

Common Name Scientific Name	Natural Heritage Rank	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Habitat/Occurrence Record
Rufus-crowned Sparrow *Aimophila ruficeps*	S1	X	X	Rocky hillsides and grassy slopes. Occurrence records in western Ouachita Mountains, breeding population at Mt. Magazine. Non-breeding record at the Redlands Mountain surface tract in Pike County.
Bowed snowfly *Allocapnia oribata*	S1	X		Aquatic, Ozark endemic known from 2 streams in Searcy and Van Buren counties.
Alabama shad *Alosa alabamae*	S1S2	X		Anadromous fish of the Gulf with spawning runs in Arkansas in the Meramec, Missouri, and Ouachita rivers. Very depleted in Mississippi River basin, potential in the Ouachita River.
Great egret *Ardea alba*	S2	X		Herbaceous and wooded wetlands. Occurrence records across the state, typically associated with large bodies of water.
Alligator gar	S2?	X		Major river systems, including Red, Arkansas, White, and Mississippi

Common Name Scientific Name	Natural Heritage Rank	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Habitat/Occurrence Record
Atractosteus spatula				rivers.
Crayfish *Cambarus causeyi*	S1	X		Endemic crayfish in complex burrows in seeps and springs. Occurrence records in the southern Ozarks.
Big sand tiger beetle *Cicindela formosa pigmentosignata*	S2S3	X		Occurrence records in Ouachita and Nevada counties; possibly extirpated.
Beach-dune tiger beetle *Cicindela hirticollis*	S2S3	X	X	Sand areas near water. Three occurrences across the state.
Little white tiger beetle *Cicindela lepida*	S2S3	X		Open sandy areas. Occurrence records in the Arkansas River corridor.
Sandy stream tiger beetle *Cicindela macra*	S2S3	X	X	Occurrence records in the Arkansas River corridor.
Blue sucker *Cycleptus elongatus*	S2	X	X	Restricted to large deep river systems with strong currents. Occurrence records across the state.
Western fanshell *Cyprogenia aberti*	S2	X		Range includes the Arkansas, White, Black, and St. Francis river basins.
Lake chubsucker *Erimyzon sucetta*	S2?	X		Heavily vegetated sloughs and backwaters. Occurrence records in Arkansas River and major river systems in southern portion of state.
Goldstripe darter *Etheostoma parvipinne*	S2	X		In or near springs, in sluggish streams, and occasionally in seepages adjacent to small streams. Occurrence records in eastern and southern portions of state.
Prairie mole cricket *Gryllotalpa major*	S1S2	X		Tallgrass prairies.
Goldeye *Hiodon alosoides*	S2?	X		Quiet turbid water in medium to large lowland rivers, small lakes, ponds, and marshes. Occurrence records across the state.
Ouachita diving beetle *Hydroporus ouachitus*	S2		X	Ozark endemic in cool, swift-moving mountain streams. Occurrence records in Ouachita, Red, Arkansas,

Common Name Scientific Name	Natural Heritage Rank	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Habitat/Occurrence Record
				and White river systems.
Sandbank pocketbook *Lampsilis satura*	S2	X		Small to large rivers with moderate flows. Occurrence records in Arkansas, Ouachita, and Saline river systems.
Black sandshell *Ligumia recta*	S2	X		Medium to large rivers with strong currents and coarse substrates. Occurrence records across state.
Texas coral snake *Micrurus tener tener*	S2	X		In Arkansas, primarily forested areas. Occurrence records in southwestern counties.
Pealip redhorse *Moxostoma pisolabrum*	S2		X	Varied river and stream habitats. Occurrence records in Ozark and adjacent areas.
Crawford's gray shrew *Notiosorex crawfordi*	S2	X		Drier grasslands and woodlands. Occurrence records in Hempstead County, possibly extirpated from Crawford County.
Crayfish *Orconectes nana*	S2		X	Clear gravelly streams of the Arkansas River drainage. Occurrence records in extreme northwest Arkansas.
Nearctic paduniellan caddisfly *Paduniella nearctica*	S1?	X		Riverine habitats. Occurrence records in Johnson and Washington counties.
Longnose darter *Percina nasuta*	S2	X	X	Clear small to medium rivers; also reported from an impoundment. Occurrence records in Ozark and Ouachita regions.
Slenderhead darter *Percina phoxocephala*	S2	X	X	Small to medium rivers with moderate to strong flow. Few records in impoundments; can do well below dams. Occurrence records primarily in northwestern portions of state.
Suckermouth minnow *Phenacobius mirabilis*	S1	X	X	Various riverine habitats. Occurrence records primarily in western Arkansas River drainage.
Pyramid pigtoe *Pleurobema rubrum*	S2	X		Abundant in the lower Ouachita and lower Saline rivers. Known to occur in the lower St. Francis River and Upper Ouachita and Saline rivers.
Comanche harvester	S1S2	X	X	Xeric sandhills, open pine

Common Name Scientific Name	Natural Heritage Rank	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Habitat/Occurrence Record
ant *Pogonomyrmex Comanche*				woodlands. Occurrence records in Ouachita and Nevada counties.
Paddlefish *Polyodon spathula*	S2?	X	X	Occurrence records in most of the large rivers in Arkansas.
Strecker's chorus frog *Pseudacris streckeri*	S2	X		Moist woods, sand prairies, along streams, and swamps. Occurrence records in Arkansas River corridor.
Northern crawfish frog *Rana areolata circulosa*	S2		X	Primarily associated with floodplain prairie systems and open uplands of the Ozark and Ouachita ecoregions.
Queen snake *Regina septemvittata*	S2	X		Riparian situations where streams support crayfish. Occurrence records across Boston Mountains and Arkansas Valley ecoregions.
Eastern harvest mouse *Reithrodontomys humulis*	S2		X	Old fields, marshes, and wet meadows. Most occurrence records in southwestern corner of state.
Hurter's spadefoot *Scaphiopus hurterii*	S2	X		Varied habitats associated with temporary water bodies, ponds, ditches, and bottomlands. Occurrence records in western half of state.
Ozark emerald *Somatochlora ozarkensis*	S1	X		Small forested streams. Endemic. All occurrence records from Pulaski County.
Diana fritillary *Speyeria diana*	S2S3	X	X	Forests with access to flowers. Occurrence records in Ozark and Ouachita regions.
Ornate box turtle *Terrapene ornata ornata*	S2		X	Prairie, grasslands, and adjacent areas. Occurrence records in Benton, Boone, Franklin, Prairie, and Sebastian counties.
Bewick's wren *Thryomanes bewickii*	S2B, S3N	X		Old fields, brushy areas, thickets, and open and riparian woodlands. Occurrence records primarily north of the Arkansas River corridor.
Purple lilliput *Toxolasma lividum*	S2	X		Widespread but uncommon; usually found in the headwaters of medium rivers. Occurrence records across state.
Southern cavefish	S1	X		Few historical records of this species from wells and caves in the

Common Name Scientific Name	Natural Heritage Rank	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Habitat/Occurrence Record
Typhlichthys subterraneus				eastern Ozarks of Arkansas.
Pondhorn *Uniomerus tetralasmus*	S2	X		Occurs in the Cache, White, St. Francis, Mississippi, and Red Rivers in Arkansas, inhabiting quiet or slow moving waters of sloughs, borrow pits, and streams
Ouachita creekshell *Villosa arkansasensis*	S2	X	X	Regional endemic in the headwater streams of the Arkansas, Ouachita, and Red river drainages.
Rainbow *Villosa iris*	S2S3	X		Riffles on the edges of emerging vegetation. Occurrence records in the Ozark and Ouachita regions.

Arkansas Important Bird Areas

There are 29 designated IBAs in Arkansas. Of these, four sites have FMO associated with them in an area of oil and gas expected development. There are no surface tracts located in recognized IBAs in Arkansas.

The following descriptions of the ornithological values of these areas are excerpted from http://ar.audubon.org/important-bird-areas-arkansas.

Bell Slough IBA (adjacent to FMO associated with state lands at Camp Joseph T. Robinson in Faulkner County)

> *The bottomland hardwood forests and open wetland habitat of Bell Slough WMA provide feeding habitat for wading birds such as American Bittern, Yellow-crowned Night-Heron, Hooded Merganser, American Woodcock, and Sedge Wren. In winter, the moist soil unit is used by Gadwall, Northern Shoveler, Ring-necked Duck, Lesser Scaup, Bufflehead, Common Goldeneye, Ruddy Duck, Wood Duck, and Hooded Merganser. Breeding birds include Northern Bobwhite, Yellow-throated Vireo, Yellow-throated Warbler, Northern Parula, Kentucky Warbler, and Painted Bunting. Bewick's Wren are rare in winter and fall.*

Camp Robinson IBA (FMO associated with this state facility)

> *Camp Robinson SUA regularly supports significant densities of a variety of birds of state conservation interest throughout the year. Frequent burning and mowing maintains habitat for breeding Bachman's Sparrow and Bell's Vireo. Ospreys and Bald Eagles nest on Lake Conway, while Hooded Mergansers, Wood Ducks, and Prothonotary Warblers nest at the Nursery Pond. Least Tern, Virginia Rail, Sora, Sedge Wren, Marsh Wren, American Redstart, and Yellow, Chestnut-sided, and Black-throated Green Warblers are common spring and fall migrants. A variety of sparrows winter here, including: Field,*

Fox, White-crowned, White-throated, Song, Chipping, Vesper, Savannah, Swamp, Lincoln's, and even Le Conte's.

Fort Chaffee IBA (including the FMO associated with this Department of Defense (DoD) facility in Crawford, Franklin, and Sebastian counties)

Fort Chaffee supports exceptionally large numbers of birds characteristic of prairie, shrub-scrub, and oak savanna habitats: Bell's vireo (2,400; may be largest in state), northern bobwhite (4,100), prairie warbler (1,300), painted bunting (1,800), Bachman's sparrow (1,800), Smith's longspur (up to 100), and Bewick's wren (10-20). Fire, primarily wildfires ignited from military maneuvers, is too frequent for the buildup of a litter layer, which may explain the absence of nesting Henslow's sparrows.

Lake Dardanelle IBA (including the FMO associated with this USACE facility in Franklin, Logan, Johnson, Pope, and Yell counties)

"Interior" Least Tern uses the sand bars of Dardanelle during migration. There are no known nest sites at this time, though the species nested historically and habitat currently exists. A resident population of Brown-headed Nuthatches may support a range expansion to the north into the Ozark National Forest. Yellow and Cerulean Warblers are uncommon breeders in backwater areas of the lakeshore. Rusty blackbird is another uncommon species that winters in flooded portions of the backwaters. Hundreds of American White Pelicans winter there every year. Wintering waterfowl numbers shift daily with hundreds to thousands of dabbling ducks and diving ducks such as scaup. Gulls also winter in abundance with tens to thousands of Ring-billed, Bonaparte's, Herring, Laughing, and Franklin's Gulls seen daily. Rare gulls such as Black-headed, Sabine's and California have been found there as well. Warm water output from the Nuclear One power plant raises the nearby water temperature by 0.5-2 degrees, thus providing open water during even the coldest parts of winter. On the South side of the lock and dam is a tall bluff line (owned by Arkansas Natural Heritage Commission) that acts as a roost for 100+ vultures during migration.

Arkansas Game Species

Table 3-53 lists the primary game species managed in Arkansas.

Table 3-53. Arkansas Managed Game Species

Game Type	Game Species
Big Game	American alligator (*Alligator mississippiensis*), American black bear (*Ursus americanus*), eastern wild turkey (*Meleagris gallopavo*), elk (*Cervus canadensis*), white-tailed deer (*Odocoileus virginianus*)
Small Game	Common snipe (*Gallinago delicate*), northern bobwhite (*Colinus virginianus*), mourning dove (*Zenaida macroura*), fox squirrel (*Sciurus niger*), gray squirrel (*S. carolinensis*), eastern cottontail (*Sylvilagus floridanus*), swamp rabbit (*Sylvilagus aquaticus*)
Waterfowl	Ducks: wood duck (*Aix sponsa*), dabbling ducks (*Anas spp.*), diving ducks (*Aythya spp.*) Geese: snow goose (*Chen caerulescens*), white-fronted goose (*Anser albifrons*), Canada goose (*Branta canadensis*) Mergansers: common merganser (*Mergus merganser*), red-breasted merganser (*M.*

Game Type	Game Species
	serrator), hooded merganser (*Lophodytes cucullatus*) Other: American coot (*Fulica americana*), common moorhen (*Gallinula chloropus*), purple gallinule (*Porphyrio martinica*), Virginia rail (*Rallus limicola*), sora (*Porzana carolina*)
Furbearers	Badger (Taxidea taxus), beaver, bobcat (Lynx rufus), coyote (Canis latrans), gray fox (Urocyon cinereoargenteus), red fox (Vulpes vulpes), mink (Neovison vison), muskrat (Ondatra zibethicus), nutria (Myocastor coypus), opossum (Didelphis virginiana), raccoon (Procyon lotor), river otter (Lontra canadensis), spotted skunk (Spilogale putorius), striped skunk (Mephitis mephitis), weasel (Mustela frenata)

Source: AGFC 2008

Arkansas' most popular game animal is the white-tailed deer, with approximately 275,000 to 290,000 licenses sold annually (Arkansas Game and Fish Commission [AGFC] 1999) and approximately 169,853 animals harvested in 2007–2008 (AGFC 2008). The estimated one million deer in Arkansas are found statewide and in most habitats, but the greatest densities occur in the South Central Plains and Ozark Highlands ecoregions.

As a result of restocking efforts, elk, black bear, and turkey are important game species in Arkansas. The approximate statewide population of 500 elk is primarily found in grassland and forest complexes near the NPS-administered Buffalo National River, in Newton and Searcy counties (AGFC 2001a). Annual elk harvests are low, with only 27 animals taken in 2007–2008 (AGFC 2008), but the popularity of elk watching and photography are increasing in Arkansas (AGFC 2001a).

Like elk, black bears were almost extirpated from Arkansas in the 1940s. Restocking efforts started in the 1960s have returned this species to much of the hardwood and mixed hardwood-pine forests of the Ozark Highlands, Boston Mountains, and Arkansas Valley ecoregions. A separate and smaller population exists in the bottomland hardwood habitats of the lower White River Basin, which is within the Mississippi River Alluvial Plains in southeastern Arkansas. Combined, the two populations have grown to approximately 3,500 individuals, and an estimated 400 individuals were harvested in 2007–2008 (AGFC 2008).

Turkeys are found statewide in Arkansas as a result of restocking efforts that began in earnest in the 1950s and the maturing of second growth forests (AGFC 2001b). In general, eastern wild turkeys require forested areas for roosting and escape cover, and open grasslands for brood rearing, but they can adapt to a variety of habitat conditions. In years with little flooding, the batture lands along the Mississippi River provide some of the best turkey habitat in the state (AGFC 2001b), but row crop agriculture is pervasive in the remainder of that ecobasin. Therefore, most of the estimated 11,910 turkeys harvested in Arkansas in 2007–2008 were taken outside the Mississippi River Alluvial Plains ecoregion (AGFC 2008).

The Mississippi River Alluvial Plains provide important habitat for waterfowl wintering in the Mississippi flyway. Nearly 60,000 waterfowl hunters harvested an estimated 1.1 million ducks and 99,000 geese in the marshes, forested wetlands, rivers, lakes, and flooded agriculture fields of Arkansas in 2008–2009 (AGFC 2008). Although waterfowl can be found throughout most of the state during fall and winter, most occur in the wetlands of the Mississippi Alluvial Plains ecoregion. The wood duck and hooded merganser are breeding residents.

Most small game species are distributed statewide. Of the small game species, squirrels, rabbits, doves, and northern bobwhites are popular quarry. Squirrels require forested habitats, while rabbits use a variety of habitats, from forests to agricultural lands. Mourning doves are common in agricultural fields, woodlots, grasslands, and agricultural fields, while the northern bobwhite occurs in grassy fields, brushy fencerows around agriculture fields, and open pinelands (Hamel 1992).

Furbearers in Arkansas include large and small mammals dependent on habitats ranging from early successional grasslands (coyote) to forested wetlands (beaver), to freshwater marshes (muskrat). Most furbearers are believed to be relatively secure in Arkansas, although some, such as the badger, are rare. Furbearer harvests have declined over the past few decades because of lower pelt prices resulting from decreased demand (AGFC 2001c).

In addition to game birds and mammals, Arkansas also has numerous native and non-native game fish. Largemouth bass (*Micropterus salmoides*) is the most important game fish in Arkansas (Hobbs et al. 2002), but it is closely followed in popularity by crappie (*Pomoxis* spp) (Burnley et al. 2002). Walleye (Sander vitreus) are native to several Arkansas River systems but usually occur in low density throughout most of the year (Perrin et al. 2003). However, they are regularly sought during the March spawning season when the fish congregate on spawning shoals. Fishable walleye populations have also been created in many Arkansas lakes and impoundments and are maintained, at least in part, through regular stocking (Perrin et al. 2003).

Routinely stocked non-native and hybrid game fish include striped bass (*Morone saxatilis*), saugeye (*Sander canadensis*), walleye cross, brook trout *(Salvelinus fontinalis)*, brown trout *(Salmo trutta)*, cutthroat trout *(Oncorhynchus clarkii)*, lake trout *(Salvelinus namaycush)*, and rainbow trout *(Oncorhynchus mykiss)*. Striped bass are stocked in some lakes and reservoirs to consume large gizzard shad (*Dorosoma cepedianum*), which can compete with and limit the abundance of small prey relied on by native predators, and to provide inland trophy angling opportunities (Fourt et al. 2002). Trout are stocked to provide angling opportunities in cold water environments such as deep lakes and tail waters below hydroelectric dams (Bowman and Jones 2004).

Twenty percent of the fish species found in North America are present in Arkansas (AGFC 2009a). Fish species diversity is a product of the diversity of aquatic habitats ranging from bayous in the Mississippi River Alluvial Plains ecoregion to the clear highland streams in the Ozark Highlands and Ouachita Mountains, and large lakes and reservoirs found within the state. Of the 215 fish species present, 197 are native while the others were introduced for food, bait, sport fishing, or vegetation control (AGFC 2009a).

The wild hog (*Sus scrofa*) is the most prevalent feral species in Arkansas and is found throughout most of the state. Although they provide recreational hunting opportunities, feral hogs degrade habitat for other animal species, damage sensitive plant communities, consume egg clutches of ground-nesting birds, and pose a disease threat to other wildlife as well as to humans (AGFC 2009b). AGFC has taken an aggressive stance on hog population control and is quick to promote wild hog hunting. State hunting rules are relaxed for the take of hogs throughout Arkansas.

3.6.5 Florida Fish and Wildlife

Florida Priority Fish and Wildlife Species

In the Florida WAP, the number of SGCNs was tallied by associated vegetation community/habitat. Table-3-54 provides this tally by vegetation community/habitat across FMO, including surface tracts.

Table-3-54. Florida SGCNs by Habitat Type and FMO Acreage

Habitat Type	Number of SGCNs	FMO in the Decision Area (acres)	FMO in Area of Expected Development—Oil and Gas (acres)	FMO in Area of Expected Development—Phosphate (acres)	BLM Surface Tracts (acres)
Disturbed Transitional	132	12,375	412	51	2
Mangrove Swamp	123	285	219	0	10
Salt Marshes	90	870	25	0	15
Sand Beach	85	238	7	0	19
Natural Pinelands	80	9,280	371	28	185
Freshwater Marsh and Wet Prairie	63	2,985	52	119	3
Tropical Hardwood Hammock	60	18	2	0	18
Mixed Hardwood-Pine Forests	57	2,497	60	26	0
Cypress Swamp	52	2,380	92	7	0
Grassland and Improved Pasture	50	12,395	429	823	0
Coastal Strand	49	122	19	0	19
Scrub	47	3,598	0	0	66
Sandhills	46	4,247	0	0	0
Hardwood Hammock Forest	44	3,255	133	31	27
Hardwood Swamp and Mixed Wetland And Forests	42	5,449	72	66	8
Commercial Pinelands	36	7,866	0	0	0
Bottomland Hardwood Forest	32	213	0	0	0
Dry Prairies	31	6,039	253	141	0
Shrub Swamp	30	1,232	43	105	0
Hydric Hammocks	23	71	0	0	0
Bay Swamp	16	398	0	0	2

Table 3-55 lists those species ranked by the state natural heritage program (i.e., Florida Natural Areas Inventory) as either Critically Imperiled (S1) or Imperiled (S2) with occurrence records either on or within one mile of FMO in the area of expected development, or on surface tracts. The table also includes those species listed by the State of Florida that are known to occur on BLM surface tracts.

Table 3-55. Florida Priority Fish and Wildlife Species

Common Name Scientific Name	Natural Heritage Rank[1]	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Habitat/Occurrence Records
Snowy plover *Charadrius alexandrinus*	S1	T	X		Coastal strand and beaches along Gulf coast.
Swallow-tailed kite *Elanoides forficatus*	S2	-	X		Various habitats with tall accessible trees for nesting and open areas for foraging. Occurrence records across state. Likely to occur at the Citrus tract.
Peregrine falcon *Falco peregrinus*	S2	-	X		Various habitats; more common on coast, or near prey concentrations. Most occurrence records on coast or large inland lakes.
American oystercatcher *Haematopus palliatus*	S2	S	X		Beaches, coastal strand, and tidal flats on Gulf and Atlantic coasts.
Roseate spoonbill *Platalea ajaja*	S2	S	X		Marshes, swamps, ponds, rivers, and lagoons in southern coastal areas.

1 S1 = Extremely rare. Typically five or fewer estimated occurrences in the state, or only a few remaining individuals, may be especially vulnerable to extirpation.
S2 = Very rare. Typically between five and 20 estimated occurrences or with many individuals in fewer occurrences, often susceptible to becoming extirpated.
S3 = Rare to uncommon. Typically between 20 and 100 estimated occurrences, may have fewer occurrences but with large number of individuals in some populations, may be susceptible to large-scale disturbances.

Florida Important Bird Areas

There are 100 recognized IBA in Florida. Twenty-five have some FMO associated with them, but only four of these are located in the oil and gas area of expected development. There are no IBAs with phosphate FMO in the phosphate area of expected development. The only surface tract within an IBA is at Egmont Key in the Lower Tampa Bay IBA. The following descriptions of the ornithological values of these areas are excerpted from http://iba.audubon.org/iba/viewState.do?state=US-FL.

Cayo Costa State Park IBA (652 acres of FMO are associated with this state park in Lee County)

> *This area has supported significant populations of Snowy Plovers, while some keys within Pine Island National Wildlife Refuge support significant breeding populations of colonial waterbirds. Only a rudimentary bird list is available.*

Corkscrew Swamp Sanctuary IBA (4.5 acres of FMO are located within this National Audubon Society owned sanctuary)

This area contains what often is the nation's largest Wood Stork rookery, although nesting success (which is dependent on local water levels) is extremely variable. The colony has been monitored annually since 1958. The Sanctuary also supports a diversity of Neotropical migrants, large numbers of wintering landbirds, and the third-largest Swallow-tailed Kite roost in the United States. Diversity of Corkscrew Swamp Sanctuary is 218 native species; CREW Wildlife and Environmental Area added only one exotic species to the overall list.

Lower Tampa Bay IBA (54 acres at the northern tip of Egmont Key are public domain)

These islands are among the most important in Florida for wading birds, shorebirds, larids, and Neotropical migrants, and they support a great diversity of species. The colonial waterbird rookeries on Tarpon Key and Whale Key, two islands of Pinellas National Wildlife Refuge, annually contain 1,215 species, making them one of the two most diverse rookeries in Florida. Fort De Soto County Park probably is the most famous migratory stopover site in Florida, and certainly is one of the state's most popular birding spots. The park is also important for shorebirds and larids. Shell Key Preserve is extremely significant for migrant and wintering shorebirds. Through 1999, Egmont Key supported only a colony of Laughing Gulls, but as nearby Passage Key continues to erode, several other larids (and Brown Pelicans) have moved to Egmont. Overall diversity is 305 native species, the seventh most diverse IBA in Florida.

Rookery Bay National Estuarine Research Reserve IBA (338 acres of FMO are within the Research Reserve boundary)

This area supports significant populations of wading birds, shorebirds, and larids (especially Cape Romano), and also supports upland species such as Mangrove Cuckoos, Black-whiskered Vireos, and Florida Prairie Warblers (e.g., see the Ten Thousand Islands National Wildlife Refuge IBA, pages 259-260). Rookery Bay Colony serves as a significant breeding rookery and year-round roost for Brown Pelicans and wading birds. A small patch of xeric oak scrub that was never known to be occupied naturally by Florida Scrub-Jays has served as a translocation experiment since 1989. This population, which numbers two pairs, has required additional transplanted birds from Archbold Biological Station to be maintained. Ted Below has conducted bi-weekly dusk roost counts of the Rookery Bay Colony islands since 1977.

Florida Game Species

Table 3-56 lists the primary game species managed in Florida. Although, not technically a game species, the American alligator is legally harvested in the state.

Table 3-56. Florida Managed Game Species

Game Type	Game Species
Big Game	American alligator, white-tailed deer, feral hog/wild boar (*Sus scrofa*), eastern wild turkey
Small Game	Northern bobwhite, white-winged dove, woodcock (*Scolopax minor*), mourning dove, gray squirrel, rabbit (*Sylvilagus spp.*)
Waterfowl	Ducks: wood duck, dabbling ducks, diving ducks Geese: snow goose, Canada goose, greater white-fronted goose

Game Type	Game Species
	Mergansers: common merganser, red-breasted merganser, hooded merganser Other: American coot, common moorhen, rail (*Rallus spp.*), common snipe (*Galinago gallinago*)
Furbearers	Beaver, bobcat, coyote, nutria, opossum, raccoon, river otter, spotted skunk, striped skunk

Source: FFWCC 2010

Migratory game birds in Florida include ducks, geese, common moorhen, coots, snipe, rails, woodcock, mourning doves and white-winged doves, and resident game birds, including quail (*Coturnix coturnix*) and wild turkeys. Migratory game bird numbers are highly influenced by habitat quality and availability of breeding grounds, which for most species occur outside Florida, although three species of ducks commonly nest in Florida. However, loss and degradation of suitable habitat in Florida have likely contributed to declining numbers of many of the more than 20 species of waterfowl that over-winter in the state.

Abundant freshwater and saltwater fishing opportunities have contributed to the 700 world-record fish catches and Florida's claim as the "Fishing Capital of the World." Florida has approximately three million acres of freshwater lakes and 12,000 miles of streams and rivers, with more than 250 different species of freshwater fish, including 73 species not native to the United States. The most popular game fish include several species of bass, catfish, garfish, and panfish (FWC 2010).

There are more than 1,000 species of marine fish in Florida waters. Of those, more than 40 are important enough for their harvest to be regulated. Six species have game fish status, meaning that they may not be sold. Popular marine game fish species include common snook (*Centropomus undecimalis*), red drum (*Sciaenops ocellatus*), spotted sea trout (*Cynoscion nebulosus*), bluefish (*Pomatomus saltatrix*), bonefish (*Albula vulpes*), grouper , and flounder (*Paralichthys albigutta*) (FWC 2010).

There are 378 fish listed as SGCN need within Florida. The mangrove swamp habitat accounts for 38 of these species. The habitat created along the shoreline by the mangrove swamp habitat provides abundant opportunities for the survival of coastal fish species such as gray snapper (*Lutjanus griseus*) and tarpon (*Megalops atlanticus*).

Wild hogs are a major nuisance species in Florida. The population is estimated at half a million individuals, and it is purported to occur in every county in Florida. The damage that wild hogs can do to native ecosystems is well documented, and Florida aggressively promotes the take of wild hogs by hunters.

3.6.6 Kentucky Fish and Wildlife

Kentucky Priority Fish and Wildlife Species

In the Kentucky WAP, the number of SGCN was tallied by associated vegetation community/habitat. Table 3-57 provides this tally by vegetation community/habitat across FMO.

Table 3-57. Kentucky SGCNs by Habitat Type and FMO Acreage

Habitat Type	Number of SGCNs	FMO in the Decision Area (acres)	FMO in Area of Expected Development (acres)
Forested Wetland	42	4,690	4,176
Upland Forest	41	192,735	161,925
Savanna/Shrub-Scrub	33	645	531
Caves, Rock Shelters, and Clifflines	16	963	618

Table 3-58 lists those species ranked by the Kentucky natural heritage program (i.e., Kentucky State Nature Preserves Commission) as either Critically Imperiled (S1) or Imperiled (S2) with occurrence records either on or within one mile of FMO in the areas of expected development. This list includes species listed by the Kentucky State Nature Preserves Commission as endangered (E), threatened (T), or of special concern (S). There are no BLM surface tracts in Kentucky.

Table 3-58 Kentucky Priority Fish and Wildlife Species

Common Name Scientific Name	Natural Heritage Rank[1]	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Notes
Lake sturgeon *Acipenser fulvescens*	S1	E		X	Large, freshwater lakes and rivers. Occurrence record associated with Lake Barkley. Reintroduced in Lake Cumberland upstream to Cumberland Falls.
Virginia stone *Acroneuria kosztarabi*	S1	S	X		Endemic stonefly in lotic system. Occurrence records in Lawrence County.
Pine mountain tigersnail *Anguispira rugoderma*	S2	E	X		Terrestrial snail associated with mature forests and dead trees. Occurrences in Bell, Clay, Harlan, Leslie, and Powell counties.
Elktoe *Alasmidonta marginata*	S2	T		X	Sporadic in eastern Kentucky.
Great egret *Ardea alba*	S1B	E		X	Marshes, lake edges, and wetlands. Occurrence records associated with Lake Barkley.

Common Name Scientific Name	Natural Heritage Rank[1]	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Notes
Cattle egret *Bubulcus ibis*	S1S2B	S		X	Wet pastureland, marshes, and dry fields. Occurrence records associated with Kentucky Ridge State Park and Dewey Lake.
Northern harrier *Circus cyaneus*	S1S2B ,S4N	T	X		Marshes, grasslands. Breeding has been confirmed to only a few counties.
Sparkling jewelwing *Calopteryx dimidiata*	S1	S		X	Damselfly in lotic systems. Occurrence records associated with Kentucky Ridge State Forest and Dewey Lake.
Mountain midget crayfish *Cambarus parvoculus*	S2	T		X	Aquatic, preferring small headwater streams with hemlock and rhododendron cover. Occurrence record associated with Kentucky Ridge State Forest.
Common raven *Corvus corax*	S1S2	T		X	Various habitats. Occurrence record on FMO at Paintsville Lake.
Little blue heron *Egretta caerulea*	S1B	E		X	Swamps, lake edges, rivers, and ponds. Occurrence records associated with Lake Barkley.
Snowy egret Egretta thula	S1B	E		X	Swamps, lake edges, rivers, and ponds. Occurrence records associated with Lake Barkley.
Least Flycatcher *Empidonax minimus*	S1B	E	X		Migrant, using riparian zones, open woodland, and brushy areas. Occurrence record near Kentucky Ridge State Forest.
Spotted darter *Etheostoma maculatum*	S2	T		X	Swift deep riffles. Currently known to occur only in the Upper Green and Barren river

Common Name Scientific Name	Natural Heritage Rank[1]	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Notes
					watersheds.
Smallscale darter *Eheostoma microlepidum*	S1	E		X	Occurs only in the Lower Cumberland and Red river drainages.
Cypress darter *Etheostoma proeliare*	S2	T	X		Creeks, streams, sloughs, and oxbows that border the Mississippi and lower Ohio rivers, and the lower Cumberland and Tennessee River drainages.
Coal skink *Eumeces anthracinus*	S2	T	X		Typically found in moist forests and stream edges. Occurrence records associated with Nolin and Laurel river lakes.
Clifty covert *Fumonelix wetherbyi*	S2	S	X	X	A terrestrial snail found in high-quality forests on wooded hillsides and ravines in south central Kentucky.
Chestnut lamprey *Ichthyomyzon castaneus*	S2	S	X	X	Medium to large rivers. Occurrence records in western Kentucky
Northern brook lamprey *Ichthyomyzon fossor*	S2	T	X	X	Small rivers with moderately warm waters. Occurrence records in eastern Kentucky.
Pocketbook *Lampsilis ovata*	S1	E	X		Various habitats, including big rivers and small streams, and can tolerate impoundments. Occurrence records across state.
Creek heelsplitter *Lasmigona compressa*	S1	E		X	Various big and moderate size rivers and streams. Occurrence records in northeastern part of the commonwealth.
A geometrid moth *Lytrosis permagnaria*	S1	E	X	X	Probably mixed and mesic forests. Occurrence records in

Common Name Scientific Name	Natural Heritage Rank[1]	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Notes
					central Kentucky.
A caddisfly *Manophylax butleri*	S2	S	X	X	Aquatic. Occurrence records associated with Lake Cumberland and Grayson Lake.
Inland silverside *Menidia beryllina*	S2	T	X	X	Wide range of streams and small rivers. Occurrence records associated with Lake Barkley and Kentucky Lake.
Eastern small-footed myotis *Myotis leibii*	S2	T	X	X	Two records, including a summer roost mist netting record at Lake Cumberland and summer maternity record at Dale Hollow Lake.
Slender madtom *Noturus exilis*	S1	E	X	X	Currently known to occur only in the Lower Cumberland and South Fork Licking river drainages.
Northern madtom *Noturus stigmosus*	S2S3	S		X	Currently known to occur in portions of the Ohio, Salt, upper Kentucky, Licking, and upper Big Sandy river drainages.
Black-crowned Night-Heron *Nycticorax nycticorax*	S1S2B	T		X	Marshes, lake and pond shorelines, and swampy woodlands. Occurrence records at Lake Barkley.
Eastern slender glass lizard *Ophisaurus attenuatus longicaudus*	S2	T	X		Grasslands and dry open woodlands. Occurrence records associated with Nolin Lake.
Osprey *Pandion haliaetus*	S2B	T		X	Large water bodies. Occurrence records associated with Lake Barkley.
Virginia bladetooth *Patera panselenus*	S1	S	X		Terrestrial snail reported from rock outcrops, talus in mature forests, and steep slopes. Occurrence records in southeastern Kentucky.

Common Name Scientific Name	Natural Heritage Rank[1]	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Notes
Northern pinesnake *Pituophis melanoleucus melanoleucus*	S2	T	X	X	Restricted to sandy pinelands. Occurrence records associated with Lake Barkley and Nolin Lake.
Pied-billed grebe *Podilymbus podiceps*	S1B,S4N	E		X	Marshy inlets; edges of reservoirs, ponds, and sloughs. Occurrence records associated with Lake Barkley.
King Rail *Rallus elegans*	S1B	E		X	Marshes and wetlands. Occurrence record associated with Nolin Lake.
Northern oak hairstreak *Satyrium favonius ontario*	S2	S	X		Open woodlands and oak groves across the commonwealth. Occurrence record associated with Lake Barkley.
Salamander mussel *Simpsonaias ambigua*	S2S3	T		X	Streams and smaller rivers and lakes. Sporadic in the upper Green River and eastward.
Western pygmy rattlesnake *Sistrurus miliarius streckeri*	S2	T		X	Woodland habitats and edges, and glades. Occurrence records associated with Lake Barkley.
Eastern spotted skunk *Spilogale putorius*	S2S3	S		X	Forested areas, brushy areas in woodlands, and prairies in eastern portion of the state. Occurrence record associated with Kentucky Ridge State Forest.
Golden-winged Warbler *Vermivora chrysoptera*	S2B	T		X	Nests in deciduous forest edges and openings. Occurrence record associated with Kentucky Ridge State Forest.

1 S1 = Extremely rare. Typically five or fewer estimated occurrences in the state, or only a few remaining individuals, may be especially vulnerable to extirpation.

Common Name Scientific Name	Natural Heritage Rank[1]	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Notes

S2 = Very rare. Typically between five and 20 estimated occurrences or with many individuals in fewer occurrences, often susceptible to becoming extirpated.
S3 = Rare to uncommon. Typically between 20 and 100 estimated occurrences, may have fewer occurrences but with large number of individuals in some populations, may be susceptible to large-scale disturbances.

Kentucky Important Bird Areas

There are five IBAs recognized in Kentucky, but none are associated with the USACE facilities or Kentucky State Ridge or Pennyrile Forests in the areas of expected oil and gas development. The Lilley Cornett Woods IBA is located in Letcher County in an area identified as having high potential for coal development, but there is no FMO in Letcher County.

Kentucky Game Species

Table 3-59 lists the primary game species being managed in Kentucky.

Table 3-59. Kentucky Managed Game Species

Game Type	Species
Big Game	Black bear, eastern wild turkey, elk, white-tailed deer, feral hog/wild boar
Small Game	Pigeon (*Columba livia*), fox squirrel, red squirrel (*Tamiasciurus hudsonicus*),gray squirrel, rabbit, crow (*Corvus corax*), bullfrog (*Rana catesbeiana*)
Waterfowl	Ducks: wood duck, dabbling ducks, diving ducks Geese: Ross' goose (*Chen rossii*), snow goose, white-fronted goose, Canada goose Mergansers: common merganser, red-breasted merganser, hooded merganser Other: American coot, common moorhen, mourning dove, gallinule, rail, common snipe, woodcock
Furbearers	Groundhog (*Marmota monax*), beaver, bobcat, coyote, gray fox, red fox, mink, muskrat, nutria, opossum, raccoon, river otter, spotted skunk, striped skunk, weasel

Source: KDFWR 2010

In 1997, Kentucky Fish and Wildlife began restoring free-ranging elk in southeastern Kentucky. Under the management of the Kentucky Department of Fish and Wildlife Resources (KDFWR), Kentucky now has the largest elk herd (approximately 11,000) east of the Rocky Mountains. With no predators, excellent food sources, and mild winters, the numbers are increasing much quicker than originally projected. Elk are generally concentrated in the eastern portion of the commonwealth in Bell, Leslie, Perry, and Knott counties, but elk can be hunted commonwealth-wide where populations exist. The 2009–2010 elk season harvest was 276 bulls and 502 cows (KDFWR 2010).

White-tailed deer hunting is also a major draw in Kentucky, with more than 110,000 deer a year taken by hunters over the last eight years. Deer populations in Kentucky are annually estimated to be approximately 900,000, with healthy populations occurring across the commonwealth in nearly every ecoregion and habitat type (KDFWR 2010).

Bird hunting is very popular in Kentucky, and hunted species vary from upland birds like turkey, quail, and grouse to waterfowl, like ducks, coots, and geese. Kentucky is in the Atlantic flyway and has a modest wintering population of ducks and geese. Fall and spring turkey seasons are very popular, and Kentucky has a strong turkey population at well over 150,000 turkeys, which occur in nearly every ecoregion and habitat within the commonwealth (KDFWR 2010).

According to the Kentucky Comprehensive Wildlife Conservation Strategy (CWCS), Kentucky is third in the nation for the number of species of fish occurring within the commonwealth (KDFWR 2005). Of the 260 fish known to occur, 236 are considered native species (KDFWR 2005). At least 55 native and non-native game fish are known within the commonwealth (Kinman 1993). Kentucky annually stocks public waterways with 4 million fish and has a great reputation for well managed fisheries containing good populations of bass, rainbow trout, sauger, and crappie.

Kentucky's native fish species include 30 percent of the total number of species found on North America, exceeded in diversity only by Alabama and Tennessee. This great diversity is due to the vast river drainage systems. The Cumberland River drainage is the largest system and includes at least 20 species of SGCN.

Wild hog populations in Kentucky are growing but not at the alarming rate that they are in other states. There is an active hunting season, and the take of wild hogs is promoted where their populations are excessive.

3.6.7 Louisiana Fish and Wildlife

Louisiana Priority Fish and Wildlife Species

In the Louisiana WAP, the number of SGCNs was tallied by associated vegetation community/habitat. Table 3-60 provides this tally by vegetation community/habitat across FMO, including surface tracts.

Table 3-60. Louisiana SGCNs by Habitat Type and FMO Acreage

Habitat Type	Number of SGCNs	FMO in the Decision Area (acres)	FMO in Area of Expected Development—Oil and Gas (acres)	BLM Surface Tracts (acres)
Mixed Hardwood-Loblolly Pine/Hardwood Slope Forest	45	40,133	35,932	38
Brackish Marsh	36	288	184	0
Bottomland Hardwood Forest	34	27,444	24,070	591
Freshwater Marsh	31	16,146	15,923	28
Intermediate Marsh	31	671	670	0
Salt Marsh	26	293	191	0
Southern Mesophytic Forest	24	12	12	0
Western Longleaf Pine Savannah	23	2	1	0
Cypress-Tupelo-Blackgum Swamp	18	229	14	2

Habitat Type	Number of SGCNs	FMO in the Decision Area (acres)	FMO in Area of Expected Development—Oil and Gas (acres)	BLM Surface Tracts (acres)
Sandbars	14	121	94	0
Calcareous Prairie	12	5	5	0

Table-3-61 lists those species ranked by the state natural heritage program (i.e., Louisiana Natural Heritage Program) as either Critically Imperiled (S1) or Imperiled (S2) with occurrence records either on or within one mile of FMO in an area of expected development or on surface tracts. None of these species is listed as endangered (E) or threatened (T) by Louisiana.

Table-3-61. Louisiana Priority Fish and Wildlife Species

Common Name Scientific Name	Natural Heritage Rank[1]	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Habitat/Occurrence Record
Rayed creekshell *Anodontoides radiates*	S2	-	X		Large rivers, to small and medium-sized creeks. Occurrence records in the Florida parishes.
Eastern diamondback rattlesnake *Crotalus adamanteus*	S1	-	X		Pine/wiregrass flatwoods, mixed pine woodlands, grasslands, and wet prairies. Occurrence records in the Florida parishes.
Blue sucker *Cycleptus elongatus*	S2S3	-	X		Largest rivers and lower parts of major tributaries. Occurrence records near split-estate in Rapides Parish.
Spike *Elliptio dilatata*	S2S3	-	X		Medium streams to large rivers in shoal habitat of unimpounded streams but occasionally in tailwaters of dams and certain lake conditions. Occurrence records near split-estate in Richland Parish.
Silverjaw minnow *Ericymba buccata*	S2S4	-	X		Headwater streams with moderate flow and clean sand or gravel bottoms. Occurrence records in Washington Parish.
Sabine fencing crawfish *Faxonella beyeri*	S1S2	-	X		A single record from a roadside ditch within a mile of split-estate in De Soto Parish. Seven miles from surface tract.
Broadside	S2	-	X		Quiet pools, backwaters of creeks and small rivers, but not

Common Name Scientific Name	Natural Heritage Rank[1]	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Habitat/Occurrence Record
topminnow *Fundulus euryzonus*					headwaters. Occurrence records in Florida parishes.
Black sandshell *Ligumia recta*	S1	-	X		Medium to large rivers with strong currents, rare in Boeuf and Pearl rivers.
River redhorse *Moxostoma carinatum*	S1S3	-	X		Clearer large creeks and rivers, and occasionally natural lakes and reservoirs. Occurrence records in Florida parishes.
Frecklebelly madtom *Noturus munitus*	S2S3	-	X		Chiefly in rocky riffles, rapids, and runs of medium to large rivers. Occurrence records in Florida parishes.
Osprey *Pandion haliaetus*	S2B, S3N	-	X		Occurrence records across the state in coastal areas and associated with large lakes. Expected to occur on surface tracts at Black Lake, Baldwin and Duck lake tracts.
Louisiana slimy salamander *Plethodon kisatchie*	S1S2	-	X	X	Mesic wooded forests in central Louisiana. No aquatic stage. Occurrence records on and near split-estate in Rapides Parish. Potential to occur on the Rapides Parish surface tract.
Pyramid pigtoe *Pleurobema rubrum*	S2	-	X		Large rivers but may occur in medium-sized lotic conditions. Occurrence records near split-estate in northeast Louisiana.
Ribbon crawfish *Procambarus bivittatus*	S1S2	-	X		Permanent large and small streams, sloughs, and sand-bottomed creeks with clear water. Occurrence records near split-estate FMO in Washington Parish.
Javelin crayfish *Procambarus jaculus*	S1S2	-	X		Seasonal, temporary lentic situations. Occurrence records near split-estate in Rapides Parish.
Strecker's chorus frog *Pseudacris streckeri*	S1	-	X		Only occurrence record in state in Caddo Parish northwest of Cross Lake within a mile of split-estate FMO.

1 S1 = Extremely rare. Typically five or fewer estimated occurrences in the state, or only a few remaining individuals, may be especially vulnerable to extirpation.

Common Name Scientific Name	Natural Heritage Rank[1]	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Habitat/Occurrence Record

S2 = Very rare. Typically between five and 20 estimated occurrences or with many individuals in fewer occurrences, often susceptible to becoming extirpated.
S3 = Rare to uncommon. Typically between 20 and 100 estimated occurrences, may have fewer occurrences but with large number of individuals in some populations, may be susceptible to large-scale disturbances.

Louisiana Important Bird Areas

There are 14 recognized IBAs in Louisiana. Of these, nine have some FMO in areas of expected development and two include BLM surface tracts. The following descriptions of ornithological importance of these areas are excerpted from http://iba.audubon.org/iba/viewState.do?state=US-LA.

Active Delta (Mississippi River Delta) IBA (includes split-estate FMO and FMO in the Delta NWR currently under lease in Plaquemines Parish)

> *This IBA is extremely important for wintering waterfowl, wading birds, secretive marsh birds, and shorebirds. It provides important nesting and brood rearing habitat for mottled ducks, secretive marsh birds and wading birds. Shrub-dominated spoil banks and willow-dominated areas provide important migratory stopover habitat for many Neotropical migrants.*
>
> *The freshwater marsh in particular holds high densities of King Rails, though no quantitative data for King Rails exist. Western Sandpiper, Least Sandpiper, and Dunlin winter on the IBA. One hundred and seventy-five species of birds were detected during two seasons of transect counts on Delta NWR and Pass a Loutre WMA, during only a few months each year. Tens of thousands of wintering waterfowl utilize the delta's rich food resources. There are numerous wading birds in the marshes, and thousands of shorebirds are found on tidal mudflats and deltaic splays. Commonly observed are Greater and Lesser Yellowlegs, Long-billed Dowitchers, Dunlins, Western Sandpipers, Wilson's Plovers, Killdeer and Willets.*
>
> *Raptors are also common on the IBA, with commonly observed species including American Kestrels, Northern Harriers, Red-tailed Hawks, Turkey Vultures, and Cooper's Hawks. Ospreys are commonly seen in the winter at the site.*

Atchafalaya Basin IBA (includes split-estate FMO Lafourche Parish and the Duck Lake surface tract in St. Martin Parish)

> *Bald Eagles nest in the tall cypress trees surrounding Lake Verret, and in many other locations throughout the IBA. There are many birds of prey in the basin, including forest inhabitants such as the Red-shouldered Hawk, Broad-winged Hawk, and Cooper's Hawk, Mississippi and Swallow-tailed Kites, Osprey, Barred, Great Horned, and Eastern Screech-Owls, American Kestrels, Merlin, and the occasional Peregrine Falcon and Northern Harrier.*
>
> *A globally significant number of Wood Storks wander through the basin in late summer and early fall, and are the focus of the joint U.S. Army Corps of Engineers/LDWF fall*

Wood Stork Day. Several wading bird rookeries exist in the basin, with globally important numbers of White Ibis occurring at one large rookery. Yellow-crowned Night-Herons breed in large numbers in the cypress swamps, which are also home to many species of woodpeckers. Over 30 species of rails and shorebirds have been found in the wetland habitats in the basin.

The Atchafalaya Basin is world-famous for the numbers of American Woodcock resident in the Basin, which is central in the range of the bird. There are tens of thousands of American Woodcock that winter in the damp, brushy woods of the Basin.

The Atchafalaya Basin also provides valuable stopover habitat for millions of Neo-tropical migrants, including many species of thrushes, vireos, flycatchers, warblers, buntings, and tanagers. The site provides important breeding habitat for several Audubon Watch List species including Prothonotary, Kentucky, and Swainson's Warblers, Wood Thrush, and Painted Bunting, and common birds such as Summer Tanager, Indigo Bunting, Great Crested Flycatcher, Eastern Tufted Titmouse, Carolina Chickadee, and Carolina Wren. During the winter migratory waterfowl species are present.

Atchafalaya Delta IBA (near the St. Mary surface tract outside the area of expected development)

Wildlife populations are found more abundantly in freshwater marsh habitat than that of saltwater. This site provides good habitat for wintering waterfowl and migratory birds. The marsh and scrub habitat provides a source of food and rest that is much needed after migrant birds traverse the Gulf of Mexico. This type of habitat supports rails, cranes, gulls, shorebirds, and colonies of terns, including Gull-billed Tern, Caspian, Royal, Forster's, Sandwich, and Least Tern.

Species of conservation concern on vegetated pioneer emerging delta habitat include the Louisiana state bird, the Brown Pelican, as well as Reddish Egret and Yellow-crowned Night-Heron. Piping, Wilson's and Snowy Plover all use this site, particularly the islands and mudflat areas. Shorebirds of concern using this IBA include Marbled Godwit, Dunlin, and Short- billed Dowitcher. Whooping Cranes likely used this IBA before they were extirpated from Louisiana.

The IBA is very important for wintering waterfowl, including American Wigeon, both teal species, Canvasbacks, Gadwall, Lesser Scaup, Mallard, Mottled Duck, Northern Pintail, Northern Shoveler, Redhead, and Ring-necked Duck, as well as Snow and Greater White-fronted Geese. Bald Eagles are also known to nest on this site. The site also supports several colonies of wading birds, such as Snowy Egret, White Ibis, and both Night-Herons, as well as colonies of Black Skimmer.

Barataria Terrebonne IBA (includes FMO in LaFourche, Plaquemines, and St. Charles parishes, including FMO associated with the USACE Bonnet Carre Spillway)

There are over 350 species of birds present in the Barataria Terrebonne IBA. Excellent breeding habitats including freshwater ecosystems, swamps, and bottomland hardwood forests are present. A number of the wading birds nest here, including herons, ibis, and egrets such as the Reddish Egret. Prothonotary Warbler and Painted Bunting use the swamp nesting habitat. Seabirds include pelicans, gulls, terns and skimmers. Because of the location of the barrier islands, there is great stopover habitat for trans-Gulf

migratory birds such as Snowy Plover. Wilson's Plover breeds here during the summer. The Piping Plover, considered vulnerable in both the United States and Canada, uses the IBA's beaches during the winter. This site also provides wintering habitat for migratory geese and ducks such as Blue- and Green-winged Teal, American Wigeon and Ring-necked Duck, and less commonly Lesser Scaup, Mallard, and Gadwall. Half of the continental Mottled Duck population inhabits Louisiana, including the Barataria Terrebonne Estuary, year round. This IBA also provides habitat for birds of prey, including significant numbers of nesting Bald Eagles.

Catahoula-Dewey Wills-Three Rivers IBA (includes split-estate FMO in La Salle, Rapides, and West Feliciana, including the Big Saline Bayou surface tract in Rapides Parish)

This area provides habitat for significant numbers of waterfowl, shorebirds, Neotropical migratory songbirds, raptors, and game birds.

Many of the public properties within this IBA are managed to provide habitat for wintering waterfowl. Catahoula Lake and the immediate surrounding wetlands support from 40,000 to 300,000 ducks from October to January, including up to 25% or more of the nationwide recorded population of Canvasbacks. The IBA also supports significant numbers of wintering Gadwall, Green-winged Teal, Northern Pintail, Ring-necked Duck, Mallard, American Widgeon, and Northern Shoveler, as well as resident Wood Ducks.

Catahoula Lake also supports significant shorebird populations. A conservative estimate of the shorebird population in a single day on Catahoula Lake alone ranges from 4,000 to 70,000 shorebirds. Throughout the IBA, there are species of conservation concern including Prothonotary Warbler, Swainson's Warbler, American Woodcock, Solitary Sandpiper, Kentucky Warbler, Little Blue Heron, and Bald Eagle.

Wading birds are common on the IBA, including Great Blue Heron, Little Blue Heron, Great Egret, Snowy Egret, Tri-colored Heron, Cattle Egret, Least and American Bittern, White, Glossy and White-faced Ibis, Wood Stork, and Roseate Spoonbill.

Other groups of birds of interest include 7 species of woodpeckers, 7 species of flycatchers, 5 species of wrens, 21 warbler species, and 15 species in the Emberizid sparrow complex.

Chenier Plain IBA (includes split-estate FMO in Cameron Parish)

This IBA is home to over 360 species of birds; these include ducks, egrets, geese, raptors, wading birds, and shorebirds. This site also serves as a stopover area for many of the transient birds that winter in Central and South America.

Shell Keys Island was a known nesting site for Royal and Sandwich Terns, Black Skimmers, and Laughing Gulls. In addition, the islet is used at various times as a loafing area by American White Pelicans, Brown Pelicans, and various species of terns and gulls. Recent hurricanes and storms have eroded the island to such an extent that no nesting has occurred since 1992.

During the winter months, the IBA supports peak populations of over 400,000 ducks and geese. Large wintering concentrations of Greater White-fronted and Snow Geese can be found here. Northern Pintail, both teal species, Mallards, Ring-necked Ducks, Gadwall,

and American Wigeon are common on the site during the winter months. Breeding populations of Mottled Ducks, Black-bellied Whistling-ducks, Wood Ducks, and Blue-winged Teal are found on the IBA during the summer months. Even a small refuge, Cameron Prairie NWR, supports more than 45,000 ducks in winter.

A variety of wading birds are common in the IBA, particularly during the breeding season. One of the only Roseate Spoonbill nesting rookeries in Louisiana is located in Lacassine Pool, a 16,000 acre freshwater impoundment found on the refuge. Other common marsh and water birds include Neotropic Cormorants, Great Blue, Tricolored, and Little Blue Herons, Great and Snowy Egrets, Black-crowned and Yellow-crowned Night Herons, White and White-faced Ibises, King, Clapper, and Yellow Rails, Least Bitterns, American Coots, Common Moorhens, Purple Gallinules, and Black-necked Stilts.

Northern Harriers and Red-tailed Hawks are abundant in these marshes through the winter.

East Kisatchie IBA (includes split-estate FMO in La Salle, Natchitoches, Rapides, and Red River parishes)

This IBA offers habitat to a number of Birds of Conservation Concern, including vulnerable Red-cockaded Woodpecker and near threatened Henslow's Sparrow and Northern Bobwhite. Waterbirds like Yellow-Crowned Night-Heron and Louisiana Waterthrush may be found in creek bottoms. The forests provide habitat for vireos including Yellow-throated Vireo, sparrows such as Henslow's and Bachman's, warblers, woodpeckers including Red-bellied and Downy, and Brown-headed Nuthatch. The site's raptors include Red-shouldered, Broad-winged, Sharp-shinned, Red-tailed, and Cooper's Hawks, and Bald Eagle. Scissor-tailed Flycatcher has begun to move into the park. In the western section of the IBA, Greater Roadrunner may be seen.

Lake Pontchartrain IBA (includes split-estate in St. Charles and Tangipahoa, including the USACE Bonne Carre Spillway)

This area supports relatively large numbers of wintering waterfowl, including Horned Grebe and Common Loon. Lesser Scaup populations declined in the lake from 1978 to 2002 during a time which they also declined nationwide. However, despite changes in the water quality, salinity and habitat in the lake, tens to hundreds of thousands of Lesser Scaup have persisted at this shallow, estuarine lake. In fact, the highest count in two decades, more than 1 million birds, came in the winter following Hurricane Katrina.

This IBA is frequented by a number of other species. Various gulls and terns, herons, egrets, rails and Black Skimmer can all be found in this site. The IBA also functions as a great stopover site for migrating birds. The lake provides excellent feeding opportunities for birds that prefer open water such as the scoters. Raptors such as Bald Eagles and Ospreys nest and forage in the habitats that surround the lake.

The Brown Pelican was extirpated from Louisiana in the 1960's, in part due to DDT and other pesticides that entered the Mississippi River from agricultural runoff and chemical spills, weakening egg shells and causing breeding failure. A successful restocking program undertaken in 1968 by the Louisiana Department of Wildlife and Fisheries has restored a strong population in Louisiana. Creation and enhancement of breeding islands

has helped maintain the population in the face of habitat loss. While Brown Pelicans do not generally feed on inland lakes, they commonly feed on Lake Pontchartrain in the winter.

While they are on human-built structures, the Purple Martin roosts on the Lake Pontchartrain Causeway each support peak numbers of up to 250,000 martins during the breeding season. The roosts are also active during spring and fall migration and the post-breeding season. These birds feed over the lake and over land in surrounding IBAs. Up to 8 million martins may pass through this site each season during migration.

West Kisatchie IBA (includes split-estate in Natchitoches and Rapides parishes outside the Kisatchie National Forest. Area is near the Black Lake tract, which is predominately a bottomland hardwood and has no suitable red-cockaded woodpecker habitat.)

In recent years, populations of the federally endangered Red-cockaded Woodpecker have been steadily increasing in several areas of West Kisatchie. In the Vernon Unit, the RCW population probably never dipped as low as other KNF populations, possibly due to military use of the northern half of the area which precluded the intense forest management that occurred elsewhere. The number of potential breeding groups, or clusters, has increased on Calcasieu and Kisatchie Ranger Districts from 214 clusters in 2001 to 346 in 2006. As the amount of suitable habitat increases with forestry management, RCW populations will increase accordingly, and other birds of conservation interest that share the RCW's habitat needs will also benefit. Chief among these are the resident Northern Bobwhite and Bachman's Sparrow. Henslow's Sparrow and American Woodcock find the area attractive wintering range. Other species found in these upland pine habitats on the Vernon include Black-and-white Warbler, Brown-headed Nuthatch, Kentucky Warbler, and Prairie Warbler. Swainson's Warbler and Wood Thrush inhabit the thicker pine habitats and Louisiana Waterthrush is found along the small creeks. This forest is also home to large numbers of common species such as Hooded Warbler, Northern Cardinal, Pine Warbler, Yellow-breasted Chat, Yellow-billed Cuckoo, Indigo Bunting and Summer Tanager. A pair of Bald Eagles nests on the shoreline of Kincaid Lake within a Forest Service Recreation Area. Some commonly encountered raptors include Osprey, Red-tailed Hawk, Red-shouldered Hawk, Broad-winged Hawk, Cooper's Hawk, Sharp-shinned Hawk, Mississippi Kite, southeastern American Kestrel, Eastern Screech-Owl, Barred Owl, and Great Horned Owl.

In addition, potential and nominated IBAs in Louisiana with FMO in areas of expected development include Caddo Cross Lake, Red River, Mississippi River, and East Delta Plain.

Louisiana Game Species

Table 3-62 lists primary game species managed in Louisiana.

Table 3-62. Louisiana Managed Game Species

Species Type	Species Name
Big Game	Wild turkey, white-tailed deer, feral hog/wild boar, alligator
Small Game	Northern bobwhite, mourning dove, fox squirrel, gray squirrel, rabbit, woodcock

Species Type	Species Name
Waterfowl	Ducks: wood duck, dabbling ducks, diving ducks, geese: snow goose, Canada goose, greater white-fronted goose Mergansers: common merganser, red-breasted merganser, hooded merganser Other: American coot, common moorhen, sora, rail, common snipe
Furbearers	Beaver, bobcat, coyote, gray fox, red fox, mink, muskrat, nutria, opossum, raccoon, river otter, spotted skunk, striped skunk, weasel

Louisiana's major game species include white-tailed deer, wild turkey, northern bobwhite, quail, migratory birds such as mourning doves and woodcock, rabbits, squirrels, and waterfowl. Alligator hunting is also popular during the annual 30-day season. The estimated population of wild alligators in Louisiana is 1.5 million, and they occur statewide in bayous, rivers, swamps, marshes, ponds, and lakes. Whitetail deer also occur statewide and are abundant, inhabiting a variety of habitats ranging from marsh and agriculture fields, to mixed and hardwood forests and forest edges. According to the Louisiana Department of Wildlife and Fisheries, approximately 220,000 to 250,000 deer are harvested in Louisiana by sportsmen annually, making this probably the most important game species in the state.

Wild turkeys prefer mixed and hardwood forest interspersed with open areas in both bottomland and upland regions. The turkey population in Louisiana is estimated at more than 80,000 individuals. Fox squirrels and gray squirrels are common and occur statewide in forested areas, parks, urban areas, and riparian corridors. Mourning doves occur throughout Louisiana in agricultural fields and urban areas. American woodcock typically inhabit moist bottomlands with thick trees and/or brush. Rabbits are abundant in a vast array of habitats throughout the state and are especially abundant in areas of recent disturbance or in agriculture fields and field rows.

Louisiana is an extremely important wintering ground for migratory waterfowl within the Mississippi and Central flyways, with all of the ecoregions within the state containing habitat that can support migrating birds. The Mississippi flyway covers eastern and central Louisiana; the Central flyway's eastern boundary passes through western Louisiana. Wetlands such as swamps, bottomland hardwoods, and the vast marshes along the Louisiana coastline, as well as agricultural fields throughout the state, provide excellent waterfowl habitat.

Louisiana has a large freshwater sport fishing industry. The most popular game fish include largemouth bass, bluegill (*Lepomis microchirus*), redear sunfish (*Lepomis microlophus*), black and white crappie (*Poxomis* spp.), and catfish. These fish flourish in a variety of aquatic habitats. Bass, bluegill, redear sunfish, and black crappie prefer quiet backwaters of rivers, bayous, swamps, lakes, ponds, and marshes where aquatic vegetation is abundant and water clarity is good. White crappie and most catfish prefer the more turbid and deeper waters of rivers and bayous. Habitat for freshwater sport fishing is present in every ecoregion.

Louisiana has 148 species of freshwater fish and approximately 400 species in marine waters. With streams, bayous, oxbows, rivers, and estuarine areas of the coast, Louisiana has complex aquatic habitats with high species diversity. Management plans have been developed for the paddle fish (*Polyodon spathula*), Gulf sturgeon (*Acipenser oxyrinchus desotoi*), and the pallid sturgeon (*Scaphirhynchus albus*). Wetland loss and changes associated with nature have produced rapid declines in habitat and numbers of some species along the Gulf coast.

Wild hog populations are becoming excessive in some areas, and the Louisiana Department of Wildlife and Fisheries is active in promoting the take of wild hogs, specifically where they are becoming overpopulated and could potentially negatively affect native environments (LDWF 2010).

3.6.8 Tennessee Fish and Wildlife

Tennessee Priority Fish and Wildlife Species

In the Tennessee WAP, the number of SGCNs was tallied by associated vegetation community/habitat. Table 3-63 provides this tally by vegetation community/habitat across FMO.

Table 3-63. Tennessee SGCNs by Habitat Type and FMO Acreage

Habitat Type	Number of SGCNs	FMO in the Decision Area (acres)	FMO in Area of Expected Development—Oil and Gas (acres)
South-Central Interior Mesophytic Forest	42	2,036	78
Southern Interior Low Plateau Dry Oak Forest	41	27,961	17,181
South-Central Interior Large Floodplain	32	28	28

Table 3-64 lists those species ranked by the state natural heritage program (i.e., Tennessee Natural Heritage Inventory Program) as either Critically Imperiled (S1) or Imperiled (S2) with occurrence records either on or within one mile of FMO in an area of expected development. This list also includes species listed by the State of Tennessee as endangered (E), threatened (T), and deemed in need of management (D).

Table 3-64 Tennessee Priority Fish and Wildlife Species

Common Name Scientific Name	Natural Heritage Rank	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Notes
Highfin carpsucker *Carpiodes velifer*	S2S3	D		X	Large rivers, mostly in the Tennessee River drainage. Historic occurrence records associated with Dale Hollow Lake.
Ashy darter *Etheostoma cinereum*	S2S3	T	X	X	Small to medium upland rivers with bedrock or gravel substrate and boulders. Occurrence records associated with Dale Hollow Lake.
A cave obligate	S1	-	X		Terrestrial cave obligate.

Common Name Scientific Name	Natural Heritage Rank	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Notes
pseudoscorpion *Kleptochthonius rex*					Occurrence record east of Dale Hollow Lake.
Armored rocksnail *Lithasia armigera*	S1S2	-		X	Partially buried logs, gravel, and preferable submerged rock outcrops; lower Cumberland River and larger tributaries; Obey River. Historic occurrence records associated with Dale Hollow Lake.
Blotchside logperch *Percina burtoni*	S2	D		X	Large creeks and small to medium rivers with low turbidity and gravel-cobble substrates; Tennessee and Cumberland watersheds. Occurrence record associated with Dale Hollow Lake.
Longhead darter *Percina macrocephala*	S2	T		X	Clear, larger upland creeks and small to medium rivers usually in rocky flowing pools upstream or downstream of rubble riffles; Tennessee and Cumberland watersheds. Occurrence record associated with Dale Hollow Lake.
A cave springtail *Pseudosinella orba*	S2	-	X		Terrestrial cave obligate; reported from 3 caves. Occurrence record east of Dale Hollow Lake.
Wallace's cave millipede *Pseudotremia wallaceae*	S1	-	X		Terrestrial cave obligate; collected from riparian mud banks in caves. Occurrence record east of Dale Hollow Lake.
A cave obligate pseudoscorpion *Tyrannochthonius steevesi*	S1	-	X		Terrestrial cave obligate; known from one cave in Pickett County. Occurrence record in northwestern Picket County.

Common Name Scientific Name	Natural Heritage Rank	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Notes

[1] S1 = Extremely rare. Typically five or fewer estimated occurrences in the state, or only a few remaining individuals, may be especially vulnerable to extirpation.
S2 = Very rare. Typically between five and 20 estimated occurrences or with many individuals in fewer occurrences, often susceptible to becoming extirpated.
S3 = Rare to uncommon. Typically between 20 and 100 estimated occurrences, may have fewer occurrences but with large number of individuals in some populations, may be susceptible to large-scale disturbances.

Tennessee Important Bird Areas

There are 30 recognized IBAs in Tennessee. Only one, Dale Hollow Lake IBA, has FMO in an area of expected development.

The following site description of Dale Hollow's ornithological importance is excerpted from http://iba.audubon.org/iba/viewSiteProfile.do?siteId=2847&navSite=state.

Dale Hollow Lake IBA (including the FMO associated with this USACE facility)

> *This area's large contiguous tract of forested uplands and undisturbed shorelines provides a unique and significant winter home to Tennessee's second largest population of Bald Eagles (second only to Reelfoot Lake). In addition, the Dale Hollow forest is a large, intact, and exceptional habitat representative of mature deciduous woodland species to include breeding, wintering, and migration seasons for a diversity of neo-tropical migratory bird species. Dale Hollow provides significant habitat for the Yellow-bellied Sapsucker (winter), Wood Thrush, Cerulean Warbler (East Obey watershed), and a diversity of other woodland species. The Dale Hollow watershed includes the drainage basins of the East and West Obey Rivers and the Wolf River. These drainage basins are relatively undisturbed, mostly forested, remote, and of rugged terrain. They are contiguous to the forested areas of Standing Stone State Park, the Big South Fork National River and Recreation Area, Pickett State Forest, and the Daniel Boone National Forest. These areas comprise several hundred thousand acres of ecologically important habitat for numerous neo-tropical migrants and seasonal breeding species. The Dale Hollow watershed is an important link of this regional woodland flyway. The Cerulean Warbler, a Tennessee In Need of Management species, has been documented the breeding seasons 2002-2004. Dale Hollow Lake's forested hillsides and undisturbed riparian zones support the second largest wintering population of Bald Eagles. There are three active Bald Eagle nests (two of them in Tennessee). There are at least three pairs of Bald Eagles present year-round. The Dale Hollow Lake watershed provides 26,000 acres of contiguous and relatively undisturbed mature deciduous upland forest habitat and lakeside riparian zones. The site supports a diverse complement of woodland species including many Neotropical migrants.*

Tennessee Game Species

Table 3-65 lists the primary game species managed in Tennessee.

Table 3-65. Tennessee's Managed Game Species

Species Type	Species Name
Big Game	Black bear, eastern wild turkey, white-tailed deer, feral hog/wild boar
Small Game	Armadillo (*Dasypus novemcinctus*), groundhog, pigeon, quail, fox squirrel, red squirrel, gray squirrel, rabbit, crow, bullfrog, beaver, bobcat, coyote, gray fox, red fox, mink, muskrat, nutria, opossum, raccoon, river otter, spotted skunk, striped skunk, weasel
Waterfowl	Ducks: wood duck, dabbling ducks, diving ducks Geese: snow goose, white-fronted goose, Canada goose Mergansers: common merganser, red-breasted merganser, hooded merganser Other: American coot, common moorhen, Virginia rail, sora
Furbearers	Groundhog, beaver, bobcat, coyote, gray fox, red fox, mink, muskrat, nutria, opossum, raccoon, river otter, spotted skunk, striped skunk, weasel

Source: TWRA 2008

The Tennessee Wildlife Resources Agency (TWRA) reintroduced elk to the state in the late 1990s in the North Cumberland Wildlife Management Area (WMA). This WMA is in the northeast corner of the state in the Cumberland Plateau and Mountains ecoregion. There were 201 elk in total released over a period of eight years. It is currently estimated that the Tennessee elk herd numbers a little over 300, nearly all within Campbell County just south of the Kentucky border. With this estimate, in 2009, Tennessee announced its first elk hunt in almost 150 years. (TWRA 2010).

The range of white-tailed deer in Tennessee has expanded from a few counties in east Tennessee in the 1940s to all 95 counties in the state. Herd growth has been such that hunting is allowed in all Tennessee counties, with the Tennessee deer herd numbering approximately 900,000 animals. Growth of the Tennessee deer herd is expected to continue to increase at one to two percent per year for the near future, with most expansion occurring in the Mississippi River counties and in eastern Tennessee. The deer herd in middle and west Tennessee has reached the point in some areas where management efforts are focused on slowing or stabilizing herd growth, and sometimes at reducing the overall size of the herd. Overall harvest numbers appeared to have leveled off and average approximately 160,000 deer per year, making this the most important game species in the state (TWRA 2010).

Black bears occur primarily in Blount, Carter, Cocke, Greene, Jefferson, Johnson, Monroe, Polk, Sevier, Sullivan, Unicoi, and Washington counties along the eastern border of the state. The highest densities of bears reside in the Cherokee National Forest and the Great Smokey National Park. Over the past six years, bear harvest numbers have exceeded 300 individuals annually. Bear populations benefited from the maturation and increased productivity of key oak forest species in protected areas and are currently very stable (TWRA 2010).

In just over a decade, the distribution of Tennessee's wild hog population has spread at an alarming rate. Although first confined to small pockets in east Tennessee and the Cumberland Plateau, it is now estimated that viable hog populations can be found in close to a third of Tennessee's counties. TWRA has taken an aggressive stance in preventing further damage to state ecosystems and promotes the take of wild hogs.

As regulated by TWRA, some furbearers such as the bobcat, fox, mink, muskrat, otter, spotted skunk, and weasel have defined hunting seasons, while others that are considered nuisance animals, such as the coyote, beaver, nutria, and striped skunk, can be hunted year-round.

Waterfowl hunting is common on Tennessee's many waterways, natural swamps, and flooded timber areas. Surveys indicate maximum populations typically occur in midwinter with more than 800,000 ducks and 40,000 geese inhabiting the state at that time (TWRA 2010).

Freshwater game fish that may occur in the Dale Hollow Reservoir, Obey River, Cumberland River, or their tributaries include striped bass (*Morone saxatilis*), white bass (*Morone chrysops*), Cherokee bass (*Morone saxatilis x M. chrysops*), yellow bass (*Morone mississippiensis*), spotted bass (*Micropterus punctulatus*), largemouth bass, smallmouth bass (*Micropterus dolomieu*), blue catfish (*Ictalurus furcatus*), channel catfish (*Ictalurus furcatus*), flathead catfish (*Pylodictis olivaris*), common carp (*Cyprinus carpio*), freshwater drum (*Aplodinotus grunniens*), white crappie, black crappie, bluegill, redear sunfish, rainbow trout, brook trout, brown trout, lake trout, walleye, sauger (*Sander canadensis*), and muskellunge (*Esox masquinongy*).

3.6.9 Virginia Fish and Wildlife

Virginia Priority Fish and Wildlife Species

Data within the Virginia WAP was used to link SGCN numbers to ecoregions, which is displayed in Table 3-66 as the best available data.

Table 3-66 Virginia SGCNs by Habitat Type and FMO Acreage

Ecoregion Type	Number of SGCNs	Federal Minerals in the Decision Area (acres)	Federal Minerals in Area of Expected Development—Oil and Gas (acres)
Northern Ridge and Valley	384	4,250	4,250
Middle Atlantic Coastal Plain	235	804	0
Northern Cumberland Mountains	101	8,326	8,326

Table 3-67 lists those species ranked by the Virginia natural heritage program (i.e., Virginia Natural Heritage Program) as either Critically Imperiled (S1) or Imperiled (S2) with occurrence records either on or within one mile of FMO in the area of expected development or on surface tracts. This lists also includes species listed by Virginia as endangered (E), threatened (T), or species of special concern (SC)

Table 3-67 Virginia Priority Fish and Wildlife Species

Common Name Scientific Name	Natural Heritage Rank[1]	State Listing	Occurrence Records Within 1 Mile of FMO	Occurrence Records on FMO	Notes
Big sandy crayfish *Cambarus veteranus*	S1S2	E	X	X	Moderate-sized streams with bedrock, cobble, or boulders and permanent, fast-flowing water. Occurrence records in Buchanan, Dickenson, Giles, and Wise counties. Occurrence record associated

Common Name Scientific Name	Natural Heritage Rank[1]	State Listing	Occurrence Records Within 1 Mile of FMO	Occurrence Records on FMO	Notes
					with the John W. Flannagan Reservoir.
Eastern hellbender *Cryptobranchus alleganiensis*	S2S3	SC	X	X	Cool, clear streams and fast-moving streams. Occurrence records associated with the New River at the Radford Ammunition Plant.
Mottled duskywing *Erynnis martialis*	S1S3	-		X	Grasslands, open woodlands, often with oak, and glades. Occurrence record associated with Radford Ammunition Plant.
Green-faced clubtail *Gomphus viridifrons*	S2	-	X		Clean, free-flowing water. Occurrence record located in Pound River associated with John W. Flannagan Reservoir.
Swainson's warbler *Limnothlypis swainsonii*	S2B	-	X		Deciduous floodplain and swamp forests. Occurrence record associated with John W. Flannagan Reservoir.
Regal fritillary *Speyeria idalia*	S1	-		X	Grasslands, and wet meadow with warm season bunch grasses. Occurrence record associated with Radford Ammunition Plant.

1 S1 = Extremely rare. Typically five or fewer estimated occurrences in the state, or only a few remaining individuals, may be especially vulnerable to extirpation.
S2 = Very rare. Typically between five and 20 estimated occurrences or with many individuals in fewer occurrences, often susceptible to becoming extirpated.
S3 = Rare to uncommon. Typically between 20 and 100 estimated occurrences, may have fewer occurrences but with large number of individuals in some populations, may be susceptible to large-scale disturbances.

Virginia Important Bird Areas

There are 20 recognized IBAs in Virginia. Of these three have FMO in an area of expected development or include BLM surface tracts. The following descriptions of the ornithological importance of these areas are excerpted from http://iba.audubon.org/iba/viewState.do?state=US-VA.

Pine Mountain IBA (includes FMO associated with John W. Flannagan Reservoir)

> *This area supports the entire suite of species characteristic of eastern mixed-mesophytic forests. The extensive network of streams and associated dense cove forests support Swainson's Warblers at relatively high densities compared to other surveyed areas in the region. Other stream-associated species or those that require large blocks of forested habitats such as the Kentucky Warbler, Worm-eating Warbler, and Wood Thrush are also likely to exceed thresholds within the IBA. Cerulean Warblers are found sporadically on*

USFS breeding bird surveys and on BBS counts but it is unlikely that their populations meet thresholds within the proposed IBA. However, with only 8 survey routes throughout the entire 13,000 ha area, the majority of the IBA remains un-surveyed and under-studied.

Radford Army Ammunition Plant IBA (near FMO in Montgomery County)

This area supports one of the last remaining populations of the VA Threatened Henslow's Sparrow in the state. Up to 15 individuals have been detected on recent surveys. The plant also supports at least one pair of Loggerhead Shrikes each year, a species that has been declining at a rate of 10% each year in Virginia. The large amount of grassland and shrubland habitat also makes this a good site for the watch listed Prairie Warbler as well as the at-risk Northern Bobwhite, Eastern Meadowlark, Northern Harrier, Grasshopper Sparrow, and Field Sparrow. A small Brown-headed Nuthatch population uses the smaller lots of planted pine on the site. This is the northern-most extension of their range in this part of the state.

Upper Potomac River IBA (includes the Meadowood surface tracts)

Due to its proximity to Washington D.C., the upper tidal reach of the Potomac River has been the focus of intensive ornithological observation for 200 years by prominent ornithologists stationed in the area. The landscape and bird community have changed dramatically over this time period. One of only 2 known breeding locations for the Bachman's Warbler in Virginia was located within the area. Currently, the area supports a significant community of piscivorous bird species. This includes one of the largest Great Blue Heron colonies within the mid-Atlantic region, a dense breeding population of Bald Eagles, and both a summer and winter concentration area for migrant Bald Eagles. The rich hardwood forests are strategically important for local breeding populations of neotropical migrants, as well as, stopover areas for northern populations moving through the region in the fall. The waterways support significant populations of waterfowl during migration and winter. Rusty Blackbirds are common winter residents.

Virginia Game Species

Table 3-68 lists the primary game species being managed in Virginia.

Table 3-68. Virginia Managed Game Species

Species Type	Species Name
Big Game	Black bear, wild turkey, white-tailed deer
Small Game	American crow (*Corvus brachyrhynchos*), fish crow (*C. ossifragus*), common snipe, northern bobwhite, mourning dove, fox squirrel, red squirrel, gray squirrel, Appalachian cottontail (*Sylvilagus obscurus*), eastern cottontail, marsh rabbit (*Sylvilagus palustris*), ruffed grouse (*Bonasa umbellus*), ring-necked pheasant (*Phasianus colchicus*), woodchuck, woodcock
Waterfowl	Ducks: wood duck, dabbling ducks, diving ducks, sea ducks (*Melanitta sp., Clangula sp., and Bucephala sp.*) Geese: snow goose, Canada goose, brant (*Branta bernicla*) Mergansers: common merganser, red-breasted merganser, hooded merganser

Species Type	Species Name
	Other: American coot, common moorhen, sora, clapper rail (*Rallus longirostris*), king rail (*R. elegans*), Virginia rail, tundra swan (*Cygnus columbianus*)
Furbearers	Beaver, bobcat, coyote, gray fox, red fox, mink, muskrat, nutria, opossum, raccoon, river otter, spotted skunk, striped skunk, weasel

Source: Virginia Department of Game and Inland Fisheries

The white-tailed deer occurs throughout Virginia and is one of the most important big game animals in the commonwealth. White-tailed deer populations within Virginia are comparable to other nearby states, holding steady over the past few years at nearly one million deer. Because of the population size, management objectives have switched from restoring and increasing to controlling and stabilizing populations. Since 2000, more than 225,000 deer are taken annually in Virginia, with more than 45 percent of those being does. Deer occur in every habitat type and ecosystem within Virginia (VDGIF 2010).

Black bear have increased in population to the point of becoming nuisances in some areas. This is considered a success of the Virginia Department of Game and Inland Fisheries. Black bears can be found within nearly every county in Virginia and have huntable populations and seasons.

Elk have moved into Virginia following their release in Kentucky during the late 1990s. Elk currently are found along the commonwealth's boundary with Kentucky and occur within most habitat types in this area. Elk populations are not monitored within Virginia but elk are hunted and take is allowed, with the elk counting as part of a hunter's bag limit for deer (VDGIF 2010).

The most commonly hunted non-migratory small game in Virginia includes crow, groundhog, grouse, quail, pheasant, rabbit, and squirrel. These species are generally common in appropriate habitats. However, quail and pheasant populations while stable have decreased in recent years.

Virginia also has a large number of waterfowl and waterfowl hunters. Waterfowl are very common along the Atlantic coastal portions of Virginia as well as within the flooded timber and swamp areas of the interior. The eastern shore of Virginia contains a wide diversity of waterfowl habitats. An extensive set of coastal salt marshes and series of undeveloped barrier islands run the length of the eastern shore. Many open water waterfowl species, such as an estimated 15,000 to 20,000 Atlantic Brant, winter here each year, primarily on the mudflats interspersed among the seaside barrier islands. Populations of many of the wintering waterfowl within the Atlantic flyway are down from recent years but are still considered stable. Puddle ducks like the widgeon and mallard are more common within Virginia's interior marshes (VDGIF 2010).

Virginia is home to or a destination for more than 800,000 anglers each year. Freshwater fish commonly sought by anglers include striped bass, yellow bass, largemouth bass, smallmouth bass, blue catfish, channel catfish, flathead catfish, freshwater drum, white crappie, bluegill, rainbow trout, brook trout, brown trout, lake trout, walleye, sauger, and muskellunge. These species can be found in any lake or freshwater area within Virginia.

3.7 SPECIAL STATUS SPECIES

BLM special status species are defined in section 6840.01 of the December 2008 revision of the *BLM Special Status Species Management Manual* as: (1) species listed or proposed for listing under the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884), as amended, and (2) species requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA, which are designated as BLM sensitive. All federal candidate species, proposed species, and delisted species for the five years following delisting are designated as BLM sensitive and included as special status species.

The following state-by-state sections provide tables with special status species known or with potential to occur in areas of expected development or on surface tracts. These species have known or suspected ranges in the areas of expected mineral development or surface tracts but do not necessarily have occurrence records on or near FMO or surface tracts. The ecoregion where the species occurs is noted to assist in identifying the amount of FMO in the areas of potential affect. The tables also provide the acreages of FMO in designated or proposed critical habitat in the areas of expected development or on surface tracts.

The federal status codes are:

- E = endangered. A species in danger of extinction throughout all or a significant portion of its range.
- T = threatened. A species likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
- C = candidate. A species under consideration for official listing for which there is sufficient information to support listing.
- P = proposed. Species proposed for official listing.
- D = delisted. Species that has been removed from the list due to recovery, original data in error, or extinction.
- XN = experimental population, non-essential.

3.7.1 Arkansas Special Status Species

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)							Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside the Areas of Expected Development
		Arkansas Valley (182,972 acres)	Boston Mountains (22,604 acres)	Mississippi Alluvial Plains (27,555 acres)	Mississippi Valley Loess Plains (0 acres)	Mountains (30,272 acres of	Ozark Highlands (1,110 acres)	South Central Plains (0 acres)			
Mammals											
Gray bat *Myotis grisescens*	E	X	X				X		Foraging habitat in forested riparian areas. Roosting habitat in caves year-round; however, migration occurs between caves used in the winter as hibernacula and caves used in the summer as maternal roosts. Cave roosts are often close to water bodies.	Most occurrence records are north of the areas of expected development. One confirmed record on FMO at Lake Dardanelle in the expected development area in Pope County. Two others within a mile of FMO in northern Stone County. Potential for roosting in any caves and foraging occurrences within 135 kilometers (84 miles) of cave roosts in the following counties: Conway, Cleburne, Johnson, Pope, Stone, and Van Buren.	No known hibernacula or maternal cave sites; however. There is a potential for foraging habitat on tracts near roost cave sites (none are currently known near surface tracts).
Indiana bat *Myotis sodalis*	E		X				X		Foraging habitat in hardwood forests, and forested wetlands	Most occurrence records are in the northern portion of the state. The only occurrence records in the	Potential to occur in suitable habitat on surface tracts, but no occurrence records

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)							Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside the Areas of Expected Development
		Arkansas Valley (182,972 acres)	Boston Mountains (22,604 acres)	Mississippi Alluvial Plains (27,555 acres)	Mississippi Valley Loess Plains (0 acres)	Mountains (30,272 acres of	Ozark Highlands (1,110 acres)	South Central Plains (0 acres)			
									and adjacent ponds and riparian areas. Hibernacula—caves, particularly limestone caves with pools. Summer roosts for reproductive females are primarily located under loose bark of dead trees. Maternal roosts occur in riparian zones, bottomland and floodplain habitats, wooded wetlands, and upland communities.	area of expected development are in northern Stone County. There are 400 acres of split-estate FMO tracts scattered to the south in a 10-mile radius of these occurrence records, but there is no FMO in the northern part of that county.	are closer than six miles (northern Searcy County).
Northern long-eared bat *Myotis septentrionali*	P	X	X				X		Generally associated with old-growth intact, interior forests. A variety of caves, overhangs,	Potential to occur on suitable habitat throughout the area of expected development.	Virtually all of the surface tracts provide potential foraging habitat and may provide suitable summer and

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)							Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside the Areas of Expected Development
		Arkansas Valley (182,972 acres)	Boston Mountains (22,604 acres)	Mississippi Alluvial Plains (27,555 acres)	Mississippi Valley Loess Plains (0 acres)	Mountains (30,272 acres of	Ozark Highlands (1,110 acres)	South Central Plains (0 acres)			
									tunnels, and mines have been used as hibernacula and roosts		maternal roosting habitat.
Ozark big-eared bat *Corynorhinus townsendii ingens*	E		X				X		Foraging habitat in riparian hardwood forests and woodlands. Hibernacula and maternal roosts in caves, particularly in limestone karst areas. Records in the northwest and north central part of the state.	Occurrence records are all north of the area of expected development.	Henderson Mountain tract has closest record— 9.6 miles to east. Roosting potential on other surface tracts with caves/rock outcrops. Foraging potential on tracts near roost caves in Marion, Fulton, Searcy, Baxter, Sharp, and Washington counties.
Birds											
Bald eagle *Haliaeetus leucocephalus*	D		X	X	X	X	X	X	Varied; typically associated with large water bodies; nests in tall trees with	Likely to occur in suitable habitat throughout area of expected development, particularly at reservoirs, lakes, and major rivers. Multiple records at Lake	Not likely to occur because of the lack of large water bodies on or near surface tracts.

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)							Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside the Areas of Expected Development
		Arkansas Valley (182,972 acres)	Boston Mountains (22,604 acres)	Mississippi Alluvial Plains (27,555 acres)	Mississippi Valley Loess Plains (0 acres)	Mountains (30,272 acres of	Ozark Highlands (1,110 acres)	South Central Plains (0 acres)			
									clear flight paths.	Dardanelle, Blue Mountain Lake, Greers Ferry Lake, and Poison Springs State Park/Forest.	
Interior least tern *Sterna antillarum athalassos*	E	X		X		X		X	Breeds on sandbars along major rivers. In Arkansas, breeds along Arkansas River in Conway, Desha, Johnson, Perry, and Sebastian counties.	Occurrence records on FMO associated with Lake Dardanelle, Ozark Lake, Murray Lake, and split-estate along the Arkansas River. Closest FMO along the Mississippi River is in western St. Francis County.One tract of split-estate on McKinney Bayou in Miller county, 1 mile upstream from occurrences on Red River.	No suitable habitat on or near surface tracts.
Ivory-billed woodpecker *Campephilus principalis*	E			X					Historically described as large blocks of contiguous forest with numerous large trees. Potential to occur in Arkansas, Desha, Monroe,	Not likely to occur, but there is FMO in the area of expected development in Monroe, Phillips, and Prairie counties.	No surface tracts in current suspected range.

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)							Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside the Areas of Expected Development
		Arkansas Valley (182,972 acres)	Boston Mountains (22,604 acres)	Mississippi Alluvial Plains (27,555 acres)	Mississippi Valley Loess Plains (0 acres)	Mountains (30,272 acres of	Ozark Highlands (1,110 acres)	South Central Plains (0 acres)			
									Phillips, Prairie, and Woodruff counties.		
Piping plover *Charadrius melodus*	T			X		X	X	X	Migrant utilizing sandy upper beaches and shores of lakes, ponds, rivers, and impoundments.	Not likely to occur, but there is potential to occur on FMO along major rivers.	No suitable habitat on or near surface tracts.
Red-cockaded woodpecker *Picoides borealis*	E			X		X		X	Mature pine forests—specifically those with longleaf pines averaging 80 to 120 years old and loblolly pines averaging 70 to 100 years old.	Closest occurrence records (in Ouachita National Forest) are more than 6 miles from FMO in the area of expected development at Nimrod Lake in Yell County. Occurrence records in Monroe County are almost 15 miles southeast of scattered FMO. Scattered records in southern counties more than 6 miles from split-estate FMO.	No suitable habitat on the surface tracts.
Wood stork *Mycteria*	T	X		X				X	Forages in flooded areas,	Not likely to occur, vagrant occurrences only.	No suitable habitat on the surface tracts.

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)							Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside the Areas of Expected Development
		Arkansas Valley (182,972 acres)	Boston Mountains (22,604 acres)	Mississippi Alluvial Plains (27,555 acres)	Mississippi Valley Loess Plains (0 acres)	Mountains (30,272 acres of	Ozark Highlands (1,110 acres)	South Central Plains (0 acres)			
americana									freshwater wetlands, marshes, and depressions. Nests in cypress, mangrove, or dead hardwoods over water.		
Amphibians											
Ozark hellbender *Cryptobranchus alleganiensis bishop*	E	X	X						Spring-fed creeks and rivers with a coarse, rocky substrate and large shelter rocks. Extant in Baxter, Clay, Fulton, Independence, Lawrence, Randolph, and Sharp counties.	Range is outside the area of expected development. Baxter County occurrence records are the closest to the area of expected development. Closest FMO is more than 14 miles south in central Stone County.	Not likely to occur on surface tracts because none in the known range have spring-fed streams.
Fish											
Arkansas darter *Etheostoma*	C						X		Shallow, clear, cool water streams with sand	Occurrence record on FMO associated with the Savoy Research and	No surface tracts within species range.

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)							Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside the Areas of Expected Development
		Arkansas Valley (182,972 acres)	Boston Mountains (22,604 acres)	Mississippi Alluvial Plains (27,555 acres)	Mississippi Valley Loess Plains (0 acres)	Mountains (30,272 acres of	Ozark Highlands (1,110 acres)	South Central Plains (0 acres)			
cragini									or silt bottoms with spring-fed pools and rooted aquatic vegetation. Records only in Benton and Washington counties.	Extension Complex in Washington County Range, outside the area of expected development.	
Arkansas river shiner *Notropis girardi*	T	X							Typically, turbid waters in broad, shallow, unshaded channels of creeks and small to large rivers, assumed extirpated from the Arkansas River.	Two historical records (1939 and 1955) on FMO in current Lake Dardanelle.	No surface tracts in historical range.
Leopard darter *Percina pantherina*	T					X			Swift shoal areas in moderate to large streams in Howard, Polk, and Sevier counties. Critical habitat is	Occurrence records near scattered FMO in Sevier County on Cossatot River upstream from Gilham Lake, but all records are outside the area of	No surface tracts within species range.

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)							Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside the Areas of Expected Development
		Arkansas Valley (182,972 acres)	Boston Mountains (22,604 acres)	Mississippi Alluvial Plains (27,555 acres)	Mississippi Valley Loess Plains (0 acres)	Mountains (30,272 acres of	Ozark Highlands (1,110 acres)	South Central Plains (0 acres)			
									outside the area of expected development.	expected development.	
Ozark cavefish *Amblyopsis rosae*	T						X		Restricted to caves and subterranean streams, pools, and springs in Benton and Madison counties in the extreme northwestern corner of state.	Occurrence records near scattered FMO associated with Spavinaw Creek and Beaver Lake, but range is outside the area of expected development.	No surface tracts within species range.
Pallid sturgeon *Scaphirhynchus albus*	E			X					Large, turbid, free-flowing rivers, including Missouri River and Mississippi River south of its junction with the Missouri. In Arkansas. Occurrences in Phillips and St. Francis counties.	Closest FMO in the area of expected development is associated with the Pine Tree Research Station in western St. Francis County.	No surface tracts within species range.

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)							Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside the Areas of Expected Development
		Arkansas Valley (182,972 acres)	Boston Mountains (22,604 acres)	Mississippi Alluvial Plains (27,555 acres)	Mississippi Valley Loess Plains (0 acres)	Mountains (30,272 acres of	Ozark Highlands (1,110 acres)	South Central Plains (0 acres)			
Yellowcheek darter *Etheostoma moorei*	E		X						Small to medium-sized, high gradient rivers depths of 10 to 20 inches. Extant in upper Little Red River drainage north of Greer's Ferry Lake in Cleburne, Searcy, Stone and Van Buren counties. Critical habitat was designated in 2012 in Cleburne, Searcy, Stone, and Van Buren counties for 102 river miles.	Likely to occur on scattered split-estate FMO bordering tributaries north of Greer's Ferry Lake.	The only tract with potential habitat is Rattlesnake Hollow tract located on Archey Creek, above designated critical habitat in South Fork of Little Red River.
Mussels											
Arkansas fatmucket *Lampsilis powellii*	T					X		X	Deep pools and backwater areas in small to medium-sized rivers with sandy bottoms. Currently	Range is outside the areas of expected development.	No surface tracts within species range.

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)							Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside the Areas of Expected Development
		Arkansas Valley (182,972 acres)	Boston Mountains (22,604 acres)	Mississippi Alluvial Plains (27,555 acres)	Mississippi Valley Loess Plains (0 acres)	Mountains (30,272 acres of	Ozark Highlands (1,110 acres)	South Central Plains (0 acres)			
									known from the headwaters of the Saline, Ouachita, and Caddo rivers in Clark, Grant, Hot Springs, Montgomery, Pike, Polk, and Saline counties.		
Curtis pearlymussel *Epioblasma florentina curtisi*	E						X		Stream segments between headwaters and lowland streams, typically 4 to 30 inches deep. In Arkansas known from the Spring River system (Fulton, Lawrence, and Randolph counties) but may be extirpated from the state.	Range is north and upstream of the area of expected development.	Surface tracts in Fulton County (Bennett Bayou and Foster Branch) and Sharp County (Martins Creek) are in the range of the species but have no perennial streams.
Fat pocketbook	E			X					Tolerates river-like reservoirs and	Occurrences in the St. Francis River in the area of	No surface tracts within species range.

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)							Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside the Areas of Expected Development
		Arkansas Valley (182,972 acres)	Boston Mountains (22,604 acres)	Mississippi Alluvial Plains (27,555 acres)	Mississippi Valley Loess Plains (0 acres)	Mountains (30,272 acres of	Ozark Highlands (1,110 acres)	South Central Plains (0 acres)			
Potamilus capax									lakes, occurs in St. Francis River basin with records in Craighead, Crittenden, Cross, Lee, Mississippi, Poinsett, and St. Francis counties. Possibly extirpated in Prairie County.	expected development. FMO in the L'Anguilla River drainage primarily associated with the Pine Tree Research Station in the western part of county. Single occurrence within 3 miles of split-estate FMO on White River tributary north of Cache River Refuge.	
Louisiana pearlshell *Margaritifera hembeli*	T							X	Small creeks in the Bayou Boeuf headwater system. Only confirmed record in Arkansas from Columbia County; indications are that the species is extirpated in Arkansas.	Range outside the area of expected development.	No surface tracts within species range.
Neosho mucket *Lampsilis*	E	X					X		Shallow riffles and runs in streams and small rivers. Occurs in the	Range outside the area of expected development.	No surface tracts within species range. Henderson Mountain tract is in extreme

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		Arkansas Valley (182,972 acres)	Boston Mountains (22,604 acres)	Mississippi Alluvial Plains (27,555 acres)	Mississippi Valley Loess Plains (0 acres)	Mountains (30,272 acres of	Ozark Highlands (1,110 acres)	South Central Plains (0 acres)			
rafinesqueana									Illinois River in Washington and Benton counties.		southern Washington County, with no hydrologic connection to known occurrence records.
Ouachita rock pocketbook *Arkansia wheeleri*	E							X	Backwater areas of rivers with sluggish currents. Occurs in Ouachita, Kiamichi and Little rivers in Calhoun, Clark, Hempstead, Hot Spring, Little River, Ouachita and Sevier counties	Range is north of most FMO in the area of expected development. No direct hydrological connections.	No surface tracts within species range.
Pink mucket *Lampsilis abrupta*	E						X	X	Large, fast-flowing rivers; can tolerate river-like impoundments but not standing water. In Arkansas, known to occur in	In the areas of expected development, occurrences are located along the White River where FMO is associated with Wittensaw State WMA in Prairie County, and the Ouachita River in Ouachita County.	No surface tracts within species range.

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		Arkansas Valley (182,972 acres)	Boston Mountains (22,604 acres)	Mississippi Alluvial Plains (27,555 acres)	Mississippi Valley Loess Plains (0 acres)	Mountains (30,272 acres of	Ozark Highlands (1,110 acres)	South Central Plains (0 acres)			
									portions of the Black, Ouachita, White, and Spring rivers.		
Rabbitsfoot *Quadrula cylindrical ssp. cylindrical*	T	X	X	X	X	X	X	X	Small- to medium-sized streams and larger rivers, usually in shallow areas where velocity is reduced. Occurs in numerous river systems across state.	There are occurrence records in the vicinity of FMO on Little Red River in Van Buren County, scattered split-estate tracts in the headwaters of the White River in eastern Stone and central Prairie counties and within the Wittensaw State WMA, and the Ouachita River in Ouachita County.	The Searcy County Buffalo River tract is the closest to occurrence records at eight miles above the location of 1995 occurrence records. The Buffalo River tract is an upland tract with no perennial streams.
Scaleshell *Leptodea leptodon*	E			X		X	X	X	Range of gradients in medium to large rivers. In Arkansas, occurs in disjunct populations across the state.	In the area of expected development, the only occurrence records are in Jackson County (40 acres 10 miles away with no hydrologic connection) and the St. Francis River with no associated FMO. There is potential for the species to occur in suitable	Surface tracts in Baxter, Fulton, and Marion counties have no perennial streams

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		Arkansas Valley (182,972 acres)	Boston Mountains (22,604 acres)	Mississippi Alluvial Plains (27,555 acres)	Mississippi Valley Loess Plains (0 acres)	Mountains (30,272 acres of	Ozark Highlands (1,110 acres)	South Central Plains (0 acres)			
										habitat in Jackson, White, St. Francis, Monroe, Franklin, and Crawford counties.	
Speckled pocketbook *Lampsilis streckeri*	E		X						Clear, constantly flowing sections of river with depths approximately 0.5 meters. Remnant population occurs in a few reaches of the upper Little Red River basin in Van Buren and Stone counties.	Likely to occur on FMO associated with tributaries on the north side of Greers Ferry Lake and Big Creek in Cleburne and White counties.	Rattlesnaked Hollow tract is on Archey Creek which has documented occurrences of Speckled pocketbook. West Fork, Dry Creek, and Lost Creek tracts are within the species' range, but all are upland tracts with no perennial streams.
Spectaclecase *Cumberlandia monodonta*	E		X			X		X	Flowing water systems only; in Arkansas, currently found in 3 locations in the Ouachita and Mulberry rivers.	Scattered split-estate and FMO associated with Poison Springs State Park/Forest upstream of Ouachita River in Ouachita County.	No surface tracts within species range.
Turgid	E						X		Clean, moving	Historical range outside	No surface tracts in

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		Arkansas Valley (182,972 acres)	Boston Mountains (22,604 acres)	Mississippi Alluvial Plains (27,555 acres)	Mississippi Valley Loess Plains (0 acres)	Mountains (30,272 acres of	Ozark Highlands (1,110 acres)	South Central Plains (0 acres)			
blossom *Epioblasma turgidula*									water with low silt levels and stable substrate. Historically known from Spring River. Presumed extinct.	the area of expected development, presumed extinct.	the Spring River drainage.
Winged mapleleaf *Quadrula fragosa*	E					X		X	Remnant population found in riffles with clean gravel, sand, or rubble. Occurs in the Ouachita River in Arkansas upstream of Camden. In multiple counties in the southern half of state.	Scattered split-estate and FMO associated with Poison Springs State Park upstream of Ouachita River in Ouachita County.	No surface tracts in range of species.
Crayfish											
Crayfish *Cambarus aculabrum*	E						X		A cave obligate known from 4 caves in Benton County.	Range outside the area of expected development. There are scattered split-estate FMO in Benton County, all over 2.5 miles from the occurrence record	No surface tracts in range of species.

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		Arkansas Valley (182,972 acres)	Boston Mountains (22,604 acres)	Mississippi Alluvial Plains (27,555 acres)	Mississippi Valley Loess Plains (0 acres)	Mountains (30,272 acres of	Ozark Highlands (1,110 acres)	South Central Plains (0 acres)			
										and in different drainages.	
Hell Creek crayfish *Cambarus zophonastes*	E						X		A cave obligate known from 2 locations in Stone County.	Stone County is in the area of expected development. Nearest FMO (80-acre tract) is 2.3 miles west of occurrence record.	No surface tracts in range of species.
Snails											
Magazine Mountain shagreen *Inflectarius magazinensis*	D	X							Small area of talus slope on the north side of Magazine Mountain. Within area of expected development, but entire range is within the Mount Magazine District of the Ozark National Forest, which is outside the *decision area* of this document.	Range outside the area of expected development and no FMO in known range. Delisted June 14, 2013.	No surface tracts within species range.

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		Arkansas Valley (182,972 acres)	Boston Mountains (22,604 acres)	Mississippi Alluvial Plains (27,555 acres)	Mississippi Valley Loess Plains (0 acres)	Mountains (30,272 acres of	Ozark Highlands (1,110 acres)	South Central Plains (0 acres)			
Insects											
American burying beetle *Nicrophorus americanus*	E	X				X	X	X	Various; recorded in grassland, old fields, and hardwood forests. Occurs in Franklin, Little River, Logan, Polk, Scott, Sebastian, and Yell counties, with potential to occur in adjacent counties.	Confirmed on FMO at Fort Chaffee; likely to occur on FMO throughout its range.	No surface tracts in range of species.
Plants											
Harperella *Ptilimnium nodosum*	E	X				X			Occurs in saturated rocky covered margins of streams and pools in Ouachita Mountains. In Arkansas, Known or suspected to occur in Garland, Montgomery, Perry, Polk, Scott,	Potential to occur in suitable habitat in area of expected development in Scott and Yell counties.	No surface tracts in range of species.

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)							Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside the Areas of Expected Development
		Arkansas Valley (182,972 acres)	Boston Mountains (22,604 acres)	Mississippi Alluvial Plains (27,555 acres)	Mississippi Valley Loess Plains (0 acres)	Mountains (30,272 acres of	Ozark Highlands (1,110 acres)	South Central Plains (0 acres)			
									and Yell counties.		
Missouri bladderpod *Physaria filiformis*	T		X			X	X		Open glades, barrens, and outcrops primarily limestone but occasionally dolomite. In Arkansas, occurs in Garland, Izard, and Washington counties.	All occurrence records are outside the area of expected development.	Only occurrence record in Sharp County is more than 25 miles southwest of the Sharp County tract, which has no glade habitats. No other surface tracts in range.
Running buffalo clover *Trifolium stoloniferum*	E			X					Limestone areas with mesic woodland, river terraces, where there are periodic disturbances. Possibly extinct in Arkansas; records in Independence and Pulaski counties.	Range outside the area of expected development.	No surface tracts in range of species.
Earth star *Geocarpon minimum*	T	X	X					X	Salt prairies and salt slicks in Bradley,	Occurrence records are outside the areas of expected development,	No surface tracts in range of species.

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		Arkansas Valley (182,972 acres)	Boston Mountains (22,604 acres)	Mississippi Alluvial Plains (27,555 acres)	Mississippi Valley Loess Plains (0 acres)	Mountains (30,272 acres of	Ozark Highlands (1,110 acres)	South Central Plains (0 acres)			
									Cleveland, Drew, and Franklin counties.	except for a 1988 record in Franklin County outside the area of expected development but just over 5 miles northeast of FMO associated with Fort Chaffee.	

3.7.2 Florida Special Status Species

Species	Federal Status	Ecoregion (Acres of FMO in Areas of Expected Oil and Gas/Phosphate Development)				Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
Mammals								
Choctawhatchee beach mouse *Peromyscus polionotus allophrys*	E	X				Coastal primary and secondary dunes. Occurs at Topsail Hill, Shell Island, and Grayton Beach State Recreation Area in Bay, Okaloosa, and Walton counties.	The species range is outside the oil and gas and phosphate areas of expected development.	The only surface tract in the general area is the Lathrop Bayou tract in Bay County. That tract is a mesic flatwood at the east end of East Bay and does not contain suitable habitat for beach mice.
Florida bonneted bat *Eumops floridanus*	E		X		X	Forages over open freshwater and wetlands and roosts in trees and tree cavities, or manmade structures. Recent records in Dade, Collier, Lee, Charlotte, Polk, and Okeechobee counties.	Potential to occur in forested situations, particularly near wetlands or open water on FMO in oil and gas development in Collier and Lee counties, and phosphate area of development in Polk County. Closest records in area between phosphate and oil and gas areas of	The Gasparilla and Lake Marion tracts are in counties known to support bonneted bat. The Gasparilla tract is predominately coastal strand and does not provide suitable habitat. The Lake Marion tract does contain suitable roost trees in a mesic flatwood, is adjacent to wetlands

Species	Federal Status	Ecoregion (Acres of FMO in Areas of Expected Oil and Gas/Phosphate Development)				Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
							expected development, and in adjacent Dade County. No FMO associated with known occurrence records at Kicco WMA.	and Marion Lake, and is considered potential habitat.
Florida panther *Puma (=Felis) concolor coryi*	E		X		X	A variety of habitats but most typically heavily forested lowlands and swamps. Current range from Polk and Osceola counties southward.	Potetential to occur in suitable habitat in all of the oil and gas area of expected development. Closest occurrence record 3.4 miles from oil and gas FMO in Lee County. Potential to occur in suitable habitat in Hardee, Manatee, and Polk counties in the phosphate potential area and in all of the oil and gas area of expected development.	The Gasparilla and Lake Marion tracts are within the current range of the Florida panther. The Gasparilla tract is predominately coastal strand and does not provide suitable habitat. The Lake Marion tract does contain suitable habitat, but the proximity of residential developments limits the potential use of the tract.
Key deer *Odocoileus virginianus*	E				X	Prefers pinelands, then hardwood hammocks and mangroves. Uses grassy	Range is outside the areas of expected development.	Likely to occur on Sugarloaf and Park Key tracts, all of which provide

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		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
clavium						areas (subdivisions, roadsides) for feeding. May move to adjacent islands during wet weather, returning in dry periods to islands having fresh water. Occurs only in Monroe County; highest numbers on Big Pine and No Name Keys.		suitable habitat. Closest occurrence record is a 1981 record 0.3 miles from Sugarloaf Key tract.
Key Largo cotton mouse *Peromyscus gossypinus allapaticola*	E				X	Mature tropical hardwood hammock, trunks of dominant trees with diameter at breast height of 10 inches or more; more mice in more mature hammocks. Currently occurs only on Key Largo and has been introduced on Lignun Vitae Key in Monroe County.	Range is outside the areas of expected development.	No surface tracts in known range.
Key Largo woodrat	E				X	Mature hardwood hammocks. Currently occurs only in North Key	Range is outside the areas of expected	No surface tracts in known range.

Species	Federal Status	Ecoregion (Acres of FMO in Areas of Expected Oil and Gas/Phosphate Development)				Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
Neotoma floridana smalli						Largo and has been introduced on Lignun Vitae Key in Monroe County.	development.	
Lower Florida Keys rice rat *Oryzomys palustris natator*	E				X	Brackish and salt marshes. Occurs in lower Florida Keys.	Range is outside the areas of expected development.	The Sugarloaf Key and Park Key tracts are within the known range of this species, and habitats are suitable. The closest occurrence record is from 1986, three miles southwest of the Sugarloaf Key tracts in the saltmarsh mangrove ecotone.
Lower Keys marsh rabbit *Sylvilagus palustris hefneri*	E				X	Freshwater and tidal marshes and adjacent upland habitat (including roadsides), especially sedges and grasses; apparently requires fresh water. Occasionally occurs in lesser numbers in uplands areas such as grassy fields and tropical hammocks. With some	Range is outside the areas of expected development.	The Sugarloaf and Park Key tracts are within the known range of this species, and habitats are suitable. The closest occurrence record is from 1988 of a dense population 0.3 miles from Sugarloaf Key tract in sedge marsh with white

Species	Federal Status	Ecoregion (Acres of FMO in Areas of Expected Oil and Gas/Phosphate Development)				Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
						exceptions, individuals generally do not cross paved roads. Occurs in Lower Keys from Big Pine to Boca Chica. Recent records are from Big Pine, Hopkins, Sugarloaf, Welles, Saddlebunch, Geiger, and Boca Chica.		mangroves.
Southeastern beach mouse *Peromyscus polionotus niveiventris*	T		X			Coastal primary and secondary dunes and adjacent scrub habitats. Current range is from Volusia County (Smyrna Dunes Park), federal lands in Brevard County (Canaveral National Seashore, Merritt Island NWR, and Cape Canaveral Air Force Station), and in Indian River County (Sebastian Inlet State Recreation Area).	Range is outside the areas of expected development.	Palm Beach County is in the historical range of the species, but the Jupiter Inlet Lighthouse ONA is 0.5 miles inland with no suitable habitat.

Species	Federal Status	Ecoregion (Acres of FMO in Areas of Expected Oil and Gas/Phosphate Development)				Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
St. Andrew beach mouse *Peromyscus polionotus peninsularis*	E	X				Coastal primary and secondary dunes and adjacent scrub habitats. Occurs in coastal Bay and Gulf counties in limited locations on the St. Joseph Peninsula and a reintroduced population on East Crooked Island.	The species range is outside of the oil and gas and phosphate areas of expected development.	The only surface tract in the general area is the Lathrop Bayou tract in Bay County. That tract is a mesic flatwood at the east end of East Bay and does not contain suitable habitat for beach mice.
West Indian manatee *Trichechus manatus*	E	X	X	X	X	Coastal and inland waterways in southeastern United States.	Occupied critical habitat occurs in the vicinity of the western fringe of the oil and gas area of expected development, including Cayo Costa State Park, and along the Caloosahatchee River in western Lee County. All of the FMO in the phosphate area of expected development is outside the manatee range.	The portions of the Loxahatchee River and Indian River Lagoon adjacent to the Jupiter Inlet Lighthouse ONA are designated critical habitat. The Gasparilla, Sugarloaf Key, and Park Key tracts are also adjacent to designated critical habitat.

Species	Federal Status	Ecoregion (Acres of FMO in Areas of Expected Oil and Gas/Phosphate Development)				Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
Birds								
Audubon's crested caracara, Florida population *Polyborus plancus audubonii*	T		X		X	Forages in dry or wet prairie areas with scattered cabbage palms and in lightly wooded areas. Also forages in improved or semi-improved pasture. Nests most often in the tops of cabbage palms but will use other trees/large palmetto. Occurs in south central Florida, with greatest numbers in a 5-county area north and west of Lake Okeechobee, including Glades, Desoto, Highlands, Okeechobee, and Osceola counties.	Likely to occur in suitable habitat in both the oil and gas area of expected development and the phosphate area of expected development. Closest occurrence record to the oil and gas FMO is a 1989 record four miles away. Closest occurrence record to phosphate FMO is a 1993 record 8.5 miles away in extreme northern Hardee County.	The Lake Marion tract is in the range of caracara. The scrubby flatwoods provide marginal habitat. The 120-acre Jupiter Inlet Lighthouse ONA is an urban situation and habitat is not considered suitable.
Bachman's warbler *Vermivora bachmanii*	E	X	X	X	X	Primarily a migrant using open woodland, pine, and scrub. No known extant records.	Presumed extirpated from atate.	Presumed extirpated from atate.

Species	Federal Status	Ecoregion (Acres of FMO in Areas of Expected Oil and Gas/Phosphate Development)				Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
Bald eagle *Haliaeetus leucocephalus*	D	X	X	X	X	Varied; typically associated with large water bodies; nests in tall trees with clear flight paths.	Likely to occur in suitable habitat in both the oil and gas area of expected development and the phosphate area of expected development. Two occurrences within 660 feet of oil and gas FMO at Cayo Costa State Park and the Rookery Bay Aquatic Preserve. Three occurrences within 1 mile of phosphate FMO, none within 660 feet of phosphate FMO.	There is potential for bald eagles to forage and nest at all surface tracts on the coast or near large bodies of water. There is an inactive nest at Lathrop Bayou and records near the Lake Marion tract in Polk County and the Citrus tracts in Citrus County.
Cape Sable seaside sparrow *Ammodramus maritimus mirabilis*	E				X	Extreme southern and southwestern Florida. Scattered populations formerly occurred from Ochopee south to Taylor Slough, in Dade, Collier, and Monroe counties. Two remaining disjunct populations occur in	Historical range in Collier County is in oil and gas area of expected development. Range is outside the phosphate area of expected development.	The surface tracts in the Lower Keys outside the current range.

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		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
						marshes of Big Cypress Swamp and Taylor Slough.		
Everglade snail kite, FL pop. *Rostrhamus sociabilis plumbeus*	E		X		X	Large, open freshwater marshes and shallow lakes. Feeds exclusively on Pomacea snails. Now restricted to St. Johns River headwaters; southwestern Lake Okeechobee; small areas in Broward, Dade, and Palm Beach counties; parts of Everglades National Park, Loxahatchee NWR, and Big Cypress National Preserve.	Potential to occur in Collier and Lee counties in the oil and gas area of expected development. The closest record to oil and gas FMO is a 2005 record from Hickey's Creek Mitigation Park 6.8 miles away. Potential to occur on FMO in the phosphate area of expected development in Polk County.	Only the Lake Marion tract in Polk County has freshwater wetlands in the vicinity, although habitat on the tract is marginal, primarily scrub, scrubby flatwoods, and fringe of bay swamp.
Florida grasshopper sparrow *Ammodramus savannarum*	E		X		X	Dry prairie with stunted saw palmetto and dwarf oaks, bluestems, and wiregrass; unimproved cattle pastures. Habitat is maintained by periodic fires. Cannot	Not expected to occur in the oil and gas area of expected development. Potential to occur on FMO in the phosphate area of	There is marginal habitat at the Lake Marion tract.

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floridanus						survive in pastureland if it is stripped of shrubby patches. Restricted to Kissimmee Prairie region northwest of Lake Okeechobee.	expected development in De Soto and Polk counties. Closest occurrence record is 22 miles east of FMO.	
Florida scrub-jay *Aphelocoma coerulescens*	T		X			Only in the scrub and scrubby flatwoods habitats of Florida. This type of habitat grows only on nearly pure, excessively well-drained sandy soils, and occurs along present coastlines in Florida, on paleodunes of the high central ridges and other ancient shorelines of the Florida Peninsula, and inland on scattered alluvial deposits bordering several major rivers.	Potential to occur on suitable habitat in both the oil and gas, and phosphate areas of expected development.	Has bred at the Jupiter Inlet Lighthouse ONA; however no birds since 2003 despite ongoing active scrub management. Potential to occur at the Lake Marion tract, but habitat is in poor condition.

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		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
Ivory-billed woodpecker *Campephilus principalis*	E					Resident of large, contiguous forests with numerous large trees. A significant portion of the forest must also be in some stage of decay, providing a continuous supply of food. Bald cypress has been noted as an important component of forests used historically in Florida.	Expected current range is outside the areas of expected development.	Lathrop Bayou is the closest surface tract to recent sightings in the Apalachicola River basin, and potential habitat in the Choctawhatchee River and Chipola River basins. However, Lathrop Bayou is a mesic flatwood and does not provide the suitable habitat. None of the other surface tracts are situated in habitat in sufficiently large blocks to be considered potential habitat.
Kirkland's warbler *Dendroica kirklandii*	E					Nests only in young jack pine stands in Michigan's Lower and Upper Peninsula, Wisconsin and Canada. Occurs in Florida as a migrant passing through to wintering grounds in the Bahamas.	Potential to occur in Collier County in the oil and as area of expected development. Not expected to occur in the phosphate area of expected development.	Some potential to use tracts during migration; no records to date.

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		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
Piping plover except Great Lakes watershed *Charadrius melodus*	T	X	X		X	Wintering habitat occurs along Gulf and Atlantic coastal beaches.	Phosphate FMO is 31 miles inland and outside the range of this coastal species. Portions of the oil and gas FMO at Cayo Costa State Preserve and surrounding area are within designated critical habitat.	Likely to occur as winter migrant at the Egmont Key tract, which is designated critical habitat. Potential for occassional use of the Gasparilla tract.
Red-cockaded woodpecker *Picoides borealis*	E	X	X	X	X	Mature pine forests—specifically those with longleaf pines averaging 80 to 120 years old and loblolly pines averaging 70 to 100 years old. In Florida, range includes the Panhandle and Peninsula counties from Osceola and Polk counties south to Collier County.	Potential to occur in Polk County in the phosphate area of expected development and in all counties in the oil and gas area of expected development. The closest cluster is 17 miles west/ southwest of FMO in Avon Park Air Force Range in Polk County. In Collier County; a 1983 record of multiple clusters in the Big Cypress National Preserve is on FMO.	At Lathrop Bayou, two breeding clusters on public domain and two additional clusters on adjacent private land. None of the other surface tracts provide suitable habitat.

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		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
Red knot *Calidris canutus*	P	X	X	X	X	Migrant through Florida found on tidal flats in the lagoon and in the swash zone of sandy beaches exposed to the coastal waters. Occurs in multiple locations along the Atlantic and Gulf coastal beaches.	Potential to occur as migrant on the western fringes of the oil and gas FMO in Collier and Lee counties.	Expected to occur at Egmont Key in Hillsborough County, and some potential to occur on the Gasparilla tract in Lee County.
Roseate tern Western Hemisphere except NE U.S. *Sterna dougallii dougallii*	T		X		X	Nests on islands on sandy beaches, open bare ground, and grassy areas; on Atlantic coast. Known to nest even on gravel roofs in the Florida Keys.	Potential to occur on the southwestern fringes of the oil and gas area of expected development in the area of Rookery Bay Aquatic Preserve.	Sugarloaf Key and Park Key tracts shorelines provide suitable habitat. Closest occurrence record 5 miles northwest in the Great White Heron NWR.
Whooping crane *Grus americana*	XN		X			Marshes, shallow lakes, lagoons, salt flats, grain and stubble fields, and barrier islands. An experimental non-migratory flock has been established at the Chassahowitzka and St. Mark's NWRs.	Both experimental populations are outside the areas of expected development. The closest FMO in the phosphate area of expected development is 71 miles from the Chassahowitzka NWR.	Closest surface tract, the Citrus tract, is 20 miles east of the Chassahowitzka NWR.

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		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
Wood stork *Mycteria americana*	T	X	X	X	X	Associated with freshwater and estuarine wetlands, primarily nesting in cypress or mangrove swamps. Feed in freshwater marshes, narrow tidal creeks, or flooded tidal pools. Occurs in suitable habitat across Florida.	Potential to occur in all suitable habitats in both the oil and gas and phosphate areas of expected development.	Potential foraging habitat on Citrus County and Lake Marion tracts.
Reptiles								
American alligator *Alligator mississippiensis*	SA	X	X	X	X	Fresh and brackish marshes, ponds, lakes, rivers, swamps, bayous, canals, and large spring runs. Occurs throughout the state.	Potential to occur in all suitable habitats in both the oil and gas and phosphate areas of expected development.	Potential to occur on all surface tracts adjacent to fresh or brackish waters.
American crocodile, FL pop. *Crocodylus acutus*	T		X		X	Coastal mangrove swamps, brackish and salt water bays, lagoons, marshes, tidal rivers, and brackish creeks; also abandoned coastal canals and borrow pits.	Potential to occur in Lee and Collier counties in the oil and gas area of expected development.	Potential to occur in the Florida Keys tracts.

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						Occurs in coastal counties in southern Florida. Today most nesting occurs on the mainland shore of Florida Bay between Cape Sable and Key Largo, but the nesting range also includes Biscayne Bay and the upper Florida Keys, with unsuccessful nesting north to Marco Island.		
Atlantic salt marsh snake *Nerodia clarkii taeniata*	T		X			Coastal salt marshes and mangrove swamps. Specifically, it occurs along shallow tidal creeks and pools, in a saline environment ranging from brackish to full strength. Historically reported from coastal areas of Volusia, Brevard, and Indian River counties, it now appears to be restricted to a limited coastal strip in Volusia	Range is outside the areas of expected development.	Surface tracts are outside the known range of this species.

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		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
						County.		
Bluetail mole skink *Eumeces egregius lividus*	T		X			Restricted to sand pine-rosemary scrub or, less frequently, longleaf pine-turkey oak association (sandhill); open, loose St. Lucie fine sands. Occurs in the southern portion of the Lake Wales Ridge in Highlands, Osceola, and Polk counties.	Phosphate FMO is southwest of the Florida Central Ridge and outside the expected range of this species. The closest occurrence record is eight miles east of phosphate FMO, although 1990 is the most current record.	Potential to occur in the scrubby flatwoods at the Lake Marion tract in Polk County, although, closest occurrence record is 7.9 miles southwest of the tract from 1969.
Eastern indigo snake *Drymarchon corais couperi*	T	X	X	X	X	Sandhill regions dominated by mature longleaf pines, turkey oaks, and wiregrass; flatwoods; most types of hammocks; coastal scrub; dry glades; palmetto flats; prairie; brushy riparian and canal corridors; and wet fields. Occupied sites are often near wetlands and frequently in association with gopher tortoise burrows. Ranges	Potential to occur in both the phosphate and oil and gas areas of expected development, particularly those areas supporting gopher tortoises. Closest record is 2005 record 7.6 miles away in Hickey's Creek Mitigation Park and a 1997 occurrence on oil and gas FMO at Cayo Costa State Preserve.	Potential to occur at the Jupiter Inlet Lighthouse ONA, although there are no documented occurrences. Potential to occur on the Lake Marion tract in Polk County. Suitable habitat not available on other surface tracts.

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		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
						throughout Florida.		
Gopher tortoise *Gopherus polyphemus*	C	X	X	X	X	Sandy soils with herbaceous groundcover. In Florida, occurs throughout the state in suitable habitat.	Potential to occur throughout the phosphate and oil and gas area and phosphate areas of expected development.	Known to occur at the Jupiter Inlet Lighthouse ONA, Egmont Key,Gasparilla, and the Lake Marion tract. Expected to occur at Lathrop Bayou.
Green sea turtle, FL, Mexico nesting pops. *Chelonia mydas*	E	X	X	X	X	Open beaches with a sloping platform and minimal disturbance are required for nesting. Nests along Atlantic shore and most of the Gulf coast of Florida.	Some potential to nest on coastal fringes of oil and gas area of expected development in Lee and Collier counties.	Known to nest at Egmont Key NWR and assumed to nest on the public domain tract. Some potential to nest at the Gasparilla tract. No suitable habitat on other surface tracts.
Hawksbill sea turtle *Eretmochelys imbricata*	E	X	X	X	X	Nesting occurs on undisturbed, deep-sand, insular or mainland beaches, from high-energy ocean beaches to tiny pocket beaches several meters wide contained in crevices of cliff walls; a	Not likely to nest on the coastal fringes of oil and gas area of expected development in Lee and Collier counties.	Potential to nest at the Egmont Key tract. Not likely to nest on any other surface domain tract.

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		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
						typical site would be a low-energy sand beach with woody vegetation, such as sea grape or saltshrub, near the water line.		
Kemp's Ridley sea turtle *Lepidochelys kempii*	E		X		X	Nesting concentrated along Gulf coast of Tamaulipas, Mexico, and Texas.	Known nesting range is outside the areas of expected development.	Not likely to nest on surface tracts in Florida.
Leatherback sea turtle *Dermochelys coriacea*	E	X	X		X	Nests on sloping sandy beaches backed up by vegetation, often near deep water and rough seas. Nests primarily on the east coast from Brevard to Broward counties.	Range is outside the areas of expected development.	The Jupiter Inlet Lighthouse ONA tract is within the range; however, it is situated in the estuary and does not provide suitable nesting habitat.
Loggerhead sea turtle *Caretta caretta*	T	X	X	X	X	Nesting usually occurs on open sandy beaches above high-tide mark, seaward of well-developed dunes. Nesting occurs along the Atlantic coast and Gulf coast from Pinellas County	Confirmed nesting at Cayo Costa State Park and western fringes of the oil and gas FMO in Collier County.	Confirmed nesting at Egmont Key NWR and expected to occur on Egmont Key surface tract. Potential to nest at the Gasparilla tract in Lee County. No other surface

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		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
						south and on the Panhandle from Franklin County westward.		tracts have suitable nesting habitat.
Sand skink *Neoseps reynoldsi*	T		X			Loose sands of sand pine-rosemary scrub, less often longleaf pine-turkey oak (sandhill) or turkey oak "barrens" adjacent to scrub, especially high pine-scrub ecotones. Occurs only on Florida's central ridges, at elevations of 27 meter (89 feet) or more, in St. Lucie fine and Lakeland yellow sands.	Phosphate FMO is southwest of the Florida Central Ridge and outside the expected range of this species.	Confirmed occurrence at the Lake Marion tract in Polk County. No other surface tract has suitable habitat in the range of this species.
Amphibians								
Reticulated flatwoods salamander *Ambystoma bishopi*	E	X				Typically mesic longleaf pine-wiregrass flatwoods and savannas and breeds in ephemeral isolated wetlands. In Florida, restricted to coastal plain from Apalachicola River	Range is outside the areas of expected development.	Lathrop Bayou contains suitable habitat. Survey completed in 2005 by the Florida Fish and Wildlife Conservation Commission (FFWCC) did not find any evidence of larvae in

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		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
						westward through Escambia County.		surveys of ephemeral wetlands. No other surface tracts are within the range of this species.
Frosted flatwoods salamander *Ambystoma cingulatum*	T	X		X		Typically mesic longleaf pine-wiregrass flatwoods and savannas and breeds in ephemeral isolated wetlands. In Florida, restricted to the Panhandle from Franklin County eastward.	Range is outside the areas of expected development.	No surface tracts within known range.
Fish								
Gulf surgeon *Acipenser oxyrinchus desotoi*	T	X	X		X	Primarily marine/estuarine in winter; migrates to upper rivers in spring for spawning; returns to sea/estuary in fall; some may remain near spawning areas. In Florida, breeds in river systems in the Panhandle south to the Suwanee River, which	Range is outside the areas of expected development.	Lathrop Bayou is in a tidally influenced bay west of the Apalachicola River in the range of the species.

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		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
						supports the largest numbers.		
Okaloosa darter *Etheostoma okaloosae*	T	X				Restricted to 6 tributary systems of the lower Choctawhatchee Bay drainage, Okaloosa and Walton counties. Most of range is within Eglin Air Force Base.	Range is outside the areas of expected development.	No surface tracts located on rivers in known range.
Mussels								
Chipola slabshell *Elliptio chipolaensis*	T	X				Silty sand substrates of large creeks and the main channel of the Chipola River in slow to moderate current. Currently restricted to Chipola River system in Calhoun, Gulf, and Jackson counties.	Range is outside the areas of expected development.	No surface tracts located on rivers in known range.
Fat three-ridge *Amblema neislerii*	E	X				The main channel of small to large rivers in slow to moderate current. Documented in the Apalachicola and lowermost	Range is outside the areas of expected development.	No surface tracts located on rivers in known range.

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		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
						portions of the Chipola River in Florida.		
Gulf moccasinshell *Medionidus penicillatus*	E	X				The channels of small- to medium-sized creeks to large rivers with sand and gravel or silty sand substrates in slow to moderate currents. Occurs in Apalachicola-Chattahoochee-Flint River basins.	Range is outside the areas of expected development.	Lathrop Bayou is the only surface tract in the known range; but it has no surface freshwater.
Ochlockonee moccasinshell *Medionidus simpsonianus*	E	X				Large creeks and the Ochlockonee River. Currently restricted to stretch above Talquin Reservoir.	Range is outside the areas of expected development.	No surface tracts located on rivers in known range.
Oval pigtoe *Pleurobema pyriforme*	E	X	X	X		Small- to medium-sized creeks to small rivers where it inhabits silty sand to sand and gravel substrates, usually in slow to moderate current. Occurs in the Apalachicola-	Range is outside the areas of expected development.	Lathrop Bayou is the only surface tract in the known range, but it has no surface fresh water.

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						Chattahoochee-Flint river basin, and Econfina, Ochlockonee, and Suwannee river systems in central Panhandle area.		
Purple bankclimber *Elliptoideus sloatianus*	T	X				Small to large river channels in slow to moderate current over sand or sand mixed with mud or gravel substrates. Restricted to Apalachicola-Chattahoochee-Flint Basin main stems and the Ochlockonee River in the central Panhandle area.	Range is outside the areas of expected development.	Lathrop Bayou is the only surface tract in the known range, but it has no surface fresh water.
shinyrayed pocketbook *Lampsilis subangulata*	E	X				Small- to medium-sized creeks to rivers in clean or silty sand substrates in slow to moderate current. Is thought to persist at 45 sites in 7 different watersheds in the Panhandle.	Range is outside the areas of expected development.	Lathrop Bayou is the only surface tract in the known range, but it has no surface fresh water.

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Snails								
Stock Island tree snail *Orthalicus reses (not including nesodryas)*	T				X	Hardwood hammocks. Historically restricted to Stock Island and Key West. Current known distribution includes Key West and transplants to Key Largo and southern portions of the mainland.	Range is outside the areas of expected development.	The Sugarloaf Key and Park Island Key tracts are within the potential range of the species. Closest occurrence record is 3.8 miles east of the tracts from 1997.
Insects								
Bartram's hairstreak butterfly *Strymon acis bartrami*	E				X	Restricted to pine rocklands with host plant pineland croton. Occurs in Florida Keys and mainland Miami-Dade County.	Range is outside the areas of expected development.	The Sugarloaf Key and Park Island Key tracts are within the potential range of the species but lack the pine rockland habitat necessary for this species. Closest occurrence record is 12 miles west/ southwest of tract from 2001 and 2004.
Florida leafwing butterfly	E				X	Restricted to pine rocklands with host plant pineland croton. Occurs in Florida	Range is outside the areas of expected	The Sugarloaf Key and Park Island Key tracts are within the potential range

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Anaea troglodyta floridalis						Keys and mainland Miami-Dade County.	development.	of the species but lack the pine rockland habitat necessary for this species.
Highlands tiger beetle *Cicindela highlandensis*	C		X			Evergreen scrub oaks, as well as high pineland with deciduous turkey oak and longleaf pines. High-quality habitat is primarily scrub or sandhill with a high percentage of open sand (greater than 50 percent) and with many natural openings. Adults not found in areas of dense scrub (except along the edges of trails) nor in areas of low shrubs.	Phosphate FMO is southwest of the Florida Central Ridge and outside the expected range of this species.	Suitable habitat but no records at the Lake Marion tract.
Miami blue butterfly *Cyclargus (=Hemiargus) thomasi bethunebakeri)*	E				X	Openings and edges of hardwood hammocks, and other communities adjacent to the coast that are prone to frequent natural disturbances (e.g., coastal berm hammocks, dunes,	Range is outside the areas of expected development.	Potential to occur on the Sugarloaf Key or Park Key tracts, but these are outside the known occurrences at Marquesas and Boca Grande in the

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						scrub, and pine rocklands). Occurs only in Monroe and Miami-Dade counties in 2 very restricted metapopulations.		Key Deer NWR.
Schaus swallowtail butterfly *Heraclides aristodemus ponceanus*	E				X	Tropical hardwood hammocks (rockland hammocks); host plant is torchwood (*Amyris elemifera*), rarely wild lime (*Zanthoxylum fagara*). Occurs from southern Miami-Dade County through the Keys in Biscayne Bay and southern Key Largo in the Upper Keys, to Lower Matecumbe Key in the Middle Keys.	Range is outside the areas of expected development.	Sugarloaf Key and Park Key tracts are south of the known range.
Corals								
Elkhorn coral *Acropora palmata*	T				X	Limited to shallow-water hard-bottom communities, including reef rubble communities, reef crests,	Range is outside the areas of expected development.	Potential to occur in the vicinity of the Sugarloaf Key and Park Key tracts. BLM jurisdiction does not

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						reef flats, spur and groove reefs, and transitional reefs, typically between 1 and 5 meters (3 and 16 feet). Occurs in Miami-Dade and Monroe counties.		extend beyond mean high water.
Staghorn coral *Acropora cervicornis)*	T				X	Typically between 15 and 30 meters (49 and 98) on fore-reef communities on bank reefs and fringing reefs. Occurs in Miami-Dade and Monroe counties.	Range is outside the areas of expected development.	Potential to occur in the vicinity of the Sugarloaf Key and Park Key tracts. BLM jurisdiction does not extend beyond mean high water.
Lichens								
Florida perforate cladonia *Cladonia perforata*	E	X	X			Open Florida oak or sand pine scrub, often associated with Florida rosemary. Occurs on a barrier island in the Florida Panhandle (Okaloosa County) and the Lake Wales Ridge areas of central Florida and in coastal scrubs in Martin and northern Palm Beach	Phosphate FMO is southwest of the Florida Central Ridge and outside the majority of the range of this species. There is a recent record 2.1 miles southwest of phosphate FMO at the Little Manatee River South Fork tract.	Jupiter Inlet Lighthouse ONA supports several thousand individuals. Lake Marion tract has potential habitat, but habitat is marginal and perforate lichen has not been observed despite several surveys of the site.

Species	Federal Status	Ecoregion (Acres of FMO in Areas of Expected Oil and Gas/Phosphate Development)				Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
						counties.		
Plants								
Aboriginal prickly-apple *Harrisia aboriginum*	E		X		X	Typically shell mounds, coastal berms, coastal strand, maritime hammocks, and coastal grasslands in Charlotte, Lee, and Sarasota counties.	Range is outside the areas of expected development.	Potential to occur on the Gasparilla tract. Closest occurrence records are 1.5 mile south of the tract from 2006.
Avon Park harebells *Crotalaria avonensis*	E		X			Endemic to the xeric white sand scrub of the Lake Wales ridge of central Florida. Only 3 populations are known, and they are all in Polk and Highlands counties near Avon Park.	Phosphate FMO is southwest of the Florida Central Ridge and outside the expected range of this species.	Potential to occur on the Lake Marion tract but has not been documented.
Beach jacquemontia *Jacquemontia reclinata*	E		X			Lee side of coastal dunes, coastal strand, and edges of maritime hammock. Currently occurs in a few sites along the east coast of Florida from Martin County south to Dade County.	Range is outside the areas of expected development.	Jupiter Inlet Lighthouse ONA is within the range of the species but is 0.5 mile inland from the coast. Species has not been documented at the ONA despite extensive surveys

Species	Federal Status	Ecoregion (Acres of FMO in Areas of Expected Oil and Gas/Phosphate Development)				Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
								of the site.
Beautiful pawpaw *Deeringothamnus pulchellus*	E		X			Grassy pine flatwoods with saw palmetto and wiregrass on Immokalee sand and Punta fine sand soils. Occurs in Charlotte, Lee, and Orange counties.	Potential to occur on FMO in the oil and gas area of expected development in Lee County. Closest occurrence record is 16 miles northwest of FMO at the Charlotte Harbor Preserve State Park.	No surface tracts within known range.
Big Pine partridge pea *Chamaecrista lineata var. keyensis*	C				X	Primarily in pine rockland vegetation. Occurs only in Monroe County on Big Pine Key and Cudjoe Key.	Range is outside the areas of expected development.	No known occurrences on Sugarloaf Key and Park Key tracts.
Blodgett's silverbush *Argythamnia blodgettii*	C				X	Pine rockland, rockland hammock, coastal berm, and on roadsides, especially in sunny gaps or edges. Occurs from Miami-Dade County to Boca Chica Key.	Range is outside the areas of expected development.	No known occurrences on Sugarloaf Key and Park Key tracts.
Carter's mustard	E		X			Sandy clearings in sand	Phosphate FMO is	Small population recorded

Species	Federal Status	Ecoregion (Acres of FMO in Areas of Expected Oil and Gas/Phosphate Development)				Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
Warea carteri						scrub and sandhills; scattered overstory of sand; longleaf or slash pine and scrub oaks. Occurs in the Lake Wales Ridge in central Florida.	southwest of the Florida Central Ridge and outside the expected range of this species.	on the Lake Marion tract, 7 individuals in 1997.
Cooley's meadowrue *Thalictrum cooleyi)*	E	X				Grass-sedge bogs and wet pine savannahs and savannah-like areas. It may also grow along fire plow lines, in roadside ditches, woodland clearings, and powerline ROWs, and needs some type of disturbance such as fire or mowing to maintain its open habitat. In Florida, 1 population occurs in Walton County.	Range is outside the areas of expected development.	Known occurrence is 14 miles east of Freeport tract.
Everglades bully *Sideroxylon reclinatum ssp. austrofloridense*	C				X	Restricted to pinelands with tropical understory vegetation on limestone rock (pine rocklands). Occurs in Miami-Dade and	Range is outside the areas of expected development.	Sugarloaf Key and Park Key tracts are in potential range, but surveys of the Keys have not documented any

Species	Federal Status	Ecoregion (Acres of FMO in Areas of Expected Oil and Gas/Phosphate Development)				Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
						Monroe counties.		occurrences outside the mainland.
Florida bonamia *Bonamia grandiflora*	T		X			Sand pine-scrub vegetation with evergreen scrub oaks and sand pine. Occurs across central Florida from Marion County south to Highlands.	Phosphate FMO is southwest of the Florida Central Ridge and outside the expected range of this species.	Potential habitat at the Lake Marion tract but has not been recorded there despite surveys.
Florida golden aster *Chrysopsis floridana*	E		X			Sand pine scrub with exposed sunny openings or occurs on the ecotonal edges of scrub. Occurs in Hardee, Hillsborough, Manatee, and Pinellas counties.	Potential to occur in the phosphate area of expected development in Hardee, Hillsborough, and Manatee counties. Closest occurrences are a 2008 record within 1.7 miles of FMO in Manatee County, and a 2006 record 2 miles from FMO in Hardee County.	Species is not known to occur on Egmont Key. Other surface tracts are outside known range.
Florida pineland crabgrass *Digitaria pauciflora*	C				X	Most common along the ecotone between pine rockland and marl prairie but do overlap somewhat	Range is outside the areas of expected development.	No surface tracts within known range.

Species	Federal Status	Ecoregion (Acres of FMO in Areas of Expected Oil and Gas/Phosphate Development)				Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
						into both of these ecosystems. Restricted to Long Pine Key of Everglades National Park and at Big Cypress National Preserve; both are managed by the NPS.		
Florida prairie-clover *Dalea carthagenensis var. floridana*	C				X	Disturbed pine rockland, pine rockland/rockland hammock ecotone, pine rockland/rockland hammock ecotone along road edges, edge of roadside in marl prairie, and ecotone between rockland hammock and marl prairie and flatwoods. Occurs in Collier, Miami-Dade, and Monroe counties. Presumed extirpated from Palm Beach County.	Potential to occur on FMO in the oil and gas area of expected development in Collier County, but the only occurrence records are in Miami-Dade County.	No surface tracts within current range, and no suitable habitat on surface tracts in historical range.
Florida semaphore cactus	E				X	Close to salt water on bare rock with a minimum of humus-soil cover in	Range is outside the areas of expected	The Sugarloaf and Park Key tracts occur within the current range of the

Species	Federal Status	Ecoregion (Acres of FMO in Areas of Expected Oil and Gas/Phosphate Development)				Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
Consolea corallicola						hammocks near sea level, including low buttonwood transition areas between rockland hammocks and mangrove swamps. Occurs only in other habitat such as openings in rockland hammocks. Occurs only the Keys, in Miami Dade and Monroe counties.	development.	species, which has been expanded by augmentation projects. There are no records near any of the surface tracts.
Florida skullcap *Scutellaria floridana*	T		X			Dark, humus-rich sands of pine-palmetto flatwoods, wet prairies, and savannahs. Restricted to Apalachicola region in Bay, Franklin, Gulf, and Liberty counties.	Range is outside the areas of expected development.	Estimated several thousand plants depending on year and fire frequency occur at the Lathrop Bayou tract in Bay County. No other surface tracts within species range.
Florida torreya *Torreya taxifolia*	E	X				Endemic to a dozen ravine complexes along the Apalachicola River in Florida and adjacent Georgia. A fungal pathogen has decimated the	Range is outside the areas of expected development.	No surface tracts within known range.

Species	Federal Status	Ecoregion (Acres of FMO in Areas of Expected Oil and Gas/Phosphate Development)				Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
						populations. There are currently no reproducing individuals known in the wild and the species is persisting only as stump shoots and occasional root sprouts.		
Florida ziziphus *Ziziphus celata*	E		X			Endemic to the Lake Wales Ridge in central Florida occurs on the periphery of turkey oak sandhills or yellow sand oak hickory scrub communities. Currently known to exist in only 5 remnant populations in Polk and Highlands counties.	Phosphate FMO is southwest of the Florida Central Ridge and outside the expected range of this species.	Lake Marion tract is in the range of the Florida ziziphus, but habitat is not considered suitable.
Four-petal pawpaw *Asimina tetramera)*	E		X			Sand pine scrub on old dunes inland from the present Atlantic coast often in ecotone between hardwood hammock and higher scrub communities. Restricted to Martin and	Range is outside the areas of expected development.	At least 4 naturally occurring plants at the Jupiter Inlet Lighthouse ONA, with 2 population augmentations (2009 and 2011), totaling 128 actively growing individuals as of

Species	Federal Status	Ecoregion (Acres of FMO in Areas of Expected Oil and Gas/Phosphate Development)				Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
						Palm Beach counties.		5/19/2014.
Graber's spurge *Chamaesyce garberi*	T				X	Sandy soil in ecotones between hammocks and pinelands or coastal hammocks and sea-oats dunes. Occurs in Miami-Dade and Monroe counties. Extirpated or possibly extirpated in Collier County.	Not likely to occur on FMO in the oil and gas area of expected development. Closest record is of an extirpated population 0.8 miles north of FMO at Rookery Bay Aquatic Preserve.	The Sugarloaf and Park Key tracts are within known range. There is 1 occurrence record 5 miles northwest of the Park Key tract, and a 2006 record of a plant 5.3 miles northwest of the Sugarloaf Key tract, but habitats are not considered suitable on the surface tracts.
Godfrey's butterwort *Pinguicula ionantha*	T	X				Open, acidic soils of seepage bogs on gentle slopes, deep quagmire bogs, ditches, and depressions in grassy pine flatwoods and grassy savannas, often occurring in shallow standing water. Occurs in central Panhandle region.	Range is outside the areas of expected development.	Estimated several hundred plants occur at the Lathrop Bayou tract in Bay County. No other surface tracts within species range.
Highlands scrub	E		X			Patches of open, nutrient-	Phosphate FMO is	Potential habitat at the

Species	Federal Status	Ecoregion (Acres of FMO in Areas of Expected Oil and Gas/Phosphate Development)				Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
hypericum *Hypericum cumulicola*						poor sand within oak and rosemary scrub. Occurs in Central Florida Ridge in Highlands and Polk counties.	southwest of the Florida Central Ridge and outside the expected range of this species.	Lake Marion tract but has not been recorded there despite surveys.
Johnson's seagrass *Halophila johnsonii*	T		X		X	Intertidal areas (typically 6 inches to 6 feet) in estuaries and tidal rivers. Occurs from Indian River County south to Miami-Dade County.	Range is outside the areas of expected development.	Confirmed population in the Indian River Lagoon adjacent to the Jupiter Inlet Lighthouse ONA.
Key tree cactus *Pilosocereus robinii*	E				X	Tropical hardwood hammocks occurring on limestone. Also in cactus hammock/thorn scrub habitats and in sandy soils in thickets just above high-tide levels. Soils typically consist of a layer of partially decomposed organic material over a limestone substrate. Occurs only in Monroe County.	Range is outside the areas of expected development.	The Sugarloaf and Park Key tracts are within range. Closest occurrence records are a 2008 record 13 miles east of Sugarloaf Key tract in the Key Deer NWR, and 14 miles east of the Park Key tract.

Species	Federal Status	Ecoregion (Acres of FMO in Areas of Expected Oil and Gas/Phosphate Development)				Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
Lewton's polygala *Polygala lewtonii*	E		X			Sandhills characterized by longleaf pine and low scrub oaks, including low turkey oak woods, and transitional sandhill/ scrub habitats. Occurs only on the Central Florida Ridge in Highlands, Lake, Marion, Orange, Osceola, and Polk counties.	Phosphate FMO is southwest of the Florida Central Ridge and outside the expected range of this species.	Potential habitat at the Lake Marion tract but has not been recorded there despite surveys.
Okeechobee gourd *Cucurbita okeechobeensis ssp. okeechobeensis*	E		X			Associated with pond apple forest at Lake Okeechobee. Currently along the St. Johns River, which separates Volusia, Seminole, and Lake counties in north Florida, and a second around the shoreline of Lake Okeechobee in south Florida.	Range is outside the areas of expected development.	Tavares and Jupiter Inlet Lighthouse ONA are in counties with occurrence records but neither has suitable habitat.
Papery whitlow-wort *Paronychia*	T		X			Rosemary scrub (rosemary phase of sand pine scrub). Occurs in Lake Wales Ridge and In Washington	Phosphate FMO is southwest of the Florida Central Ridge and outside the expected range of this	Potential habitat at the Lake Marion tract but has not been recorded there

Species	Federal Status	Ecoregion (Acres of FMO in Areas of Expected Oil and Gas/Phosphate Development)				Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
chartacea						and Bay counties in the Panhandle in the sandy areas along margins of karst lakes.	species.	despite surveys.
Pigeon wings *Clitoria fragrans)*	T		X			Turkey oak barrens with wire grass, bluejack and turkey oak; also scrub and scrubby high pine. Occurs in Central Florida Ridge in Highlands and Polk counties.	Phosphate FMO is southwest of the Florida Central Ridge and outside the expected range of this species.	Potential habitat at the Lake Marion tract but has not been recorded there despite surveys.
Pygmy fringe-tree *Chionanthus pygmaeus*	E		X			Xeric, coarse white sand of scrub/oak scrub at the southern end of the Central Florida Ridge.	Phosphate FMO is southwest of the Florida Central Ridge and outside the expected range of this species.	Potential habitat at the Lake Marion tract but has not been recorded there despite surveys.
Sand flax *Linum arenicola*	C				X	Pine rockland, disturbed pine rockland, marl prairie, roadsides on rocky soils, and disturbed areas. Occurs in Miami-Dade and Monroe counties.	Range is outside the areas of expected development.	Sand flax has been documented on Sugarloaf Key 0.38 miles northeast of surface tract, but when checked in November 2005, after Hurricane Wilma, there were no

Species	Federal Status	Ecoregion (Acres of FMO in Areas of Expected Oil and Gas/Phosphate Development)				Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
								living plants.
Sandlace *Polygonella myriophylla*	E		X			Xeric, sand pine scrub and ancient sand dunes. Occurs in the Florida Central Ridge in Highlands, Osceola, and Polk counties.	Phosphate FMO is southwest of the Florida Central Ridge and outside the expected range of this species.	Potential habitat at the Lake Marion tract but has not been recorded there despite surveys.
Scrub blazingstar *Liatris ohlingerae*	E		X			Openings in oak-rosemary scrub, sand pine scrub. Occurs in the Florida Central Ridge in Highlands and Polk counties.	Phosphate FMO is southwest of the Florida Central Ridge and outside the expected range of this species.	Potential habitat at the Lake Marion tract but has not been recorded there despite surveys.
Scrub buckwheat *Eriogonum longifolium var. gnaphalifolium*	T		X			More common in transition habitats between scrub and high pine and in turkey oak barrens than in either dense scrub or open high pine. Occurs in Florida Central Ridge from Marion County south to Highlands County.	Phosphate FMO is southwest of the Florida Central Ridge and outside the expected range of this species.	Potential habitat at the Lake Marion tract but has not been recorded there despite surveys.
Scrub lupine *Lupinus aridorum*	E		X			Sand pine-scrub species in well-drained sandy soils of the Lakewood or St. Lucie series, or sand pine and	Phosphate FMO is southwest of the Florida Central Ridge and outside the expected range of this	Potential habitat at the Lake Marion tract but has not been recorded there

Species	Federal Status	Ecoregion (Acres of FMO in Areas of Expected Oil and Gas/Phosphate Development)				Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
						rosemary (*Ceratiola ericoides*). Occurs only in Polk, Orange, and Osceola counties.	species.	despite surveys.
Scrub mint *Dicerandra frutescens*	E		X			In and around sand pine evergreen oak scrub, where it may occur in the low shrub layer or in open stands, clearings, or adjacent sandy places. Occurs in a very limited portion of the Lake Wales Ridge in Highlands County.	Phosphate FMO is southwest of the Florida Central Ridge and outside the expected range of this species.	Potential habitat at the Lake Marion tract but has not been recorded there despite surveys.
Scrub plum *Prunus geniculata*	E		X			Deep, yellow sands of longleaf pine-turkey oak sandhill and white, excessively leached, wind-deposited soils of evergreen scrub oak-sand pine scrub. Occurs in Florida Central Ridge.	Phosphate FMO is southwest of the Florida Central Ridge and outside the expected range of this species.	Potential habitat at the Lake Marion tract but has not been recorded there despite surveys.
Short-leaved rosemary	E		X			White sands of sand pine-oak scrub of the Lake	Phosphate FMO is southwest of the Florida	Potential habitat at the Lake Marion tract but has

Species	Federal Status	Ecoregion (Acres of FMO in Areas of Expected Oil and Gas/Phosphate Development)				Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
Conradina brevifolia						Wales Ridge. Occurs in Polk, Highlands, and Osceola counties.	Central Ridge and outside the expected range of this species.	not been recorded there despite surveys.
Telephus spurge *Euphorbia telephioides*	T	X				Wiregrass-dominated, longleaf pine-slash pine savanna/ flatwoods or on contiguous low, sandy rises dominated by pine-scrub oak near the coast. Occurs only in Bay, Franklin, and Gulf counties.	Range is outside the areas of expected development.	Potential habitat at Lathrop Bayou tract but not recorded despite repeated surveys.
Tiny polygala *Polygala smallii*	E		X			Open grassy pineland; sandy pine rockland, scrubby flatwoods, and sandhills. Occurs along the southeast coast from St. Lucie County to Miami-Dade County.	Range is outside the areas of expected development.	Jupiter Inlet Lighthouse ONA is within species range, but habitats are not considered suitable.
Wedge spurge *Chamaesyce deltoidea ssp. serpyllum*	C				X	Known only from pine rockland vegetation on Big Pine Key in Monroe County.	Range is outside the areas of expected development.	Sugarloaf Key and Park Key tracts are more than 11 miles southwest of occurrence 2005 record.

Species	Federal Status	Ecoregion (Acres of FMO in Areas of Expected Oil and Gas/Phosphate Development)				Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
White birds-in-a-nest *Macbridea alba*	T	X				Grassy vegetation on poorly drained, infertile sandy peat soils of the Florida Gulf coastal lowlands near the mouth of the Apalachicola River. Also in seepage bogs and savannas and, sparingly, on drier sites with longleaf pine and runner oaks. Occurs only in Bay, Franklin, Gulf, and Liberty counties in the Florida Panhandle.	Range is outside the areas of expected development.	Occurs at Lathrop Bayou. No other surface tracts are within species range.
Wide-leaf warea *Warea amplexifolia*	E		X			Limited to sunny openings with exposed sand in longleaf pine/turkey oak sandhills and sand pine-scrub oak scrub. Occurs in Lake Wales Ridge in Lake, Orange, and Polk counties	Phosphate FMO is southwest of the Florida Central Ridge and outside the expected range of this species.	Potential habitat at the Lake Marion tract but has not been recorded there despite surveys.
Wireweed *Polygonella basiramia*	E		X			Restricted to bare patches within sand pine-evergreen oak scrub vegetation. Characteristic of early scrub	Phosphate FMO is southwest of the Florida Central Ridge and outside the expected range of this	Potential habitat at the Lake Marion tract but has not been recorded there

Species	Federal Status	Ecoregion (Acres of FMO in Areas of Expected Oil and Gas/Phosphate Development)				Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		East Gulf Coastal Plain (0/0 acres)	Florida Peninsula (4,910/1,887 acres)	South Atlantic Coastal Plain(3,75/0 acres)	Tropical Florida (0/0 acres)			
						vegetation development; often absent from later stages. Occurs in Highlands and Polk counties.	species.	despite surveys.

3.7.3 Kentucky Special Status Species

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
Mammals									
Gray bat *Myotis grisescens*	E	X	X	X	X	X	Foraging habitat in forested riparian areas. Roosting habitat is caves year-round; however, however migration occurs between subterranean caves used as winter hibernacula and caves used in the summer as maternal roots. Cave roosts are often close to water bodies within 1 km of rivers or lakes. White-nosed syndrome has been confirmed in at least four locations in Kentucky, including Mammoth Cave in Edmonson and Barren counties, and in Breckinridge, Trigg and Wayne counties, as of 01/17/13.	In the oil and gas area of expected development, there are occurrence records associated with FMO at Lake Barkley (Trigg County), Lake Cumberland (Clinton County), Dale Hollow Lake (Clinton County), and Kentucky Ridge State Forest (Bell County). At Barkley Lake there are three foraging occurrence records documented on FMO at Lake Barkley and 1 record just over 3 miles away. There is a maternity site/hibernacula record from 2008 within 1.6 miles of FMO associated with	NA

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
								Sinking Fork. At Lake Cumberland, there is a foraging record 1 mile from FMO in the area of expected development. There is also a hibernacula record within 1.3 miles of FMO, but 17 miles from the closest area of expected development.	
								At Dale Hollow Lake, there are 2 maternity site records (one mile and 2.5 miles) from FMO in the area of expected development. At Kentucky Ridge State Forest, there is a 2002 mist net record within five miles of FMO. In addition, at Nolin Lake, occurrence records are seven miles upstream from FMO outside the area of	

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
								expected development in Edmonson County. There is potential for additional roosting occurrences in caves and foraging occurrences within 135 kilometers (84 miles) of cave roosts on FMO. In the coal potential area, occurrence records are primarily summer and maternity mist net records, and transient roost sites. Most hibernacula are located outside of the coal potential area.	
Indiana bat *Myotis sodalis*	E	X	X	X	X	X	Foraging habitat in hardwood forests, forested wetlands, and adjacent ponds and riparian areas. Hibernacula—caves, particularly limestone caves with pools. Summer	In Kentucky, known Indiana bat records associated with FMO are all associated with USACE facilities, primarily at Lake Barkley (Trigg County), Nolin Lake, Cumberland	NA

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
							roosts for reproductive females are primarily located under loose bark of dead trees. Maternal roosts occur in riparian zones, bottomland and floodplain habitats, wooded wetlands, and upland communities.	Lake (Clinton County), Dewey Lake (Floyd County), and Yatesville Lake (Lawrence County). At Lake Barkley, there isone hibernacula record within 1.6 miles of FMO. At Nolin Lake there is a mist nest record and roost record both 3.5 miles from FMO in the area of expected development, and a hibernacula record 2 miles from FMO, but10 miles outside the area of expected development. At Cumberland Lake, there are two mist net records1.3 and 2.5 miles from FMO in the area of expected development. A cluster of hibernacula locations in Pulaski County is 23 miles from any major FMO in the	

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
								area of expected development associated with Cumberland Lake. At Yatesville Lake there is a summer roost record within 1.7 miles of FMO in the area of expected development. In the coal potential area, occurrence records are primarily summer and maternity mist net records, and transient roost sites. Most hibernacula are located outside of the coal potential area. In the coal high potential area mining, there are maternity mist net records on FMO at Dewey Lake. In the area of moderate	

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
								potential for coal development there are records at Yatesville Lake, with a summer mist net records 1.7 miles from FMO. Records in Menifee, Rowan and western Morgan counties are all over 10 miles from FMO at Grayson, Yatesville, and Paintsville lakes. At Little South Fork the closest record is a transient roost site 9 miles from FMO in McCreary County. There is potential to occur in suitable habitat in other areas on FMO.	
								At Little South Fork in McCreary County, the closest record is a 1981 transient roost site 9 miles from FMO.	

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
								At Dewey Lake, a 2006 maternity mist net record is on FMO in the area of expected development. At Yatesville Lake, there is a 2007 summer mist net record 1.7 miles from FMO in the area of expected development. Records in Menifee, Rowan, and western Morgan counties are all more than 15 miles from FMO at Grayson, Yatesville, and Paintsville lakes.	
Northern long-eared bat *Myotis septentrionalis*	P	X	X	X	X	X	Generally associated with old-growth intact interior forests. A variety of cave overhangs, tunnels, and mines used as hibernacula and roosts	Potential to occur in suitable habitat throughout the areas of expected development.	NA
Virginia big-eared bat *Corynorhinus*	E					X	Foraging habitat in riparian hardwood forests and woodlands. Hibernacula and maternal roosts in caves or	Records in Menifee, Rowan, and western Morgan counties associated with Licking River are at least 10	NA

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
townsendii virginianus							sandstone rock shelter.	miles from the closest FMO at Grayson Lake in eastern Morgan County. There is potential for this species to occur in suitable habitat on other areas of FMO. Current occurrence records are outside of the coal areas of potential.	
Birds									
Bald Eagle *Haliaeetus leucocephalus*	D	X	X	X	X	X	Varied; typically associated with large water bodies. Nests in tall trees with clear flight paths.	There are 6 records within a mile of FMO and 1 confirmed record on FMO in 2000. Likely to occur in suitable habitat throughout area of expected development on FMO associated with reservoirs, lakes, and major rivers.	NA
Fish									
Blackside dace	T	X			X		Inhabits small (7-15 feet wide)	All occurrence records in	NA

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
Phoxinum cumberlandensis)							headwater streams and creeks with moderate flows. Restricted to the Cumberland Plateau portion of the upper Cumberland drainage above and below Cumberland Falls.	Whitley and McCleary counties are upstream of FMO associated with Lake Cumberland and Little South Fork River. In Bell County, occurrences in Laurel Fork, Fourmile Run, Lick Fork, and Cannon Creek have no hydrologic connection to FMO associated with Clear Creek. In Laurel County, there are occurrences in 3 tributaries of the Cumberland River at least 4 miles above a small (9 acres) tract of FMO on the Cumberland River.	
Cumberland darter *Etheostoma susanae*	E	X	X		X		Shallow water in low-velocity shoals and backwater areas with sand or sandy-gravel substrates. Occurs in Cumberland River drainage above Cumberland Falls.	Occurrence records are outside the oil and gas area of expected development. In the coal potential areas there are records above a 68-acre tract of FMO along the Cumberland River in the	NA

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
								northwestern corner of Whitley County, but outside of designated critical habitat.	
Kentucky arrow darter *Etheostoma sagittal spilotum*	C	X					Upland creeks and streams, generally in headwaters, also found in larger streams, generally in slow to moderate currents. Occurs in upper Kentucky River drainage, includes population in Clemons Fork in Robinson Forest and Red Bird River watershed.	Occurs within both the oil and gas area of expected development and the are of moderate coal potential.	NA
Palezone shiner *Notropis albizonatus*	E	X	X		X		Flowing pools and runs in upland streams with cobble, pebble, and gravel/sand substrate. Occurs in the Cumberland and Tennessee River drainages in Wayne and McCreary counties.	Range is outside of the oil and gas area of expected development. Occurrences in McCreary County are in the coal area of moderate potential.There are occurrence records from 2005 and earlier on FMO along 3 miles of the Little South Fork.	NA

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
Pallid sturgeon *Scaphirhynchus albus*	E						Large riverine systems associated with the Mississippi and Missouri River and their tributaries. In Kentucky, occurrence records in the Tennessee River.	Range in the Tennessee River is outside of the areas of expected development.	NA
Relic darter *Etheostoma chienense*	E						Headwaters of slow-flowing streams, often associated with undercut banks and narrow, shallow moderately flowing runs with sandy, gravel substrate. Occurs in a very small area of the Bayou du Chien system in western Kentucky.	Range is outside of the areas of expected development.	NA
Mussels									
Clubshell *Pleurobema clava*	E	X	X	X	X		Creeks and medium to large rivers in sand and gravel substrates.	Occurrences in Edmonson County are within the oil and gas area of expected development. Range is outside the area of coal expected development.	NA

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
Cracking pearlymussel *Hemistena lata*	E/ XN						Sand, gravel, and cobble substrates in swift currents or mud and sand in slower currents.	Natural populations presumed extirpated in Kentucky.	NA
Cumberland bean *Villosa trabalis*	E	X	X		X		Riffle and shoal areas of silt-free sand, firm rubble, gravel, and cobble substrates in moderate to swift currents and depths less than 1 meter (3 feet).	In the oil and gas areas of expected development, most records near Cumberland Lake were prior to the dam construction in 1952. Both Laurel and Wayne counties, with extant populations, are outside of area of expected development. In the coal potential area, Jackson and Laurel counties have small FMO tracts (<6 acres) along the Rockcastle River. There is no FMO in Jackson County.	NA
Cumberland	E/	X	X		X		Small- to medium-sized rivers in shallow flats or pools with	All occurrence records are outside of the oil and gas	NA

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
elktoe *Alasmidonta atropurpurea*	XN						slow current. In Kentucky, it occurs in the Big South Fork system of the Upper Cumberland River.	area of expected development. In the area of moderate coal potential, McCreary County occurrence records in Rock Creek and the Big South Fork Cumberland are 6 miles from the closest FMO associated with Big South Fork Cumberland above Cumberland Lake. Also, occurrence records in Marsh Creek in McCreary County are 8.5 miles upstream from FMO on the Cumberland River in Whitley County. Occurrence records in Sinking Creek in Laurel County are more than 10 river miles above FMO near Rockcastle Creek in western Laurel County.	
Cumberlandian	E/	X		X		X	Large creeks to large rivers	In the oil and gas areas of	NA

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
combshell *Epioblasma brevidens*	XN						with coarse sand to boulder-sized substrates, generally less than 1 meter (3 feet). In Kentucky, occurs in South Fork of the Cumberland River, and low numbers in Powell and Clinch rivers.	expected development, there are records in Russell County, but it may no longer be extant. In the moderate coal potential ares, in McCreary County there are occurrence records over 20 miles above FMO on the Big South Fork Cumberland River above Cumberland Lake. Multiple records in the Buck Creek drainage are outside the area of expected development. record in Rockcastle River is in the area of expected development, but there is no FMO in the watershed. Experimental population in Knox County within area of coal potential, but there is no FMO in Knox County.	

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
Dromedary bean *Dromus dromas*	E						Possibly extirpated in Kentucky.	In McCreary County, in the area of moderate coal potential, the only occurrence record (extirpated) in Big South Fork Cumberland River in the southern portion of county more than 20 miles from FMO associated with Big South Fork Cumberland River above Cumberland Lake.	NA
Fanshell *Cyprogenia stegaria*	E	X	X	X	X	X	Medium to large streams with gravel substrates and strong currents. In Kentucky, reproducing populations in the upper Green and Licking rivers.	Occurrences records in Edmonson County in the Green River are in the oil and gas area of expected development. However, there is no hydrologic connection to the only FMO in the area at Nolin Lake.	NA
Fluted kidneyshell *Ptychobranchus subtentum*	E						Small to medium-sized streams with cool,clear water, found near riffles with gravel,	Occurrence records are outside of the oil and gas areas of expected	NA

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
							sand and cobble substrates. In Kentucky occurs in the Cumberland River drainage below Cumberland Falls	development. In the area of moderate coal potential, occurrence records in the headwaters above Lake Cumberland in McCreary, and Whitley counties.	
Littlewing pearlymussel *Pegias fabula*	E	X		X		X	Small- to medium-sized streams with cool, clear water; found near riffles with gravel, sand, and cobbles substrates. In Kentucky, occurs in Cumberland River drainage below Cumberland Falls.	In McCreary County, in the area of moderate coal potential, occurrence records (2001 to 2008) in the Big South Fork Cumberland River are more than 20 miles south of FMO also associated with the Big South Fork Cumberland River above Cumberland Lake.	NA
Northern riffleshell *Epioblasma torulosa rangiana*	E		X	X			Smaller stream riffles with swift flowing, shallow water and a substrate of gravel. In Kentucky, only known population occurs in Green	Pre-1989 occurrences records in Edmonson County and a 1964 record in Hart County all on the Green River, are in the oil and gas	NA

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
							River.	area of expected development, but there is no hydrologic connection to FMO at Nolin Lake. No occurrence records near FMO in the area of coal potential.	
Orangefoot pimpleback *Plethobasus cooperianus*	E			X			Medium to large rivers with deep steady flowing water, also shallower shoals and riffles. In Kentucky, occurs sporadically in the Ohio and Tennessee River.	Occurrence records on Tennessee River (1985 and 1999) are 3.5 miles below FMO at Lake Barkley, and 10.5 miles up the Cumberland River from FMO at Lake Cumberland. No occurrence records near FMO in the area of coal potential.	NA
Oyster mussel *Epioblasma capsaeformis*	E/ XN	X		X	X		Moderate to swift currents in large creeks and rivers, various substrates but rarely	Known current range is outside of the oil and gas areas of expected	NA

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
							mud. In Kentucky, occurs in Buck Creek and Big South Fork in McCreary and Pulaski counties.	development. In McCreary County in the area of coal expected development, occurrence records are more than 11 miles south of FMO associated with Little South Fork and Big South Fork of the Cumberland River.	
Pink mucket *Lampsilis abrupta*	E		X	X	X		Large, fast-flowing rivers; can tolerate river-like impoundments, but not standing water. In Kentucky, sporadic in the lower Ohio River to the Licking River.	Three occurrences (all pre-1989) are in the oil and gas area of expected development between 3.5 and 10 miles below FMO associated with Lake Barkley.	NA
Ring pink *Obovaria retusa*	E		X	X	X		Medium to small streams, creeks, and rivers with shallow steady flowing water. In Kentucky, occurs in Tennessee River in McCracken, Livingston, Marshall counties, and Green	Occurrence records include a 1987 record 8.5 miles south of FMO at Lake Barkley, a 1982 record on the Green River in the area of expected development with no FMO in the	NA

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
							River in Hart and Emerson counties.	watershed, and a 2007 record miles below FMO at Cumberland Lake. No occurrence records near FMO in the area of coal potential.	
Purple cat's claw *Epioblasma obliquata obliquata*	E		X	X			Large river systems in sand and gravel substrates in runs and riffles. In Kentucky, restricted to the Green River.	Potential to occur in the Green River in the oil and gas area of expected development; however, the only FMO in county is at Nolin Lake with no hydrologic connection to the Green River.	NA
Rabbitsfoot *Quadrula cylindrical ssp. cylindrical*	T						Small- to medium-sized streams and larger rivers, usually in shallow areas in areas where velocity is reduced. In Kentucky, occurs in the Tennessee and Red rivers.	In the oil and gas ares of expected development, occurrence records include one historical occurrence inundated by Bards Lake, a 2007 record almost eight miles below FMO at Bards Lake, and 1982 record in the Green River in the area of	NA

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
								expected development with no FMO in the watershed. There are historical records at Lake Cumberland in McCreary County and at Dewey Lake in Floyd County. There are no current occurrence records associated with FMO in the coal areas of potential.	
Rough pigtoe *Pleurobema plenum*	E		X	X	X		Medium to large rivers in shoals with cobble, sand, and gravel substrates. In Kentucky, occurs in portions of the Tennessee River (below dams), Clinch River (between miles 154 and 323), Green River, and Barren River.	Two occurrences (1989 and 2002) in the Green River in the area of expected development but no hydrologic connection to the only FMO in the county at Nolin Lake in the northern part of the county. Historic occurrence records associated with Lake Cumberland, but expected to be extirpated at those	NA

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
								locations.	
Sheepnose *Plethobasus cyphyus*	E				X		Usually reported from deep water (greater than 2 meters [7 feet]) with slight to swift currents and mud, sand, or gravel bottoms. It also appears capable of surviving in reservoirs.	Occurrence records below Kentucky Lake have FMO within three miles. Occurrence records in Mammoth Cave National Park near FMO associated with Nolin Lake. Occurrence records associated with Cave Run Lake are outside the area of expected development. No occurrence records associated with FMO in the area of coal potential.	
Slabside pearlymussel *Lexingtonia dolabelloides*	E						Large creeks to moderate-sized rivers in relatively shallow riffles and shoals with moderate current. In Kentucky, the current range is in the Tennessee River system, outside of the main river.	Current range outside the expected areas of development for both oil and gas, and coal.	NA

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
Snuffbox *Epioblasma triquetra*	E	X	X		X	X	Small- to medium-sized creeks to large rivers and lakes over gravel and sand with occasional cobble and boulders. In Kentucky, occurs sporadically in the upper Green River and eastward.	In the oil and gas area of expected development, occurrence records associated with Nolin River north of Nolin Lake are outside the area of expected development. Occurrences in the Green River are in the area of expected development but more than 4 miles from FMO associated with Nolin Lake and have no hydrologic connection. Occurrence records in the Kentucky River upstream from Buck Lake are in both areas of expected development and occur on FMO. Occurrence records on Buck Creek in Pulaski County are outside the area of expected development, and there is no hydrological	NA

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
								connection to FMO in the area of expected development. Occurrence records in Tygarts Creek have no hydrologic connection to the closest FMO at Grayson Lake.	
Spectaclecase *Cumberlandia monodonta*	E				X		Large rivers, particularly in outside river bends below bluff lines. Current extant populations in Kentucky in the Ohio and Green rivers.	A 1990 record in the Tennessee River is 5 miles below FMO at Barkley Lake and outside the area of oil and gas areas of expected development. 1982 occurrence records in the Green River in Edmonson County are in the oil and gas area of expected development, but there is no hydrological connection to FMO at Nolin Lake in the northern part of the county.	NA
Tan riffleshell *Epioblasma*	E				X		Headwaters, riffles, and shoals in sand and gravel	Current range is in the coal area of expected	NA

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
florentina walkeri							substrates. In Kentucky, occurs in the Upper Clinch River and Indian Creek, a tributary of the upper Clinch River.	development in McCreary County. Occurrence records on the Big South Fork Cumberland River are approximately 12 miles southeast and upstream of FMO associated with the Little South Fork of the Cumberland River.	
White wartyback *Plethobasus cicatricosus*	E		X				Presumed to inhabit shoals and riffles in large rivers like the Tennessee River. Historical records in Oldham and Union counties, but possibly extinct in Kentucky.	Current range is outside of the areas of expected development.	NA
Crustaceans									
Kentucky cave shrimp *Palaemonias ganteri*	E		X				Cave obligate known endemic to the Mammoth and Flint Ridge cave systems in Barren, Edmonson, Hart, and Warren counties.	Occurrence records in Hart County are 3 miles east/northeast of FMO associated with Nolin Lake. Hart and warren counties are outside of the oil and gas area of expected	NA

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
								development. Oil and gas development is expected to be associated with COE impounded reservoirs and would typically be downstream of occupied habitat.	
Insects									
Clifton cave beetle *Pseudanophthalmus caecus*	C		X				Cave obligate known from 2 caves less than 2 kilometers (1 mile) apart in Woodford County.	Range outside areas of expected development.	NA
Louisville cave beetle *Pseudanophthalmus troglodytes*	C		X				Cave obligate known from 2 caves in Jefferson County, Kentucky.	Range outside areas of expected development.	NA
Tatum cave beetle Pseudanophthalmus parvus	C		X				Cave obligate known from 1 cave in Marion County, presumed extant.	Range outside areas of expected development.	NA

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
Plants									
Price's potato-bean *Apios priceana*	T		X				Open, mixed-oak forests, forest edges, and clearings on river bottoms and ravines, being unable to tolerate deep shade.	Occurrence records associated with Lake Barkley and Land Between the Lakes. Occurrence records are outside of the coal area of potential.	NA
Cumberland sandwort *Arenaria cumberlandensis*	E	X	X				Restricted to shady, moist rockhouse floors, overhanging ledges in sandstone rock faces. Kentucky range in McCreary County.	Occurrence records are outside of the oil and gas areas of expected development. There are occurrences in the coal area of potential, but no FMO in the Big South Fork National River and Recreation Area.	NA
Kentucky glade cress *Leavenworthia exigua laciniata*	T		X				Restricted to open glades, shallow soils with flat-bedded Silurian dolomite and dolomitic limestone. Occurrences in Bullitt and Jefferson counties.	Range outside areas of expected development.	NA

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
Short's bladderpod *Physaria globosa*	E		X				Steep, rocky, wooded slopes, and talus areas. Also occurs on cliff tops, bases, and cliff ledges. Usually found adjacent to rivers or streams.	Range is outside the areas of expected development..	NA
Virginia spiraea *Spiraea virginiana*	T				X		Along scoured banks of high gradient streams or on meander scrolls, point bars, natural levees, and braided features of lower stream reaches. Soils are sandy, silty, or clay, and elevation range is 1,000 to 2,400 feet.	No occurrence records in the oil and gas areas of expected development. In the coal area of potential there are occurrence records adjacent to FMO at Laurel River Lake in Whitley County.	NA
White fringeless orchid *Platanthera integrilabia*	C				X		Wet, boggy areas at the heads of streams and on seepage slopes.	No occurrence records in the oil and gas areas of expected development. In the moderate coal area of potential, there are 3 occurrence records in Whitley County in the Daniel Boone National Forest. Occurrence records in	NA

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Central Appalachians (60,918 acres)	Interior Plateau (161,408 acres)	Interior River Valley and Hills (13,451 acres)	Southwestern Appalachians (0 acres)	Western Allegheny Plateau (37,116 acres)			
								McCreary County are more than 6 miles from FMO associated with Little South Fork.	

3.7.4 Louisiana Special Status Species

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)						Habitat	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development
		East Gulf Coastal Plain (0 acres)	Gulf Coast Prairies and Marshes (55,210 acres)	Mississippi Alluvial Plain (15,271 acres)	Upper East Gulf Coastal Plain (0 acres)	Upper West Gulf Coastal Plain (836 acres)	West Gulf Coastal Plain (57,218 acres)			
Mammals										
Louisiana black bear *Ursus americanus luteolus*	T	X	X	X	X	X	X	Typically bottomland forests, but may use a variety of habitats. Hollow tree cavities are important for denning. Critical habitat designated in southeastern Louisiana.	Could occur in suitable habitat across the state. Critical habitat overlaps the area of expected development in extreme northwestern West Feliciana Parish and at the confluence of Richland, East Carroll, and West Carroll parishes. A total of 1,349 acres of FMO are located in black bear critical habitat in LA. However, only one tract is in the area of expected development, a 39-acre tract on the eastern boundary of Poverty Point in Richland Parish.	Baldwin tract in St. Mary Parish is in designated critical habitat and has suitable habitat. The tract is outside of the area of expected development.
West Indian manatee *Trichechus*	E		X					Marine, estuarine, and freshwater environments. In	Closest occurrence record is 9 miles northeast of FMO in Plaquemines Parish.	Baldwin tract in St. Mary Parish does not have suitable

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)						Habitat	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development
		East Gulf Coastal Plain (0 acres)	Gulf Coast Prairies and Marshes (55,210 acres)	Mississippi Alluvial Plain (15,271 acres)	Upper East Gulf Coastal Plain (0 acres)	Upper West Gulf Coastal Plain (836 acres)	West Gulf Coastal Plain (57,218 acres)			
manatus								Louisiana, occurs occasionally along the coast and major waterways.	Potential for occasional occurrences in coastal parishes in the area of expected development, including Plaquemines and Cameron parishes.	habitat, no other surface tracts in species' range.
Birds										
Bald eagle *Haliaeetus leucocephalus*	D	X	X	X	X	X	X	Varied; typically associated with large water bodies; nests in tall trees with clear flight paths.	Likely to occur on FMO in suitable habitat throughout Louisiana. Three occurrence records within 660 feet of FMO in the area of expected development, includingon the Louisiana Ammunition Depot, and two in southeastern Louisiana, in Plaquemines and St. Charles parishes.	Likely to occur on Baldwin, Black Lake, and Duck Lake tracts. Occurrence record within 0.36 miles of Duck Lake tract.
Interior least tern *Sterna antillarum athalassos*	E				X	X	X	Breeds on sandbars along major rivers. Occurrence records in Bossier, Caddo, Concordia, East Carroll, Madison, Natchitoches, Red River, and Tensas	Potential to occur on FMO in suitable habitat throughout Louisiana. Occurrence record is on Red River, 1.1 miles from FMO in the area of expected development and	No suitable habitat on or near surface tracts.

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)						Habitat	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development
		East Gulf Coastal Plain (0 acres)	Gulf Coast Prairies and Marshes (55,210 acres)	Mississippi Alluvial Plain (15,271 acres)	Upper East Gulf Coastal Plain (0 acres)	Upper West Gulf Coastal Plain (836 acres)	West Gulf Coastal Plain (57,218 acres)			
								parishes.	within one-quarter mile of FMO in East Carroll Parish.	
Piping plover *Charadrius melodus*	T		X					Sandy upper beaches and shores in coastal parishes.	Potential to occur on FMO in Plaquemines Parish.	No suitable habitat on or near surface tracts.
Red-cockaded woodpecker *Picoides borealis*	E	X			X	X	X	Mature pine forests—specifically those with longleaf pines averaging 80 to 120 years old and loblolly pines averaging 70 to 100 years old.	Potential to occur on FMO at the Louisiana Ammunition Plant in the area of expected development. Most state records are in National Forests or outside the area of expected development, but there is potential to occur in suitable habitat across the state.	No surface tracts contain suitable foraging or nesting habitat within the species range.
Sprague's pipit *Anthus spragueii*	C	X	X	X	X	X	X	Winters across state; prefers large expanses of native grasslands; may use improved pasture.	Potential to occur on FMO throughout Louisiana.	No surface tracts contain suitable habitat within the species range.
Whooping crane *Grus americana*	E/X							Experimental, non-essential population at the White Lake Wetlands Conservation Area.	Vermillion Parish is outside the area of expected development. Closest FMO in the area of expected	No surface tracts within species range.

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)						Habitat	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development
		East Gulf Coastal Plain (0 acres)	Gulf Coast Prairies and Marshes (55,210 acres)	Mississippi Alluvial Plain (15,271 acres)	Upper East Gulf Coastal Plain (0 acres)	Upper West Gulf Coastal Plain (836 acres)	West Gulf Coastal Plain (57,218 acres)			
									development is in extreme western Cameron Parish.	
Reptiles										
Gopher tortoise *Gopherus polyphemus*	T	X						Sandy soils with herbaceous groundcover. In Louisiana, occurs only in St. Tammany, Tangipahoa, and Washington parishes.	Likely to occur in suitable habitat on split-estate FMO in St. Tammany, Tangipahoa, and Washington parishes.	No surface tracts within species range.
Green sea turtle *Chelonia mydas*	T		X					Feeds in shallow, low-energy waters along coastal parishes	Foraging potential near/on FMO in Plaquemines Parish.	No surface tracts within species range.
Hawksbill sea turtle *Eretmochelys imbricata*	E		X					Shallow coastal water and infrequently found in shallow areas with high turbidity. Occurs along coastal parishes.	Foraging potential near/on FMO in Plaquemines Parish.	No surface tracts within species range.
Kemp's Ridley sea turtle *Lepidochelys kempii*	E		X					Shallow coastal waters over sand or mud bottoms where crabs are numerous. Occurs along coastal parishes.	Foraging potential near/on FMO in Plaquemines Parish.	No surface tracts within species range.

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)						Habitat	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development
		East Gulf Coastal Plain (0 acres)	Gulf Coast Prairies and Marshes (55,210 acres)	Mississippi Alluvial Plain (15,271 acres)	Upper East Gulf Coastal Plain (0 acres)	Upper West Gulf Coastal Plain (836 acres)	West Gulf Coastal Plain (57,218 acres)			
Leatherback sea turtle *Dermochelys coriacea*	E		X					Largely pelagic, feeding on primarily on jellyfish. Occasional occurrences along coastal parishes.	Foraging potential near/on FMO in Plaquemines Parish.	No surface tracts within species range.
Loggerhead sea turtle *Caretta caretta*	T		X					At sea, as well as in bays, lagoons, and mouths of large rivers. Occurs along coastal parishes.	Foraging potential near/on FMO in Plaquemines Parish.	No surface tracts within species range.
Louisiana pine snake *Pituophis ruthveni*	C						X	Sandy, well-drained soils in open pine forests, primarily longleaf pine savannah. Closely associated with pocket gophers. Current range in Louisiana is limited to Bienville Vernon, Sabine, and Natchitoches parishes.	Potential to occur in suitable habitat in the area of expected development in Bienville Parish. Two FMO tracts (40 acres and 80 acres) in Bienville Parish near (0.4 and 0.1 miles) a cluster of occurrence records. Other occurrences, including those on Fort Polk, are outside the area of expected development.	Potential to occur in upland habitats at Black Lake tract in Natchitoches Parish.
Ringed map turtle *Graptemys*	T	X						Riverine habitats with moderate to fast currents, with basking areas. In Louisiana,	There is FMO on the Tangipahoa River, West Pearl River, and Bogue Chitto River approximately 2	No surface tracts within species range.

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)						Habitat	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development
		East Gulf Coastal Plain (0 acres)	Gulf Coast Prairies and Marshes (55,210 acres)	Mississippi Alluvial Plain (15,271 acres)	Upper East Gulf Coastal Plain (0 acres)	Upper West Gulf Coastal Plain (836 acres)	West Gulf Coastal Plain (57,218 acres)			
oculifera								occurs in St. Tammany and Washington parishes.	miles from occurrence records.	
Amphibians										
Dusky gopher frog *Rana capito sevosa*	E	X						In St. Tammany Parish, a series of suitable but currently unoccupied ponds in the historical range may be used for translocation and are designated critical habitat.	The nearest FMO is 20 miles east of designated critical habitat in St. Tammany Parish.	No surface tracts in the species range
Fish										
Gulf sturgeon *Acipenser oxyrinchus desotoi*	T	X						Shallow coastal waters and estuaries; spawning in large rivers of the northern Gulf of Mexico. In Louisiana, occurs in Ascension, Jefferson, Lafourche, Orleans, Plaquemines, St. Bernard, St. Charles, St. James, and St. John the Baptist parishes.	Potential to occur on FMO in Plaquemines Parish.	No surface tracts in species range.

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)						Habitat	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development
		East Gulf Coastal Plain (0 acres)	Gulf Coast Prairies and Marshes (55,210 acres)	Mississippi Alluvial Plain (15,271 acres)	Upper East Gulf Coastal Plain (0 acres)	Upper West Gulf Coastal Plain (836 acres)	West Gulf Coastal Plain (57,218 acres)			
Pallid sturgeon *Scaphirhynchus albus*	E	X						Large riverine systems associated with the Mississippi River and its tributaries. In Louisiana, occurs in Ascension, Jefferson, Orleans, Plaquemines, St. Bernard, St. Charles, St. James, and St. John the Baptist parishes.	Potential to occur on FMO in Plaquemines Parish.	No surface tracts within species range.
Mollusks										
Alabama heelsplitter *Potamilus inflatus*	T	X						Medium to large rivers with slow to moderate currents; found in various substrates. Found in the Amite and Tangipahoa rivers in Louisiana.	There are scattered FMO upland tracts within 1.5 miles of occurrence records on the Amite River in East Baton Rouge and Livingston parishes and 1.6 miles from occurrence records in the West Pearl River in St. Tammany Parish. All occurrence records are outside of the area of expected development.	No surface tracts within species range.
Fat pocketbook	E							Tolerates river-like reservoirs and lakes.	One occurrence record associated with the	No surface tracts within species

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)						Habitat	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development
		East Gulf Coastal Plain (0 acres)	Gulf Coast Prairies and Marshes (55,210 acres)	Mississippi Alluvial Plain (15,271 acres)	Upper East Gulf Coastal Plain (0 acres)	Upper West Gulf Coastal Plain (836 acres)	West Gulf Coastal Plain (57,218 acres)			
Potamilus capax								Occurs in Concordia, East Carroll, Madison, and Tensas parishes along the Mississippi River.	Mississippi River in Jefferson Parish is 121 river miles below the only FMO on river, and the entire range is outside of the area of expected development.	range.
Louisiana pearlshell *Margaritifera hembeli*	T			X				Small headwater streams in the Red River drainage in Rapides and Grant parishes.	Potential to occur on FMO in Rapides Parish. Grant Parish is outside area of expected development.	Potential to occur at Big Saline Bayou tract in Rapides Parish.
Pink mucket *Lampsilis abrupta*	E			X				Large, fast-flowing rivers; can tolerate river-like impoundments, but not standing water. In Louisiana, occurs Morehouse Parish in portions of Bayou Bartholomeau.	One occurrence record on FMO on Bayou Bartholomew in Morehouse Parish, but there is no hydrologic connection to FMO in the area of expected development more than 40 miles south in Caldwell Parish.	No surface tracts within species range.
Rabbitsfoot *Quadrula cylindrical ssp. cylindrical*	T			X				Small to medium-sized streams and larger rivers, usually in shallow areas in areas where velocity is reduced. In Louisiana, occurs	Two 40-acre FMO tracts on Bayou Bartholomew are in close proximity (0.16 and 0.8 mile) to occurrence records. There is no hydrologic connection with	No surface tracts within species range.

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)						Habitat	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development
		East Gulf Coastal Plain (0 acres)	Gulf Coast Prairies and Marshes (55,210 acres)	Mississippi Alluvial Plain (15,271 acres)	Upper East Gulf Coastal Plain (0 acres)	Upper West Gulf Coastal Plain (836 acres)	West Gulf Coastal Plain (57,218 acres)			
								Morehouse Parish in portions of Bayou Bartholomew and Ouachita River.	FMO in the area of expected development more than 40 miles south in Caldwell Parish.	
Plants										
Chaffseed *Schwalbea americana*	E		X				X	Acidic, sandy, or peaty soils in open pine flatwoods, seepage bogs, or pine savannahs. Occurs in Allen Parish and Jefferson Davis Parish.	There are 4 FMO tracts (totaling 160 acres) within 4 miles of occurrence records in northwestern Jefferson Davis Parish. These tracts and the entire range are outside of the area of expected development.	No surface tracts within species' range.
Earth star *Geocarpon minimum*	T					X	X	Saline prairies. Occurrences in Caddo, Caldwell, De Soto, and Winn parishes.	In the area of expected development, there are 3 FMO tracts (totaling 120 acres) between1.7 and 4 miles of occurrence records on the border between Caddo and De Soto parishes. Potential to occur on FMO in suitable habitats in Caddo, De Soto, and Caldwell parishes.	Rocky Bayou tract is within the species' range, but heavily forested tract does not provide suitable habitat.

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)						Habitat	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development
		East Gulf Coastal Plain (0 acres)	Gulf Coast Prairies and Marshes (55,210 acres)	Mississippi Alluvial Plain (15,271 acres)	Upper East Gulf Coastal Plain (0 acres)	Upper West Gulf Coastal Plain (836 acres)	West Gulf Coastal Plain (57,218 acres)			
Louisiana quillwort *Isoetes louisianensis*	E						X	Semi-aquatic, found in slow moving shallow water in sandy loam soils or coarse sand. Occurs in St. Tammany and Washington parishes.	Potential to occur in suitable habitat on split-estate FMO in St. Tammany and Washington parishes.	No surface tracts within species' range.

3.7.5 Tennessee Special Status Species

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Cumberlands and SouthernRidge and Valley (0 acres)	Interior Low Plateau (34,400 acres)	Mississippi River Alluvial Plain (0 acres)	Southern Blue Ridge (0 acres)	Upper East Gulf Coastal Plain (0 acres)			
Mammals									
Gray bat *(Myotis griscens)*	E	X	X		X	X	Foraging habitat in forested riparian areas. Roosting habitat is caves year round; however, migration occurs between caves used in the winter as hibernacula and caves used in the summer as maternal roosts. Cave roosts are often close to water bodies.	Expected to occur in suitable habitat on FMO. Nearest occupied cave location is 3.3 miles from Dale Hollow Lake, and 4.7 miles from Standing Stone State Park.	NA
Indiana bat *(Myotis sodalis)*	E	X	X	X	X	X	Foraging habitat in hardwood forests, forested wetlands and adjacent ponds and riparian areas. Hibernacula—caves, particularly limestone caves with pools. Summer roosts for reproductive females are primarily located under loose bark of dead trees. Maternal roosts occur in riparian zones, bottomland and floodplain habitats, wooded	Expected to occur in suitable habitat on FMO.	NA

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Cumberlands and SouthernRidge and Valley (0 acres)	Interior Low Plateau (34,400 acres)	Mississippi River Alluvial Plain (0 acres)	Southern Blue Ridge (0 acres)	Upper East Gulf Coastal Plain (0 acres)			
							wetlands, and upland communities.		
Northern long-eared bat *Myotis septentrionalis*	P	X	X	X	X	X	Generally associated with old growth intact, interior forests. A variety of cave overhangs, tunnels, and mines used as hibernacula and roosts.	Potential to occur in suitable habitat throughout the area of expected development	NA
Fish									
Blackside dace *(Phoxinum cumberlandensis)*	T	X					Inhabits small (7- to 15 feet wide) upland streams with moderate flows in Scott, Campbell, and Claiborne counties.	Range is outside of the area of expected development.	NA
Duskytail darter *(Etheostoma percnurum)*	E/ XN						Clear, warm, moderate-gradient. In Tennessee, range includes Copper Creek of the Clinch river and the main stem of the Clinch River in Scott County. Experimental populations in Tellico River in Monroe County and French Broad and Holston rivers in Knox County.	Range is outside of the area of expected development.	NA

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Cumberlands and SouthernRidge and Valley (0 acres)	Interior Low Plateau (34,400 acres)	Mississippi River Alluvial Plain (0 acres)	Southern Blue Ridge (0 acres)	Upper East Gulf Coastal Plain (0 acres)			
Mussels									
Cumberland bean *(Villosa trabalis)*	E	X			X		Small rivers and streams in fast riffles with gravel or sand and gravel substrate. Currently, in Tennessee, occurs only in the Hiwassee River.	Two historical records in area inundated by the Dale Hollow Lake.	NA
Cumberland elktoe *(Alasmidonta atropurpurea)*	E/ XN	X					Small to medium-sized rivers in shallow flats or pools with slow current. Populations in 8 Cumberland River tributaries in Campbell, Fentress, Morgan, and Scott counties.	Range is outside the area of expected development, including experimental, non-essential populations.	NA
Cumberlandian combshell *(Epioblasma brevidens)*	E/ XN	X	X				Large creeks to large rivers with coarse sand to boulder-sized substrates, generally less than 1 meter (3 feet). Occurs in South Fork of the Cumberland River, and low numbers in Powell and Clinch rivers. Experimental population in Knox County	Range is outside the area of expected development, including experimental, non-essential populations.	NA
Fluted kidneyshell *(Ptychobranchus*	E						Primarily small rivers to large creeks in sand and gravel	Range is outside the area of expected	NA

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Cumberlands and SouthernRidge and Valley (0 acres)	Interior Low Plateau (34,400 acres)	Mississippi River Alluvial Plain (0 acres)	Southern Blue Ridge (0 acres)	Upper East Gulf Coastal Plain (0 acres)			
subtentum)							substrates. Currently in Claiborne and Hancock counties.	development.	
Littlewing pearlymussel *(Pegias fabula)*	E	X					Restricted to small, cool streams. Currently occurs in Scott and Van Buren counties.	Range is outside the area of expected development, including experimental, non-essential populations.	NA
Oyster mussel *(Epioblasma capsaeformis)*	E/ XN						Moderate to swift currents in large creeks and rivers; various substrates but rarely mud. Currently occurs in Lincoln, Marshall, and Trousdale counties.	Range is outside the area of expected development, including experimental, non-essential populations.	NA
Pink mucket *(Lampsilis abrupta)*	E	X	X				Large, fast-flowing rivers; can tolerate river-like impoundments but not standing water. Occurs in disjunct populations across the state.	Range is outside the area of expected development. Closest record is historical (1939) record 3 miles south of FMO at Standing Stone State Park.	NA

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Cumberlands and SouthernRidge and Valley (0 acres)	Interior Low Plateau (34,400 acres)	Mississippi River Alluvial Plain (0 acres)	Southern Blue Ridge (0 acres)	Upper East Gulf Coastal Plain (0 acres)			
Slabside pearlymussel *(Lexingtonia dolabelloides)*	E						Large creeks to moderate-sized rivers in relatively shallow riffles and shoals with moderate current. In Kentucky, the current range is in the Tennessee River system, outside of the main river.	Range is outside the area of expected development.	NA
Tan riffleshell *(Epioblasma florentina walkeri)*	E	X	X				Remnant populations in the Big South Fork Cumberland River and Hiwassee River in Marshall, Polk, and Scott counties.	Range is outside the area of expected development.	NA
Insects									
Fowler's cave beetle *(Pseudanophthalmus fowlerae)*	C		X				Cave obligate found in a single limestone cave in Clay County.	Single occurrence location is 1.7 miles east and upstream of of FMO at Dale Hollow Reservoir in area of expected development.	NA

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)					Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Cumberlands and SouthernRidge and Valley (0 acres)	Interior Low Plateau (34,400 acres)	Mississippi River Alluvial Plain (0 acres)	Southern Blue Ridge (0 acres)	Upper East Gulf Coastal Plain (0 acres)			
Inquirer cave beetle *(Pseudanophthalmus inquisitor)*	C		X				Cave obligate found in a single limestone cave in Clay County.	Single occurrence location is 1.7 miles east and upstream of of FMO at Dale Hollow Reservoir in area of expected development.	NA
Plants									
Cumberland sandwort *(Arenaria cumberlandensis)*	E	X					Restricted to shady, moist rockhouse floors, overhanging ledges in sandstone rock faces. Occurs in Fentress, Morgan, Pickett, and Scott counties on a variety of private and public lands.	Occurrence records are 18 miles southeast of FMO.	NA

3.7.6 Virginia Special Status Species

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)			Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Middle Atlantic Coastal Plain (0 acres)	Northern Cumberland Mountains (8,326 acres)	Northern Ridge and Valley (4,250 acres)			
Mammals							
Indiana bat *Myotis sodalis*	E		X	X	Foraging habitat in hardwood forests, forested wetlands and adjacent ponds and riparian areas. Hibernacula—caves, particularly limestone caves with pools. Summer roosts for reproductive females are primarily located under loose bark of dead trees. Maternal roosts occur in riparian zones, bottomland and floodplain habitats, wooded wetlands, and upland communities.	Potential to occur in suitable habitat in all the oil and gas area of expected development in Dickenson and Montgomery counties.	Meadowood tract is outside the known range.
Northern long-eared bat *Myotis septentrionalis*	P	X	X	X	Generally associated with old growth, intact interior forests. A variety of cave overhangs, tunnels, and mines used as hibernacula and roosts.	Potential to occur in suitable habitat throughout the area of expected development	Potential to occur in suitable habitat at Meadowood.
Virginia big-eared bat *Corynorhinus townsendii*	E		X	X	Foraging habitat in riparian hardwood forests and woodlands. Hibernacula and maternal roosts in caves, particularly in limestone karst areas.	Known hibernacula and summer roost caves are outside the oil and gas area of expected	Meadowood tract is outside the known range.

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)			Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Middle Atlantic Coastal Plain (0 acres)	Northern Cumberland Mountains (8,326 acres)	Northern Ridge and Valley (4,250 acres)			
virginianus						development, but are in adjacent counties.	
Birds							
Bald eagle *Haliaeetus leucocephalus*	D	X	X	X	Varied; typically associated with large water bodies; nests in tall trees with clear flight paths.	Potential to occur in suitable habitat at Flannagan Dam, but no occurrence records in vicinity.	There is potential to nest at Meadowood, particularly in the vicinity of Thompson Creek and Occoquan River. Two records less than 1 mile away in Massey Creek from 2002.
Insects							
Mitchell's satyr butterfly *Neonympha mitchellii mitchellii*	E			X	Restricted to calcareous sedge wetlands, usually true fens, sometimes sedges meadows in fen complexes. Larvae almost certainly feed on Carex. Occurs in southwestern Floyd and Patrick counties	Occurrence records in county adjacent to Radford Ammunition Plant, but not hydrologically connected. Considered potential habitat.	Meadowood is outside of the known range.

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)			Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Middle Atlantic Coastal Plain (0 acres)	Northern Cumberland Mountains (8,326 acres)	Northern Ridge and Valley (4,250 acres)			
Snails							
Virginia fringed mountain snail *Polygyriscus virginianus*	E		X		Very restricted range, known from bluffs on the New River in loose, damp dolomitic limestone talus.	Range is downstream, but outside of the area of expected development	Meadowood tract is outside the known range.
Plants							
Sensitive joint-vetch *Aeschynomene virginica*	T	X			Fresh to slightly brackish tidal river systems, within the intertidal zone where populations are flooded twice daily. In Virginia, populations occur along the Potomac, Mattaponi, Pamunkey, Rappahannock, Chickahominy, and James rivers and their tributaries.	Range is outside the oil and gas area of expected development.	Meadowood is within the known range of the species. However, Thompson Creek is not tidally influenced and not considered suitable habitat.
Small whorled pogonia *Isotria medeoloides*	T	X			Acidic soils, in dry to mesic second-growth, deciduous or deciduous-coniferous forests; typically with light to moderate leaf litter, an open herb layer	Range is outside the oil and gas area of expected development.	Meadowood is within the known range of the species. Surveys

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)			Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Middle Atlantic Coastal Plain (0 acres)	Northern Cumberland Mountains (8,326 acres)	Northern Ridge and Valley (4,250 acres)			
					(occasionally dense ferns), moderate to light shrub layer, and relatively open canopy. Isotria medeoloides frequently occurs on flats or slope bases near canopy breaks. Occurs in the Coastal Plain and Piedmont.		in 2004, 2008, 2009, and 2011 by Virginia Natural Heritage, observed none to date. Closest record is 4.3 miles north of Meadowood.
Smooth coneflower *Echinacea laevigata*	E	X		X	Formerly, a plant of prairie-like habitats or oak-savannas maintained by natural or Native American-set fires. Now, primarily occurs in openings in woods, such as cedar barrens and clear cuts, along roadsides and utility line ROWs, and on dry limestone bluffs. Usually found in areas with magnesium- and calcium-rich soils. Requires full or partial sun. Associated species include *Juniperus virginiana* and *Eryngium yuccifolium*.	Potential to occur on FMO in the oil and gas area of expected development in Montgomery County. Closest record is 1 mile northwest of Radford Ammunition Plant.	Meadowood tract is outside the known range.

Species	Federal Status	Ecoregion (Acres of FMO in the Area of Expected Oil and Gas Development)			Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts
		Middle Atlantic Coastal Plain (0 acres)	Northern Cumberland Mountains (8,326 acres)	Northern Ridge and Valley (4,250 acres)			
Virginia spiraea *Spiraea virginiana*	T		X	X	Along scoured banks of high-gradient streams or on meander scrolls, point bars, natural levees, and braided features of lower stream reaches. Soils are sandy, silty, or clay, and elevation range is 1,000 to 2,400 feet. In Virginia, occurrence records in western counties of Carroll, Dickenson, Grayson, and Wise.	Potential to occur on FMO in the oil and gas area of expected development in Dickenson County. Closest record at Flannagan Dam near the mouth of the Russell Fork.	Meadowood tract is outside the known range.

3.8 WILDLAND FIRE ECOLOGY AND MANAGEMENT

Fire is an inherent component of ecosystems and historically has played an important role in the promotion of plant succession and the development of plant community character. Forest fuels accumulate rapidly in pine stands and pose a serious threat from wildland fire. Control of fires has changed plant communities and resulted in conditions that may sustain large-scale fires when natural ignition of vegetation occurs. Prescribed fire is a method to reduce the accumulation of fuels and reduce the intensity and magnitude of wildland fires.

There are two wildfire seasons each year in the southeastern United States. The first wildfire season usually begins in late October with the first frost and hardwood leaf drop and runs through December. The second wildfire season usually begins in February and runs to mid-April or until spring green-up. These seasons vary from year to year, depending on rainfall, wind, and other weather factors. Wildfires in the South cause extensive damage and can be an avenue for decay in individual trees, weakening them and making them susceptible to insect disease and infestation (Southern Group of State Foresters 2004).

Traditional approaches to managing wildland fire in the South have included early detection, rapid initial attack, reliance on cooperators, prevention, and prescribed fire. For most of the 20th century, wildland fire suppression was the objective, including detecting wildland fires early; aggressively attacking wildland fires with the most resources available; and relying on local large landowner cooperators. More recently, prescribed fire has been used to reduce fuel loadings, but as the population in the South increases, liability concerns arise, causing a reduction in the number of acres burned. Most southern forests and associated species are adapted to regular wildland fire. However, changing land use practices, urban sprawl, land fragmentation, natural disasters such as hurricanes, increasing land values, population increases, and the transition from urban to rural populations result in fuel buildup and a need to increase fuels management and wildland fire activities (Southern Group of State Foresters 2004).

3.8.1 Arkansas Wildland Fire Ecology and Management

Fire plays a critical role in maintaining Arkansas' ecosystems. Over thousands of years, many natural habitats have evolved in Arkansas under the influence of periodic fire and are dependent on it. Restoration and maintenance of such fire-dependent habitats now requires prescribed burning. As the human population of the state has grown and fire has been increasingly excluded from natural lands, fire-dependent habitats have drastically declined. As a result, many unique plants and animals needing these habitats are declining. Prescribed fire is not implemented on BLM surface tracts in Arkansas but could be used as a management tool in the future.

Table 3-70 displays the number of wildland fires and associated acres in Arkansas. Arkansas' 10-year wildland fire average is 1,694 wildland fires for 31,019 acres. The highest occurrence in the last 10 years was in 2006 with 2,700 wildland fires and 75,506 acres. The fewest wildland fires occurred in the 2008 fire season. During 2008, Arkansas had 917 fires for 10,941 acres. The average wildland fire size is 18 acres (National Interagency Fire Center [NIFC] 2012).

Table 3-69. Arkansas Wildland Fires

Year	Number of Wildland Fires	Acres
2002	1,380	15,334
2003	1,751	25,446
2004	1,229	21,182

Year	Number of Wildland Fires	Acres
2005	1,891	26,317
2006	2,700	75,506
2007	1,290	32,212
2008	917	10,941
2009	1,125	19,229
2010	2,010	30,954
2011	2,645	53,065
TOTAL	**16,938**	**310,186**

Source: NIFC 2012

In Arkansas, there are 3.7 million wildland-urban (WUI) acres, which account for 4.2 percent of Arkansas. There are 835 communities at high risk and 53 communities at very high risk for wildland fire damage (Southern Group of State Foresters 2008).

3.8.2 Florida Wildland Fire Ecology and Management

Fire plays a critical role in maintaining Florida's ecosystems. This is largely because more lightning strikes occur per square mile in Florida than any other place in North America, and fire is one of the primary natural forces under which Florida's land ecosystems have developed. Before modern development, lightning-set fires frequently swept almost unimpeded across Florida's landscape. Of Florida's 44 land-based natural community types, 17 are dependent on periodic fire for their continued existence and 16 more benefit from an occasional fire. Without fire applied at appropriate frequencies and intensities, the structure and species composition of vegetation communities gradually changes. Prolonged fire exclusion could ultimately result in the loss of fire-dependent natural communities and the species that depend on them. Many of Florida's rare and endangered species of plants and animals are dependent on periodic fire for their continued existence. Prescribed burning of natural lands is known to increase abundance and health of many wildlife species, including native game species such as deer, turkey, and quail. Fire-dependent natural communities contain pyrogenic vegetation that promotes the spread of fire. Over time, hazardous fuels gradually accumulate, making the occurrence of fire increasingly likely (FDEP 2011).

Prescribed fire has been used as a management tool on the Jupiter Inlet Lighthouse ONA and Lathrop Bayou. Three prescribed burns at Jupiter Inlet Lighthouse ONA have been conducted since 1998 to restore a more natural fire regime in Florida scrub, a fire adapted fire plant community. The prescribed burn objective for the ONA is to improve wildlife habitat and reduce hazardous fuel loads in this Wildland Urban Interface. As of 2010, three burns, each about five acres, have been completed, totaling 17.3 acres or 34 percent of the 51 acres of the intact scrub acreage within the ONA.

A prescribed burn program was initiated at Lathrop Bayou with the first restoration burn in March 2007. The prescribed burn program is being used to restore an old growth stand of longleaf pine. Three prescribed burns have been conducted across the tract since 2007. Frequent, low-intensity prescribed burns benefit a host of fire-adapted species found at Lathrop Bayou, including the following federally listed species: red-cockaded woodpecker, Florida skullcap, white birds-in-the-nest, and Godfrey's butterwort.

Florida's wildland fire season is year-round, with the majority of activity occurring from December through July. Wildfires in the South cause extensive damage and can be an avenue for decay in individual trees, weakening them and making them susceptible to insect disease and infestation (Southern Group of State Foresters 2004).

Table 3-70 displays the number of wildland fires and associated acres in Florida. Florida's 10-year wildland fire average is 3,214 wildland fires for 164,109 acres. The highest occurrence in the last 10 years was in 2007 with 4,918 wildland fires for 578,346 acres. The fewest wildland fires occurred in the 2003 fire season. During 2003, Florida had 2,057 fires for 34,473 acres. The average wildland fire size is 51 acres (NIFC 2012).

Table 3-70. Florida Wildland Fires

Year	Number of Wildland Fires	Acres
2002	2,516	50,385
2003	2,057	34,473
2004	3,363	169,789
2005	2,189	35,922
2006	4,292	199,993
2007	4,918	578,346
2008	2,939	156,102
2009	2,797	124,401
2010	2,334	37,929
2011	4,736	253,746
TOTAL	**32,141**	**1,641,086**

Source: NIFC 2012

Arson, lightning, and escaped debris burns are the three most prevalent causes of wildland fire in Florida (Southern Group of State Foresters 2004). A rapidly expanding population has led to large and expanding areas of WUI across the state. There are 6.5 million WUI acres, which account for 7.3 percent of Florida. There are 4,903 communities at high risk and 8,799 communities at very high risk for wildland fire damage (Southern Group of State Foresters 2008).

3.8.3 Kentucky Wildland Fire Ecology and Management

There are no BLM tracts in Kentucky, and BLM does not manage wildland fire ecology on FMO.

3.8.4 Louisiana Wildland Fire Ecology and Management

Prescribed fire has been used as a management tool to restore fire-dependent ecosystems in Louisiana. The objective of prescribed fire in Louisiana is to reduce the invasion of exotic species and the succession to woody species in pitcher plant bogs, pine savannas, coastal prairies, marshes, and other natural plant communities of Louisiana (USGS 2000). The coastal prairie of Louisiana is one of the Southeast's most endangered ecosystems, with more than 99 percent of its historical range lost to human activities. Restoration and conservation efforts by multiple agencies are now focused on protecting what is left to

preserve this ecosystem's diversity of native plants and wildlife, including two endangered bird species. Before the area became settled, fire was a sustaining force on the coastal prairie. Fires set by lightning fed on the dormant grasses and kept trees in check, while the roots and bulbs of the native prairie plants remained unaffected by fire at the surface. Fire suppression practices, grazing and mowing, and fragmentation of the prairie landscape through agriculture and urban sprawl have all but eliminated wildfire as a dominant factor in the modern coastal prairie ecosystem (USGS 2000). Prescribed fire is not implemented on BLM surface tracts in Louisiana but could be used as a management tool in the future.

Table 3-71 displays the number of wildland fires and associated acres in Louisiana. Louisiana's 10-year wildland fire average is 1,619 wildland fires for 30,127 acres. The highest occurrence in the last 10 years was in 2011 with 2,965 wildland fires for 52,078 acres. The fewest wildland fires occurred in the 2003 fire season. During 2003, Louisiana had 773 fires for 18,147 acres. The average wildland fire size is 19 acres (NIFC 2012).

Table 3-71. Louisiana Wildland Fires

Year	Number of Wildland Fires	Acres
2002	1,139	25,942
2003	773	18,147
2004	1,211	25,575
2005	1,814	47,468
2006	2,256	42,712
2007	931	9,341
2008	1,359	17,332
2009	1,578	29,272
2010	2,166	33,401
2011	2,965	52,078
TOTAL	**16,192**	**301,268**

Source: NIFC 2012

Arson, lightning, and escaped debris burns are the three most prevalent causes of wildland fires in Louisiana. There are 3.8 million WUI acres, which account for 4.3 percent of Louisiana. There are 1,725 communities at high risk and 200 communities at very high risk for wildland fire damage (Southern Group of State Foresters 2008).

3.8.5 Tennessee Wildland Fire Ecology and Management

There are no BLM tracts in Tennessee, and BLM does not manage wildland fire ecology on FMO.

3.8.6 Virginia Wildland Fire Ecology and Management

Prescribed fire is used as a resource management tool in the ecosystems of Virginia to restore forest health (Virginia Prescribed Fire Council 2009). Historically, fire played a role in balancing forest habitats in the Appalachian Mountains, Allegheny Highlands, and other ecoregions throughout the commonwealth (The Nature Conservancy 2012). Fires create successional stages within grasslands, savannas, and

hardwood and pine forests, creating diverse food and habitat for wildlife species such as Bachman's sparrow. Longleaf pine, pitch pine, and table mountain pine forest depend on fire for reproduction. In Virginia, several rare plant species have been found to be fire dependent in their reproductive lifecycle. Prescribed fire was used to stimulate seed productive in one rare plant, Peter's Mountain Mallow, and it is suspected that other rare plants would benefit from prescribed fire for species health. Prescribed fire may help prevent the spread of invasive plant species by reducing fuel loads and preventing catastrophic wildfires (Virginia Department of Conservation and Resources 2012). Catastrophic wildfires can create areas of disturbance where invasive plant species can take hold and spread through ecosystems. Prescribed fire may also be used to control invasive species that are not adapted to fire, often in combination with other tools such as herbicides or mowing (Virginia Invasive Species Council 2005). Prescribed fire is not implemented on the Meadowood tract in Virginia but could be used as a management tool in the future.

Although wildland fires can and do burn during any month of the year, depending on weather conditions, Virginia normally has two main wildland fire seasons: a fall season during late October and November and a spring season during the months of March and April. Depending on weather conditions, both seasons can present very difficult wildland fire situations. Wildland fires in the South cause extensive damage and can be an avenue for decay in individual trees, weakening them and making them susceptible to insect disease and infestation (Southern Group of State Foresters 2004).

Table 3-72 displays the number of wildland fires and associated acres in Virginia. Virginia's 10-year wildland fire average is 1,038 wildland fires for 14,655 acres. The highest occurrence in the last 10 years was in 2002 with 1,729 wildland fires for 23,344 acres. The fewest wildland fires occurred in the 2003 fire season. During 2003, Virginia had 438 fires for 3,762 acres. The average wildland fire size is 14 acres (NIFC 2012).

Table 3-72. Virginia Wildland Fires

Year	Number of Wildland Fires	Acres
2002	1,729	23,344
2003	438	3,762
2004	923	5,587
2005	778	5,337
2006	1,315	19,989
2007	1,569	15,019
2008	1,221	40,653
2009	920	8,002
2010	847	7,698
2011	635	17,154
TOTAL	**10,375**	**146,545**

Source: NIFC 2012

There are 8.7 million WUI acres, which account for 9.8 percent of Virginia. There are 780 communities at high risk for wildland fire damage. There are no communities at very high risk for wildland fire damage (Southern Group of State Foresters 2008).

3.9 CULTURAL RESOURCES

Cultural resources are sensitive, irreplaceable resources with potential public and scientific uses, and are an important and integral part of our national heritage. Cultural resources constitute "a definite location of human activity, occupation, or use identifiable through field inventories (i.e., surveys), historical documentation, or oral evidence" (BLM-M-8110). The term "cultural resource" also includes "historic, or architectural sites, structures, or places with important public and scientific uses, and may include definite locations (i.e., sites or places) of traditional cultural or religious importance to specified social and/or cultural groups. Cultural resources are concrete, material places and things that are located, classified, ranked, and managed through the system of identifying, protecting, and utilizing for public benefit" (BLM-M-8110). Archaeological resources, a subset of cultural resources, are "any material remains of human life or activities that are at least 100 years of age, and that are of archaeological interest" as further defined in the Code of Federal Regulations (CFR) 43, section 7.3.

It is important to note that cultural resources on FMO tracts are the property of the surface owner. However, proponents seeking to access federal minerals underlying non-federal surface must comply with federal laws, regardless of surface ownership; this includes compliance with cultural resource laws on lands underlain by split-estate FMO. Because the FMO tracts have not been fully surveyed for cultural resources, the state-by-state discussions address the potential types of cultural resources that may be present, upon completion of an inventory prior to any surface disturbing activities. This section is not intended to be a complete history of man's use of the various state's or of the FMO tracts or BLM-administered surface tracts; it merely presents the different cultures that have used the area and may have left material remains as evidence of their occupation or use. This section also identifies the condition of cultural resource surveys, if such information is available.

The FMO tracts have not been fully surveyed for cultural resources in any of the states. Surveys are usually initiated on a project-specific basis, such as for oil and gas, coal mining, transportation, or water projects, to comply with the requirements of section 106 of the National Historic Preservation Act (NHPA), outlined in 36 CFR Part 800. As specified in 36 CFR 800.1(a), "the section 106 process seeks to accommodate historic preservation concerns with the needs of Federal undertakings through consultation among the agency official and other parties with an interest in the effects of the undertaking on historic properties. The goal of consultation is to identify historic properties potentially affected by the undertaking, assess its effects and seek ways to avoid, minimize or mitigate any adverse effects on historic properties." Surveys are also performed by academic institutions and by the BLM staff complying with section 110 of NHPA, although section 110 surveys are usually limited to BLM surface tracts.

Identified prehistoric or historical cultural sites, structures, or objects listed on or eligible for listing on the National Register of Historic Places (NRHP) are protected and managed as directed by 36 CFR 800. A cultural resource is considered eligible for listing in the NRHP if it is at least 50 years old, unless it is of exceptional historical significance; retains integrity of location, design, setting, materials, workmanship, feeling, and association; and has one or more of the following characteristics:

- Associated with events that have made a significant contribution to the broad patterns of history
- Associated with the lives of persons significant in its past
- Embodies the distinctive characteristics of a type, period, or method of construction
- Represents the work of a master, has high artistic values, or represents a significant and distinguishable entity whose components may lack individual distinction
- Yielded, or may be likely to yield, information important in prehistory or history (36 CFR 60.4).

Cultural resources found ineligible for the NRHP require no further archaeological work and are not protected by law. Sites identified as undetermined or unknown need additional work to determine the site's eligibility.

Under the Archeological Resources Protection Act of 1979 (ARPA) (16 U.S.C. Section 470hh), the nature and location of any archaeological resource cannot be disclosed to the public unless the federal land manager determines that such disclosure would provide further protection, and there is no risk of harm to the site. To adequately address the existing condition of these resources while protecting their importance, only the general types of resources are discussed herein.

A Class I Cultural Resources Inventory has been completed for the BLM-administered surface tracts in Arkansas, Florida, and Louisiana (Brockington 2009). This inventory contains additional detail concerning the cultural resources currently identified on these tracts, as well as the cultural affiliations associated with each tract.

3.9.1 Arkansas Cultural Resources

This section presents the current conditions of cultural resources on FMO and surface tracts in Arkansas. It also presents the general cultural time periods and the nature of the cultural resources that could associated with each of those periods that may be anticipated in Arkansas.

Prehistoric Period

The period before exploration and settlement of Arkansas by Europeans falls into the broad category of prehistory. Within this category, cultural resource site types are attributed to a range of culturally distinct chronological periods ranging from more than 10,000 years ago to the present day. The cultural time periods represented include Paleoindian, Archaic, Woodland, and Mississippian, with the Protohistoric categorization representing the aboriginal cultures of the historical period. Descriptions of the prehistoric periods and general types of cultural materials associated with each one are provided in Table 3-73 below. Cultural resources from these time periods may be present on BLM-administered FMO and surface tracts.

Table 3-73. Prehistoric Periods Present in Arkansas

Cultural Time Period	Timeframe	Characteristics
Paleoindian	10,000 BC—8,000 BC	This period is characterized by specialized nomadic hunters of now-extinct megafauna. Arkansas apparently was not inhabited by humans before about 10,000 BC. Occasional projectile points have been documented in the northwestern part of the state and in the Ouachita and Boston Mountains.
	Early Paleoindian	This period is characterized by fluted lanceolate points resembling western Clovis forms.
	Middle Paleoindian	This period is characterized by smaller fluted and unfluted points, such as Coldwater, Quad, Sedgewick, and Pelican.
	Late Paleoindian	This period is characterized by resharpened lanceolate corner- and side-notched forms, such as Dalton and San Patrice.
Archaic	8000 BC—600 BC	This period is marked by a shift in lifeways indicated by

Cultural Time Period	Timeframe	Characteristics
		development of a more complex material culture, localized habitat exploitation, and dramatic population increase; many tool forms appeared for the first time during this stage.
	Early Archaic	This period is characterized by a directional shift from highly curated tool forms associated with Paleoindian sites to highly expedient forms linked to Early Archaic corner- and side-notched assemblages; an increase in residential mobility, as indicated by greater numbers of expedient tools in Early Archaic assemblages.
	Middle Archaic	This period is characterized by more sedentary or semi-sedentary settlement system. Demarcated by the appearance of stemmed bifaces and greater reliance on aquatic resources.
	Late Archaic	This period is characterized by increased sedentism and the establishment of extensive trade networks. Evidence of plant domestication. Mound construction developed.
Woodland	600 BC—AD 900	This period is characterized by an increase in populations and sedentism, along with increasing intra- and extra-regional trade. Also developing social hierarchies, technological innovations in ceramics, and increased mound building.
	Early Woodland	This period is characterized by building burial mounds, including small mementos or offerings. Two Early Woodland cultures, Early Fourche Maline and Tchefuncte, have been defined in Arkansas.
	Middle Woodland	This period is characterized by increased site size and density, the appearance of large earthen mounds, the emergence of agriculture, the development of ceremonialism, and a complex inter-regional trade network.
	Late Woodland	This period was a continuation and an expansion of previous lifeways (e.g., agriculture, village occupation, and ceremonialism), but with advances in ceramics, including the appearance of cord-marked pottery and new temper. Some sites show supplementing hunting and foraging with the cultivation of chenopodium, maygrass, squash, and corn.
Mississippian	AD 900—AD1541	This period is characterized by permanent settlements, increased religious and social complexity, and greater dependency on agricultural practices. Throughout the Southeast, the most dramatic characteristics of this period are the construction of large fortified villages, and of flat-topped earthen mounds that are used in political and religious functions. Artifact assemblages during this period become more complex. Pottery is more diversified than during previous cultural periods; there are clear functional differences in form and quality. In southwestern Arkansas, the Caddo culture developed,

Cultural Time Period	Timeframe	Characteristics
		consisting of individual temple mound sites and associated dispersed family farmsteads. Towns were not fortified, and each family had its own fields. Houses were circular not square. In southeastern Arkansas, the Plaquemine culture continued to flourish by hunting, gathering, and fishing rather than by agriculture. Other parts of Arkansas that did not support land suitable for farming were locations where non-agriculturally based societies continued.
Protohistoric (Aboriginal Cultures of the Historical Period)		By the early 18th century, most southeastern groups were less populated and less organized than their ancestors. A combination of European diseases, warfare, and perhaps over-farming and drought contributed to the decline of Native American societies in this area. This period also saw the initial contacts between aboriginal populations and Europeans, and the subsequent displacement of aboriginal populations by European settlers.

Source: Brockington 2009.

Evidence of human occupation in Arkansas has been dated from the Paleoindian period. These sites are few but are very important. The Archaic period in Arkansas is better understood than the paleolithic but extensive research should be performed. Native American sites that date from the Historical period (Protohistoric) are sources of information from one of the most significant times in all of North American history. Historical properties or other cultural resources may be on one or more of the unsurveyed tracts.

Historical Period

The first recorded Europeans to enter Arkansas were Hernando DeSoto and his soldiers in 1541. DeSoto's expedition left many dead aboriginal warriors and empty food storehouses along a wide swath of his journey (Brockington 2009). French explorers Marquette and Jolliet encountered four villages of Quapaw Indians near the confluence of the Arkansas and Mississippi rivers in 1673 (Brockington 2009). "Contact between European explorers and the Native American population was sporadic until the French founded the Arkansas Post in 1686" (Department of Arkansas Heritage 2008, p 6). Quapaws became close allies of the French. The U.S. Government forced the Quapaws to give up their Arkansas land in 1818 and 1824. Two other major aboriginal groups affected by the European settlement were the Caddo and the Tunica. The Caddo lived in several tribal groups in southwestern Arkansas and nearby areas of Texas, Louisiana, and Oklahoma from AD 1000 to about AD 1800. Many Caddo gradually retreated with the oncoming European incursion. In the 1800s, most Caddo were forced to move first to Texas and then to reservations in Oklahoma. Tunica Indians in southeastern Arkansas were farmers. By the early 19th century, most joined the Biloxi Indians near Marksville, Louisiana.

In addition to interactions between European settlers and Native Americans, archaeological sites from the historic period may include rural and urban farmsteads, mines, and house sites, as well as associated refuse dumps. Examples may also include Civil War battlefields, German prisoner-of-war camps, Japanese-American relocation camps, industrial sites, or subsurface evidence of former landscape features (Department of Arkansas Heritage 2008, p 11). "No above-ground structural evidence is known to remain

of the Native American, French, or Spanish occupations of Arkansas. The majority of Arkansas' National Register listings are for historic properties built in the late nineteenth or early twentieth centuries" (Department of Arkansas Heritage 2008, pp 7-8).

Cultural Resource Sites

More than 31,500 historic resources have been surveyed and recorded, and more than 42,800 archaeological sites are listed in the files of the Arkansas Archeological Survey (Department of Arkansas Heritage 2008, p 6). It is important to note that these figures represent all the sites within Arkansas and are not limited to those on or within any defined distance from FMO tracts. While the precise number of inventoried cultural resource sites on specific FMO tracts within Arkansas is not known, numerous sites have been inventoried, and undoubtedly numerous others have yet to be identified. Difficulty in sorting the Arkansas cultural resources database and FMO identification also make the identification of specific trends in cultural resources difficult. Undoubtedly, more cultural sites will continue to be identified through inventory measures.

Not all the BLM's Arkansas surface tracts have been fully surveyed for cultural resources. However, many of the tracts included in this evaluation have been surveyed for cultural resources (Klinger and Kandare 1984, Pace 1999, and Spears and Johnson 2000). The tracts that have not been surveyed are in Baxter, Cleburne, Crawford, Searcy, Pike, and Van Buren counties. Tracts that have been surveyed are in Baxter, Fulton, and Searcy counties. Given the small size of some of the tracts, the presence of known sites will not be identified at the tract level, although that information is known and maintained as sensitive information as part of BLM's records.

Of the 23 surface tracts in Arkansas, five inventoried cultural sites were identified within the boundaries of three different surface tracts. Three of the sites are eligible for listing in the NRHP. One site is ineligible, and one site's eligibility status is unknown. In addition, 20 sites were identified within one mile of one of the BLM surface tracts; however, these sites would not be affected by BLM activities and management. Such sites could provide information on the potential for cultural sites on adjacent BLM surface tracts. It is important to note that the absence of an inventoried site does not equate to the absence of a cultural resource. It may be that the site has not been inventoried yet, or that the cultural resource was situated such that the inventory methods failed to identify the site.

The number of known cultural sites will continue to increase as new inventories are performed. The five sites currently identified will be monitored periodically, as funding and staffing allow, to review site condition and to ensure the site is protected from potential threats. Vandalism of the site or collection of cultural artifacts (i.e., unauthorized digging and "pothunting"), which are illegal under the ARPA, have occurred in the past. Cultural resource sites may also deteriorate from a variety of natural causes. Collectively, these agents may adversely affect known and currently unknown cultural resources.

3.9.2 Florida Cultural Resources

This section presents the current conditions of cultural resources on FMO and surface tracts in Florida. It also presents the general cultural time periods and the nature of the cultural resources that could be associated with each of those periods that may be anticipated in Arkansas.

Prehistoric Period

The period before exploration and settlement of Florida by Europeans falls into the broad category of prehistory. Within this category, cultural resource site types are attributed to culturally distinct

chronological periods that range from more than 10,000 years ago to the present day. The geographic and ecologic differences between Florida and much of the rest of the Southeast has resulted in a much broader array of cultures in the prehistoric period. The availability of more and different resources required changes technologically and socially compared with other cultures, which has resulted in a different representation of cultural categorizations, including Paleoindian, Archaic, Gulf Formational, Transitional, Okeechobee, St. Johns, Woodland, and Mississippian, with the Protohistoric categorization representing the aboriginal cultures of the historical period. Descriptions of the prehistoric periods and general types of cultural materials associated with each one are provided in Table 3-74 below. Cultural resources from these time periods may be present on BLM-administered FMO and surface tracts.

Table 3-74. Prehistoric Periods Present in Florida

Cultural Time Period	Timeframe	Characteristics
Paleoindian	10,000 BC—8000 BC	The Paleoindian period in Florida is predominately characterized by isolated finds of lanceolate or fluted projectile points and rarely an associated hearth or other feature. Little to no data concerning Paleoindian sites are reported for the coastal areas of Florida; however, a significant amount of information about the Paleoindian occupation of Gulf coastal Florida has been gathered through various excavations. A theory postulates that Paleoindian settlement focused on “oases” or more properly the concentration of wildlife in and around streams, springs, and karstic sinks. The distribution of Paleoindian sites throughout Florida reflects a settlement pattern in part shaped by very different environmental conditions than exist today. Most of the favored site locations of the late Pleistocene, such as along freshwater streams at the base of river valleys, are now submerged or covered with up to 300 meters (984 feet) of sediment. Because the ancient Paleoindian shoreline extends some 100 miles into the Atlantic and Gulf of Mexico, many Paleoindian sites are likely to be in locations not accessible by traditional survey techniques. By the end of the Paleoindian period, prehistoric populations were shifting from small, highly mobile bands to larger aggregates of increasingly localized base camps.
Archaic	8000 BC—1000 BC	The environment and physiology of Florida underwent pronounced changes due to climate amelioration. These alterations were interconnected and included a gradual warming trend, a rise in sea levels, and the spread of oak-dominated forests and hammocks throughout much of Florida. Consequently, population numbers and density increased.
	Early Archaic	Within northwest Florida, evidence of Early Archaic activities is infrequent, and it is suggested that settlement patterns during this time were similar to those of the Paleoindian period.
	Middle Archaic	Florida populace had developed a more sedentary, or semi-sedentary, settlement system wherein groups seem

Cultural Time Period	Timeframe	Characteristics
		to have established permanent habitation sites of larger size than had been formed previously.
	Late Archaic	This period is marked by the appearance of a few very large sites, such as Poverty Point in Louisiana, the establishment of extensive trade networks, increased sedentism, the widespread distribution of stemmed projectile points, and the development of ceramic technology. The influx of cultural groups appears to have coincided with the development of oyster and clam beds in nearby estuaries.
Gulf Formational	2000 BC–1000 BC	This period is primarily recognized as an intermediate stage of social and economic change; the rise and development of baked clay ceramic technology during which Archaic peoples learned the manufacture of stone and ceramic vessels. It is characterized by fiber-tempered plain and punctate wares. The late part of this period is characterized by disappearance of fiber-tempered ceramics and the rise of more decorative ceramic series.
Transitional Period	1000 BC—500 BC	After the Archaic period, the cultures of Florida continued to diversify. Researchers have generally divided south Florida into 3 different culture areas: Okeechobee (around the Okeechobee Basin), Caloosahatchee (the southwest coast and adjacent inland areas), and Glades (the rest of south Florida).
Okeechobee	750 BC—AD 1750	The Okeechobee period of south Florida is divided into 4 subperiods. Archaeologically, the subperiods are distinguished primarily by successive additions of new ceramic types to the overall assemblage, and perhaps an acceleration of shell midden accumulation because of population increase. Subsistence patterns, however, appear to remain consistent throughout the East Okeechobee I through IV periods. It appears that despite a growth in population size and frequency, plant domestication was not necessary because of the abundant resources from estuary and coastal areas that could be exploited through seasonal cycles of hunting, fishing, and gathering.
St. Johns	500 BC—AD 1565	The St. Johns period in central Florida encompasses the Woodland and Mississippian Periods in other regions of southeastern North America. Village sites reflect the increased sedentism of earlier occupations. As with the Transitional period, bone and shell tools dominate the assemblages. Excavations of canals and large ditches and the construction of earthen mounds occurred. These constructions appear to represent drainage control structures for the most part. However, ceremonial uses of the mounds also are evident. Coastal environment use, increased settlement density, and the use of domesticated species of indigenous and exotic plants

Cultural Time Period	Timeframe	Characteristics
		dominate this cultural period. Fully sedentary villages appear by late in the period.
Woodland	1000 BC—AD 900	Gathering and eventual domestication of native wild taxa. Planting and maintaining plots of land, initially through slash and burn horticulture but eventually, through more sophisticated crop management techniques, helped select for the development of more stable settle societies. Prehistoric Floridians profited from acquiring copper, stone, and ceramic items, and seem to have exceeded their neighbors to the east in the rapid development of ceremonialism. The period is generally marked by more sedentary lifestyle and more organized community structure.
	Early Woodland	Settlement patterns mainly center around maritime hammocks near tidal marshes and lagoons, with subsistence generally based on the exploitation of estuarine and maritime forest resources.
	Middle Woodland	Ecological changes created lower salinity levels in area bays, promoting the growth of marsh clams and a consequent increased exploitation of these clams by area populations.
	Late Woodland	Technological advances in ceramics. Revered members of society seemed to have had access to a special use or “cult pottery” that archaeologically is generally restricted to mound or mortuary contexts.
	Manasota Culture	Dominates the Woodland period for some coastal regions of Florida. Only a few sites are recorded. Because very little stone was available in the region, the people of the Manasota culture used a variety of coastal resources for tool production.
Mississippian	AD 900—AD1600	Typified by ceremonial centers with truncated temple mounds and open village plazas surrounded by scattered hamlets and camps. Regional chiefdoms developed that were associated with particular river valleys and that dominated trade networks throughout the Southeast. They became powerful regional polities commanding wide-ranging trade and social networks. These societies built earthwork mounds, presumably for use as ceremonial structures but that also exemplify significant social inequality. In the central peninsular Gulf coast, the Safety Harbor culture followed Manasota. The Safety Harbor culture resembles the Fort Walton culture in northwest Florida, but it is not a true Mississippian culture. Population densities remained relatively small compared with more northern populations. Ramped platform mounds, some rebuilt, have been found in association with burial mounds and ringed shell middens at the large coastal communities.

Cultural Time Period	Timeframe	Characteristics
Protohistoric (Aboriginal Cultures of the Historic Period)		With the arrival of the first Europeans, the southeastern polities began to break up. By the mid-1600s, Florida was inhabited by smaller populations of historically known tribal confederations such as the Yamasee, Calusa, Timucua, and Apalachee. Mound building ended and extreme social stratification declined, at least in part because of population displacement. It is likely that disease introduced by the Spanish, and later the English, was responsible for the elimination of a very large percentage of the population.

Source: Brockington 2009.

Adapting to changing climates and widely varying environments, Florida Indians spread to every part of the peninsula. Along the coasts and St. Johns River, shellfish constituted an important resource. Huge mounds of shell still attest to the presence of pre-European villages and towns. On the richer soils in the Florida Panhandle, farming people settled in villages and grew corn, beans, and squash. About 1,000 years ago, the well-known Mississippian chiefdoms began to construct large pyramids of earth, some more than 40 feet high, organized in regular patterns around a central plaza. The Florida landscape is rich with remains of their mounds, canals, plazas, villages, and other sites. (Florida Division of Historical Resources 2006).

Historic Period

Since its discovery in 1513 by Juan Ponce de Leon, Florida has been an arena of colonial rivalry among the French, Spanish, British, and Americans (Florida Division of Historical Resources 2006). The following sections provide a brief summary of the major sub-periods of the historic period.

First Spanish Period (AD 1528–1763): The first documented landing along the Atlantic Coast in the southeast United States was by Pedro de Salazar, sometime between 1514 and 1516. Although Spanish pilots had explored and mapped the Gulf coast since the early 16th century, the first Europeans to enter the Tampa Bay area were part of the ill-fated Narváez expedition in 1528. A Spaniard named Juan Ortiz was abandoned at Tampa Bay while looking for Narváez's ship. Ortiz was held captive in the town of Uzita, believed to be occupied by Indians derived from the Safety Harbor culture. Ortiz was later appointed as guard of the charnel house and provided descriptions of the town and its inhabitants. De Soto's expedition landed in 1539 in search of New World treasures of gold and silver. De Soto met with Ortiz, who had become an interpreter for the Indians at Uzita.

Following the initial settlement, the Spanish attempted to establish missions in La Florida to strengthen their military posts, contain the native populations, and bring Christianity to the people. The second Spanish entrada into the region occurred in 1567 when Menéndez arrived in the Bay of Tocobaga (known today as Old Tampa Bay) to establish a Jesuit mission. The mission of Tocobaga was abandoned in 1568 because of raids by hostile native groups.

Rivalry continued in Florida during this period among the English, French, and Spanish. English raids left Spain with a tenuous hold on military posts. Ultimately, the Seven Years War (1754–1763) resulted in the removal of French control and Spain's cession of Florida to England.

British Period (AD 1763–1781): With the Treaty of Paris in 1763, the British acquired Florida in exchange for Cuba. The British quickly colonized the area and built new military installations. Populations continued to live in the same manner as in previous times but with influences from Africa, the Caribbean, Europe, and Native American groups. Florida's loyalties were also divided during the American Revolution. East Florida remained loyal to the crown and was a haven for Loyalists. With the encouragement of French allies, Spain again defeated the English in east Florida.

Second Spanish Period (1781–1821): After the peace settlements of 1783, Florida was once again under official Spanish rule. During this period, the Spanish began to rebuild their colony as political pressures and economic problems in Europe continued. Florida's Native American population was declining considerably as a result of disease, slave raids, intertribal warfare, and attacks from a new group of Native Americans, the Seminoles. The Seminoles, descendants of Creek Indians, moved into Florida during the early 18th century to escape the political and population pressures of the expanding American colonies to the north.

American Period (1821–present): In 1821, Florida was officially transferred to the United States. There were several periods of unrest. As Florida passed through its territorial phase in the 1820s and 1830s, it remained essentially unpopulated and unsettled. What settlement there was stayed primarily in the north, from Pensacola in the west, through the new (1824) territorial capital in Tallahassee, to St. Augustine and Jacksonville in the east. During the Civil War, cattle from central Florida were driven north to feed the Confederates. In 1864, Union troops occupied Tampa. As a result of the increased military presence during the Spanish-American War of 1898, Florida obtained improved harbors, railroads, and military installations. Expansion and improvement continued rapidly in Florida in industry, timbering, cattle ranching, and citrus farming, especially following World War I.

Cultural Resource Sites

More than 150,000 archaeological sites or standing historical structures have been surveyed and recorded (Florida Division of Historical Resources 2006). It is important to note that these figures represent all the sites within Florida and are not limited to those on or within any defined distance from FMO tracts. While the precise number of inventoried cultural resource sites on specific FMO tracts within Florida is not known, numerous sites have been inventoried, and undoubtedly others that have yet to be identified. Undoubtedly, more cultural sites will continue to be identified through inventory measures.

Not all the BLM's Florida surface tracts have been fully surveyed for cultural resources. However, several of the tracts included in this evaluation have been surveyed for cultural resources. Given the small size of some of the tracts, the presence of known sites will not necessarily be identified at the tract level, although that information is known and maintained as sensitive information as part of BLM's records.

There are a few prominent historical resources on the Jupiter Inlet Lighthouse ONA and Egmont Key surface tracts. Both of these BLM surface tracts contain historical sites. President Franklin Pierce ordered the construction of Fort Jupiter Inlet Lighthouse Reservation in 1854 and Lt. George Meade, later Union General at the Battle of Gettysburg, was selected to design the structure. The Jupiter Inlet Lighthouse was completed in 1860; the resulting 108-foot brick tower was topped with a first-order Fresnel lens manufactured in Paris by Henry-LePaute. The light was first lit in 1860, although it was disabled during much of the Civil War by the assistant lighthouse keeper, a Southern sympathizer. Through the years, the site has served as one of the first U.S. Weather Bureau and Signal Stations, a U.S. Navy Wireless Station, Radio Compass Station, and a successful German U-boat tracking station during World War II. The Jupiter Inlet Lighthouse remains an active aid to navigation and is one of only 13 of the original First Order lenses still in use in the United States. Egmont Key has a unique natural and cultural history, including a lighthouse that has stood since 1858. During the 19th century, the island served as a camp for

captured Seminoles at the end of the Third Seminole War and was later occupied by the Union Navy during the Civil War. In 1898, as the Spanish-American War threatened, Fort Dade was built on the island and remained active until 1923 (Florida State Park Service 2010).

Of the 10 surface tracts in Florida, six cultural resource surveys have been conducted on BLM-administered surface tracts, although these surveys generally also included lands outside the BLM's tract. These surveys have identified three cultural sites within the boundaries of three different surface tracts. One of these identified sites is already listed in the NRHP, one has been determined to be potentially eligible, and the third has been recommended ineligible for listing. In addition, 28 sites were identified within one mile of one of the BLM surface tracts. Such sites could provide information on the potential for occurrence sites on adjacent BLM surface tracts; however, these sites are not and will not be affected by BLM activities and management. It is important to note that the absence of an inventoried site does not equate to the absence of a cultural resource. It may be that the site has not been inventoried yet, or that the cultural resource was situated such that the inventory methods failed to identify the site.

The number of known cultural sites will continue to increase as new inventories are performed. The three sites currently identified will be monitored periodically, as funding and staffing allow, to review the site condition and to ensure the site is protected from potential threats. Vandalism of the site or collection of cultural artifacts (i.e., unauthorized digging and "pothunting"), which are illegal under the ARPA, have occurred in the past. Cultural resource sites may also deteriorate from a variety of natural causes. Collectively, these agents may adversely affect known and currently unknown cultural resources.

3.9.3 Kentucky Cultural Resources

This section presents the current conditions of cultural resources on FMO in Kentucky. There are no BLM-administered surface tracts in Kentucky, so there is no discussion of cultural resources on such lands. This section also presents the general cultural time periods and the nature of the cultural resources that could be associated with each of those periods that may be anticipated in Kentucky. This section also identifies the condition of cultural resource surveys, as such information is available.

Prehistoric Period

The period before the Europeans' exploration and settlement of Kentucky falls into the broad category of prehistory. Within this category, cultural resource site types are attributed to a range of culturally distinct chronological periods ranging from more than 10,000 years ago to the present day. The cultural time periods represented include Paleoindian, Archaic, Woodland, and Late Prehistoric (Mississippian and Fort Ancient), with the Protohistoric categorization representing the aboriginal cultures of the historic period. Table 3-75 describes the prehistoric periods and general types of cultural materials associated with each. Cultural resources from these time periods may be present on FMO tracts.

Table 3-75. Prehistoric Periods Present in Kentucky

Cultural Time Period	Timeframe	Characteristic
Paleoindian	10,000 BC–8,000 BC	The earliest definitive archaeological remains of the first Americans in the Lower Ohio River Valley date to the Late Pleistocene glacial period about 12,000 years ago. Sites associated with these early groups are marked by the presence of well-crafted, lanceolate-shaped projectile points or knives with distinctive flake channels or "flutes" found on 1 or both sides.

Cultural Time Period	Timeframe	Characteristic
	Early Paleoindian	This period is characterized by fluted lanceolate points resembling western Clovis forms. Sites within Kentucky have been identified from this period, including open habitation sites.
	Middle Paleoindian	This period is characterized by smaller fluted and unfluted points, marked by increased diversity in fluted point styles. No sites of this nature have been identified in eastern Kentucky.
	Late Paleoindian	This period is characterized by resharpened lanceolate corner- and side-notched forms, such as Dalton.
Archaic	8,000 BC–1,000 BC	This period is marked by a shift in lifeways indicated by development of a more complex material culture, localized habitat exploitation, and dramatic population increase; many tool forms appeared for the first time during this stage.
	Early Archaic	This period marked a directional shift from highly curated tool forms associated with Paleoindian sites to highly expedient forms linked to Early Archaic corner- and side-notched assemblages, and an increase in residential mobility, as indicated by greater numbers of expedient tools in Early Archaic assemblages.
	Middle Archaic	This period is characterized by a more sedentary or semi-sedentary settlement system. Middle Archaic sites along the Ohio River drainage and elsewhere included large base camps used as long-term, perhaps even year-round, residential sites. Although the Middle Archaic period is poorly understood in Kentucky, it is generally recognized as a period of intensive regionalization when groups began to exploit a wider range of local subsistence resources.
	Late Archaic	During the Late Archaic period, the number of prehistoric sites scattered across the Kentucky landscape increased dramatically. The diversity of those sites present in the landscape also increased.
Woodland	600 BC–AD 900	This period is generally demarcated by the introduction of ceramic pottery. Many trends initiated in the Late Archaic period, such as increased social complexity and a greater reliance on native cultigens, continued into the Woodland period.
	Early Woodland	Large midden sites are located in the alluvial valleys and smaller resource procurement sites are found scattered throughout the landscape. Large burial mounds with log tombs, along with an assortment of high-status grave goods characterized this ceremonial complex. Evidence also exists for widespread horticulture.
	Middle Woodland	This period is characterized by increased site size and density, the appearance of large earthen mounds, the emergence of agriculture, the development of

Cultural Time Period	Timeframe	Characteristic
		ceremonialism, and a complex inter-regional trade network.
	Late Woodland	The major technological change in the Late Woodland period was the introduction of the bow and arrow. Increasing regional variability of stylistic motifs on ceramic pottery increased throughout the Late Woodland period. Subsistence/settlement strategies continued the trend toward increased sedentism.
Late Prehistoric	Mississippian	AD 900–AD 1700: The intensive horticulture of the Late Woodland period was replaced by intensive agriculture based on maize, beans, and squash. Large Mississippian sites are best documented in western Kentucky and the Lower Ohio River Valley.
	Fort Ancient	AD 900–AD 1700: The Fort Ancient culture bore many similarities to its Mississippian counterpart further downriver. However, its subsistence strategies still incorporated some level of horticulture and were augmented by hunting. There is little evidence to suggest that Fort Ancient societies were organized along the lines of a chiefdom or for that matter, even significantly hierarchical.
Protohistoric (Aboriginal Cultures of the Historic Period)		This period begins when the first indirect effects of the European presence were felt by native cultures, roughly AD 1540. The beginning date was selected based on journals of the 1540s De Soto expedition, which observed that trade goods and European disease were in the area before the expedition's arrival. Over the next few hundred years, several other explorers traveled through the area. Disease increasingly reduced native populations all over the central and eastern parts of the continent during this period. In this region, epidemics are documented from the last decades of the 1500s and into the mid-1600s. With the introduction of European diseases and Iroquois pressures in the Ohio Valley, depopulation of the area appears to be evident. However, few archaeological site data from this period have been investigated, making this claim difficult to assess.

Source: Brockington 2009.

Historic Period

Precisely when the first European explorers arrived in the Ohio Valley is uncertain. It is possible that some French trappers, traders, and priests traversed parts of the region during the late 17th and 18th centuries, but the first successful English expedition did not occur until 1742 (Kentucky Heritage Council 2003). Eruption of the French and Indian War in January 1754 squelched further exploration and settlement efforts until after the signing of the Treaty of Paris in 1763 passed control of the Ohio Valley to the British (Kentucky Heritage Council 2003). Following the treaty, exploration and settlement

proceeded regularly, although several small battles occurred between the British and Americans, as well as between European settlers and Native Americans. Initially, European American settlers came primarily from the Virginia colony, of which Kentucky was a part (Kentucky Heritage Council 2003). Throughout the 19th century, Kentucky continued to receive waves of immigrants. Most early Kentuckians practiced agriculture in the 19th and 20th centuries, although the commonwealth began to urbanize in the early-to-mid 20th century (Kentucky Heritage Council 2003).

Cultural Resource Sites

More than 50,000 historic properties have been surveyed and recorded, and more than 22,000 archaeological sites are listed in Kentucky's Archeological Sites Inventory (Kentucky Heritage Council 2003). As a result of ongoing inventories, about 800 new sites are documented annually (Kentucky Heritage Council 2003).

Although the exact number of inventoried cultural resource sites on specific FMO tracts within Kentucky is not known, numerous sites have been inventoried; undoubtedly, numerous others that have yet to be identified. Difficulty in sorting the Kentucky cultural resources database and FMO identification also make the identification of specific trends in cultural resources difficult. Undoubtedly, more cultural sites will continue to be identified through inventory measures. Vandalism of the site or collection of cultural artifacts (i.e., unauthorized digging and "pothunting"), which are illegal under the ARPA, have occurred in the past. Cultural resource sites also may deteriorate from various natural causes. Collectively, these agents may adversely affect known and currently unknown cultural resources.

3.9.4 Louisiana Cultural Resources

This section presents the current conditions of cultural resources on FMO and surface tracts in Louisiana. It also presents the general cultural time periods and the nature of the cultural resources that could be associated with each of those periods that may be anticipated in Louisiana.

Prehistoric Period

The period before exploration and settlement of Louisiana by Europeans falls into the broad category of prehistory. Within this category, cultural resource site types are attributed to a range of culturally distinct chronological periods ranging from more than 10,000 years ago to the present day. The cultural time periods represented include Paleoindian, Archaic, Poverty Point, Tchula, Marksville, Troyville/Coles Creek, and Caddo/Plaquemine, with the Protohistoric categorization representing the aboriginal cultures of the historical period. Descriptions of the prehistoric periods and the general types of cultural materials associated with each are provided in Table 3-76. Cultural resources from these time periods may be present on BLM-administered FMO and surface tracts.

Table 3-76. Prehistoric Periods Present in Louisiana

Cultural Time Period	Timeframe	Characteristics
Paleoindian	10,000 BC–8,000 BC	Based on radiocarbon dates from the Avery Island salt dome coastal site, the Paleoindian occupation of Louisiana is dated as beginning circa 10,000 BC The period is characterized by fluted, lanceolate-shaped projectile points largely made from non-local sources, lithic scatters, and a low population density. Within the Red River region, these Paleoindian finds are limited

Cultural Time Period	Timeframe	Characteristics
		and largely restricted to the Pleistocene terraces and older floodplain terrace remnants. Further cultural evidence is lacking.
Archaic	8,000 BC–500 BC	This period is marked by a shift in lifeways indicated by development of a more complex material culture, localized habitat exploitation, and dramatic population increase; many tool forms appeared for the first time during this stage
	Early Archaic	This period is characterized by indications that the early Archaic peoples were becoming more regional and making temporary encampments, possibly base camps. New, smaller, regional projectile points were produced alongside earlier Paleoindian styles, and lithic artifacts were beginning to be made primarily from locally available cherts. Early Archaic culture is poorly documented in Louisiana.
	Middle Archaic	This period's "distinctive" projectile points are documented well into the Late Archaic and even the neighboring cultural areas are only generally sequenced. Whether people were living in permanent or semi-permanent locations is still being debated, but the first earthen mounds were being constructed, middens were accumulating on the floodplains, and humans were being buried with grave goods. Populations slowly increased with a trend toward increasing exploitation of riverine resources.
	Late Archaic	This period continues the region's trends toward seasonally occupied, semi-permanent settlements, greater population densities, and extensive trade networks. Hunting and gathering practices apparently intensified, and horticulture was introduced on a limited scale with exotic cultigens, such as squash, being introduced.
Poverty Point	2,000 BC–1,000 BC	Poverty Point is viewed by some as a transitional culture bridging Archaic and Tchefuncte times, and by others as a Late Archaic climax. The main site at Poverty Point surpassed any earthwork complex previously existing in the New World. The transition from the small, dispersed settlements into a large community occupying 1 place for a long period of time marks an important change in settlement systems in the Lower Mississippi Valley.
Tchula	500 BC–AD 1	Identified by its distinctive laminated paste pottery, the Tchefuncte culture was largely a continuation of the Late Archaic lifestyle and the decline of the Poverty Point culture. In Louisiana, sites are found principally in "slack water environments," ranging from the coastal to southern central regions, and are found rarely in the northwestern portion of the state. The Tchefuncte artifact inventory remained basically Late

Cultural Time Period	Timeframe	Characteristics
		Archaic in nature.
Marksville	AD 1–AD 400	This period is characterized by the construction of conical mounds, an intensification of human interments, increased ceremonialism, and a "reemphasis on interregional exchange" as Louisiana's populations were drawn into the Hopewell Interaction Sphere. As with the earlier Poverty Point culture, there is no evidence that increased societal complexity caused any change in subsistence pattern during this era. Selected individuals were buried in specially prepared vaults or on clay platforms in conical burial mounds, accompanied by rich grave goods.
Troyville-Coles Creek	AD 400–AD 1,200	Populations continued to increase throughout the period and, although initially confined to the uplands and stable floodplains, eventually began occupying more diverse locations to exploit more varied means of subsistence. Horticultural experimentation continued with the introduction of new cultigens, and the introduction of the bow and arrow provides further evidence of the expansion of subsistence patterns. The construction of large earthen platform mounds began and continued throughout this and the succeeding period, arguably evincing the development of chiefdom-level societies. Coastal traditions appear to be quite different from inland patterns, with different ceramic designs and increasing use of shellfish as a food source.
Caddo/Plaquemine	AD 800–AD 1700	Subsistence practices were slightly different. Although hunting and gathering remained a part of the subsistence strategy, the people were agriculturalists growing both cultigens and native seed crops. Evidence suggests that the Caddoan peoples had abandoned mound building and "any vestiges of the former ceremonial complexes" prior to European contact. The Caddoan populations had begun to decline shortly after de Soto's expedition reached Louisiana in 1542. Some of the villages visited by de Soto were completely abandoned before 1700, replaced by large towns in present-day Mississippi. It has been suggested that this decline was the result of an "extreme drought," which began in 1350, and the introduction of European diseases.
Protohistoric (Aboriginal Cultures of the Historic Period)		The first contact between Louisiana's Native Americans and Europeans evidently occurred during DeSoto's entrada in the 1540s. Unfortunately, this expedition left few traces, and the documentary evidence that exists makes it difficult to pinpoint the route. In retrospect, the main impact of the Spanish incursion was the introduction of new diseases that evidently devastated large portions of the native population. No further contact occurred with

Cultural Time Period	Timeframe	Characteristics
		Europeans until the exploration of LaSalle and his successors starting in 1682, which marks the beginning of the historic contact period.

Source: Brockington 2009; Louisiana Department of Culture, Recreation and Tourism 2008.

In summary, evidence of human occupation in Louisiana has been dated from the Paleolithic period. There are only a few sites, but they are historically important. Recent research has revealed that some of the great engineering efforts of mounds and earthworks probably began during the Archaic period, much earlier than previously suspected. Historic Native American occupation sites reveal information from one of the most tumultuous times in North American history. The potential exists for historic properties or other cultural resources to be on one of these tracts.

Historical Period

Most historians date the beginning of the historical period in Louisiana at 1682 (Louisiana Department of Culture, Recreation, and Tourism 2008). Historically, Louisiana is one of the principal centers of French civilization in the New World. Several successive waves of immigration increased the population, including more immigrants from France and large numbers from Germany. Near the end of Europe's Seven Years War, France ceded portions of Louisiana to Spain (in 1762) (Louisiana Department of Culture, Recreation, and Tourism 2008). After 38 years, during the Napoleonic Wars, Spain ceded the Louisiana territory back to France, which in 1803, sold this vast area to the United States. Following this, there were several trends that changed the cultural makeup of the area: (1) an ever-increasing number of Anglo-Americans from the eastern states; (2) growth and prosperity of the plantation system; (3) settlement of the northern part of the state by Scots Irish Uplanders, and (4) increasing exploitation of the state's vast network of rivers and bayous for commerce (Louisiana Department of Culture, Recreation, and Tourism 2008). Because of items two and four in the list, Louisiana held strategic importance during the Civil War, represented by the creation of several Confederate military camps. Several battles ensued and within one year, Louisiana was severely crippled (Louisiana Department of Culture, Recreation, and Tourism 2008). Following reconciliation, which took until 1877 when statehood was restored, Louisiana experienced a wave of industrialization (Louisiana Department of Culture, Recreation, and Tourism 2008). Associated construction of railroads opened more of the state to settlement and to harvesting of the vast timber resources. At the start of the 20th century, the discovery of oil led to an additional influx of people and to industrialization (Louisiana Department of Culture, Recreation, and Tourism 2008).

The major turning points noted above within the Louisiana historical period do not include dozens of minor events that also contributed to the area's cultural history. Each of these activities provided an opportunity for the evidence of development to be reflected in the archaeological record.

Cultural Resource Sites

Nearly 15,000 archaeological sites have been recorded since the first such report in 1804 (Louisiana Department of Culture, Recreation, and Tourism 2008). It is important to note that these figures represent all the sites within Louisiana and are not limited to those on or within any defined distance from FMO tracts. Louisiana cultural resources data are not in a format to make such queries in a timely manner. Although the precise number of inventoried cultural resource sites on specific FMO tracts within Louisiana is not known, there are numerous sites that have been inventoried and undoubtedly numerous others that have yet to be identified. Difficulty in sorting the Louisiana cultural resources database and FMO tract identification also make identification of specific trends in cultural resources difficult.

Only one cultural resources survey has been completed on the four surface tracts in Louisiana. This survey did not identify any cultural resource sites on the surface tract. However, these tracts have a potential for sites of human occupation. Some of these sites may have significant value and may be eligible for listing on the NRHP.

In addition, three of the surface tracts had four inventoried sites within one mile of one of the tracts. Such sites could provide information on the potential for occurrence of sites on adjacent BLM surface tracts; however, these sites are not and will not be affected by BLM activities and management. One of the surface tracts contained no inventoried sites and did not have any inventoried sites within one mile. It is important to note that the absence of an inventoried site does not equate to the absence of a cultural resource. It may be that the site has not yet been inventoried or that the cultural resource was situated so that the inventory methods failed to identify the site.

The number of known cultural sites will continue to increase as new inventories are performed. The sites that already have been identified will be monitored periodically, as funding and staffing allow, to review the site condition and ensure the site is protected from potential threats. Vandalism of a site and collection of cultural artifacts (i.e., unauthorized digging and "pothunting"), which are illegal under the ARPA, have occurred in the past. Cultural resource sites also may deteriorate from a variety of natural causes. Collectively, these agents may adversely affect known and unknown cultural resources.

3.9.5 Tennessee Cultural Resources

This section presents the current conditions of cultural resources on FMO in Tennessee. There are no BLM-administered surface tracts in Tennessee, so there is no discussion of cultural resources on such lands. This section also presents the general cultural time periods and the nature of the cultural resources that could be associated with each of those periods that may be anticipated in Tennessee. This section also identifies the condition of cultural resource surveys, as such information is available.

Prehistoric Period

The period before exploration and settlement of Tennessee by Europeans falls into the broad category of prehistory. In this category, cultural resource site types are attributed to a range of culturally distinct chronological periods ranging from more than 10,000 years ago to the present day. The cultural time periods represented include Paleoindian, Archaic, Woodland, and Mississippian, with the Protohistoric categorization representing the aboriginal cultures of the historic period. Table 3-77 provides descriptions of the prehistoric periods and general types of cultural materials associated with each one. Cultural resources from these time periods may be present on FMO.

Table 3-77. Prehistoric Periods Present in Tennessee

Cultural Time Period	Timeframe	Characteristics
Paleoindian	10,000 BC–8,000 BC	Archaeological research conducted throughout eastern Tennessee has shown that the first occupation of the area by Native Americans occurred at least 12,000 years ago. The Paleoindians of eastern Tennessee and the rest of North America were nomadic hunters and gatherers. Most of what is known of Paleoindian subsistence and settlement is based on the analysis of lithic materials found at these rare sites and from inferences based on the analysis of site patterning.

Cultural Time Period	Timeframe	Characteristics
		Paleoindian sites occur most frequently in the Western Valley and Interior Low Plateaus of Tennessee and occur less frequently in eastern Tennessee, where most sites consist of only surface scatters.
Archaic	8,000 BC–900 BC	This period represents a time of adaptation and change for Native American peoples adjusting to a post-Pleistocene environment. Marked by a shift in lifeways indicated by development of a more complex material culture, localized habitat exploitation, and dramatic population increase, this stage saw the appearance of many tool forms for the first time.
	Early Archaic	Early Archaic sites in eastern Tennessee are relatively common in a variety of topographic settings, suggesting a fairly large and mobile population. The best defined sites located in the area have been those preserved in highly stratified alluvial sites in the lower Little Tennessee River Valley. These riverine sites generally lack evidence of permanent structures, but activity areas are common and include site furniture set around prepared clay hearths. Sites located in the upland areas of eastern Tennessee appear to represent both field camps and occasional base camps—the latter of which are smaller and generally contain fewer, less diversified artifacts.
	Middle Archaic	One of the most notable changes in settlement patterning is an increase in riverine sites during this period. Along with the movement of settlements closer to the river, a significant increase in riverine tools is seen, suggesting a focus on riverine resources. In eastern Tennessee, Middle Archaic sites are not as common as sites representing the Early and Late Archaic periods.
	Late Archaic	The Late Archaic period in eastern Tennessee, and elsewhere in the eastern United States, is characterized by an even more sedentary lifestyle as well as an increasing variety of projectile point forms. The trend toward a sedentary lifestyle is seen through the construction of the first permanent structures as well as evidence of the first domestication of plants, such as squash, gourd, chenopod, and sunflowers.
Woodland	900 BC–AD 900	The Woodland period is characterized by the increasing elaboration of trends that were present at the end of the Archaic period, such as increasing sedentism, heightened cultural complexity and social exchange, intensified cultivation of plants, and, most notably, the widespread use of ceramic technology.
	Early Woodland	This period is characterized by the introduction of ceramics and the beginning of ceremonial mortuary patterns. These ceramics are predominantly fabric impressed or cord marked and conical in shape. This period also sees a marked shift to more permanent settlements at major river locations.

Cultural Time Period	Timeframe	Characteristics
	Middle Woodland	Initially, the Middle Woodland period's settlement patterns do not differ much from the Early Woodland. Structures were semipermanent and found in dispersed patterns along with storage pits, shallow basins, and a few burials. However, the period is characterized by single-family base camps emerging toward a village settlement pattern.
	Late Woodland	The Late Woodland period in eastern Tennessee was initially characterized by the construction of conical or round burial mounds and the predominance of limestone-tempered pottery. The settlement patterns of this period are based around burial mounds placed on higher terraces with loosely organized households along the riverbank. However, no well-defined habitation sites have truly been excavated from this period.
Mississippian	AD 900–AD 1,600	This period is marked by the appearance of chiefdom-level sociopolitical organization and permanent fortified villages with platform mounds and other earthworks. Large villages were located in bottomlands to take advantage of the fertile soils at these locations. The fertile soils found at these sites were used in the new primary reliance on horticulture for subsistence. Copper, exotic cherts, and marine conch shells were often used for the production of special ceremonial items that symbolically expressed elements of Mississippian myth and ritual. During the 15th century AD, the large Mississippian villages that reached their apex in the Dallas phase underwent rapid changes that would eventually bring to an end the chiefdom societies built throughout the period.
Protohistoric (Aboriginal Cultures of the Historic Period)		After the unsuccessful attempts at colonization by the Spanish, Tennessee passed into unrecorded obscurity for the next 100 years. The native peoples were left relatively unscathed by further European contact during this time. During the mid-1700s, Europeans began trading with the Cherokee, and Fort Loudon was built on the Little Tennessee River. With the increasing numbers of Europeans entering the Cherokee land, tensions quickly began to rise between the 2 cultures. When the American Revolution began, the Cherokee actively sided with the British, causing further deterioration in relations with the newly formed American government. Between 1777 and 1782, a series of raids on Overhill towns caused the complete Cherokee abandonment of upper-eastern Tennessee. After this, more conflict, disease, and migration further decimated the Cherokee population in eastern Tennessee.

Source: Brockington 2009.

Historical Period

"Though hunters or traders did probably enter the area, the first thoroughly documented accounts of European encroachment begin in 1673 with the arrival of the British in the east and the French in the west. This also marks the beginning of sustained settlement by Europeans in the Tennessee area" (Brock et al. 2008). As the struggle for control of North America progressed, the frontier, including Tennessee, became of prime interest as a staging ground for the conflict. The frontier led to military incursions into Tennessee by the French and English to gain territory and allies (Brock et al. 2008). With the end of the French and Indian War, the English restricted settlement west of the Appalachian Mountains with the Proclamation Line of 1763 (Brock et al. 2008). However, this did not stop land prospectors, settlers, and explorers from entering the area. The first permanent Euro-American settlements were not established in eastern Tennessee until the late 18th century. Until that time, the only Europeans who visited the area were traders, explorers, and "long hunters" (Brockington 2009).

During much of the 19th and early 20th centuries, most of the residents of Tennessee were employed in small farm operations. Fishing and canning were some of the first industries to enter the area. One industry that has been present in Tennessee since its inception is the iron-refining industry. One of the earlier iron-refining sites in Tennessee was the Cumberland Furnace on Barton's Creek, dating to 1795 (Brock et al. 2008). After Tennessee declared statehood, settlement and industrial development increased. The State of Tennessee remained divided during the Civil War. In Tennessee, at least 1,700 battles and skirmishes were fought—more than any other state except Virginia (Wren et al. 2008). Preparations for, evidence of, and fortifications against such battles left a large number of historic archaeological sites. With the onset of World War II, the Tennessee Valley Authority began to build dams throughout eastern Tennessee under the World War II Emergency Program.

Cultural Resource Sites

More than 142,000 eligible historical structures have been surveyed and recorded (Tennessee Historical Commission 2003). "Probably less than two percent of the state area has been field checked for archeological sites. There are at present approximately 20,000 sites recorded in the Division of Archeology's site files" (Tennessee Historical Commission 2003).

Although the exact number of inventoried cultural resource sites on specific FMO tracts in Tennessee is unknown, numerous sites have been inventoried and, undoubtedly, numerous others have yet to be identified. Difficulty in sorting the Tennessee cultural resources database and FMO identification also make the identification of specific trends in cultural resources difficult. Undoubtedly, inventory measures will continue to identify more cultural sites. Vandalism of the site or collection of cultural artifacts (e.g., unauthorized digging and "pothunting"), which are illegal under the ARPA, have occurred in the past. Cultural resource sites may also deteriorate from a variety of natural causes. Collectively, these agents may adversely affect known and currently unknown cultural resources.

3.9.6 Virginia Cultural Resources

This section presents the current conditions of cultural resources on FMO and surface tracts in Virginia. It also presents the general cultural time periods and the nature of the cultural resources that could be associated with each of those periods that may be anticipated in Virginia.

Prehistoric Period

The period before exploration and settlement of Virginia by Europeans falls into the broad category of prehistory. In this category, cultural resource site types are attributed to a range of culturally distinct chronological periods ranging from more than 16,000 years ago to the present day (Virginia Department of Historic Resources 2001).

"The Commonwealth's resources illuminate thousands of years of Native American culture, mark the birth of a new nation, and represent the homes of the nation's founders, battlegrounds of both the American Revolution and Civil War, and public and private architecture that embodies the dynamic forces of immigration, frontier, economic, and industrial revolution, and growth" (Virginia Department of Historic Resources 2001).

The period before exploration and settlement of Virginia by Europeans falls into the broad category of prehistory. In this category, cultural resource site types are attributed to a range of culturally distinct chronological periods ranging from more than 10,000 years ago to the present day. The cultural time periods represented include Paleoindian, Archaic, Woodland, and Late Prehistoric, with the Protohistoric categorization representing the aboriginal cultures of the historic period. Table 3-78 provides descriptions of the prehistoric periods and general types of cultural materials associated with each one. Cultural resources from these time periods may be present on FMO tracts.

Table 3-78. Prehistoric Periods Present in Virginia

Cultural Time Period	Timeframe	Characteristics
Paleoindian	10,000 BC–8,000 BC	This period is characterized by specialized nomadic hunters of now-extinct megafauna. While concentrating on hunting various large game, people from this time period also foraged for locally available foods. Paleoindian refers to the small bands of nomadic people who first populated North America. After crossing the large expanse of land that appeared between Alaska and Siberia during the last glacial period, they kept traveling until some of them had reached as far as the southern tip of South America and as far east as Virginia. Paleo Indian sites are often found on the outskirts of what previously were large bodies of water, such as old glacial lakes and rivers. Currently, however, very little known is about the everyday life of the people. Paleoindian artifacts in Virginia are rare and when identified can provide important information on population distributions and use patterns.
Archaic	8,000 BC–600 BC	This period represents a time of adaptation and change for Native American peoples adjusting to a post-Pleistocene environment. Marked by a shift in lifeways indicated by development of a more complex material culture, localized habitat exploitation, and dramatic population increase, this stage saw the appearance of many tool forms for the first time.
	Early Archaic	Archaeological sites from the Early Archaic period are usually small and tend to consist of fire hearths as well as charcoal and rock concentrations. These sites are

Cultural Time Period	Timeframe	Characteristics
		likely the result of small, mobile groups of people using areas for short periods of time. During the Early Archaic, people began notching their projectile points, probably as an aid in attaching the point to a wooden shaft.
	Middle Archaic	By the Middle Archaic, modern-day climatic and environmental conditions had been reached, and prehistoric peoples had adopted more efficient ways to exploit a wide range of plants and animals; again, people change their tools. For, example, archaeologists begin to find pitted (or nutting) stones, which may indicate an increase in the use of nuts and seeds. Other artifacts, such as stones used to grind up wild grains and wood working tools, are also found.
	Late Archaic	The appearance of large storage pits during the Late Archaic period suggests that people were starting to live in semi-permanent base camps. Increasing amounts of squash, gourd, pigweed, and sunflower remains indicate that Late Archaic peoples were practicing some form of horticulture in addition to hunting and gathering a variety of wild animals and plants. At sites from this period, archaeologists begin to find fragments of bowls made from soft rocks called steatite and soapstone—some of the earliest evidence that prehistoric peoples were using vessels or containers.
Woodland	600 BC–AD 900	The Woodland period is characterized by the increasing elaboration of trends that were present at the end of the Archaic period, such as increasing sedentism, heightened cultural complexity and social exchange, intensified cultivation of plants, and, most notably, the widespread use of ceramic technology. There is also the appearance of complex mortuary practices, long-distance trade networks, the construction of burial mounds and other earthworks, and the rise of agriculture.
	Early Woodland	This period is characterized by the introduction of ceramics and the beginning of ceremonial mortuary patterns. These ceramics are predominantly fabric impressed or cord marked and conical in shape. This period also sees a marked shift to more permanent settlements at major river locations. The Early Woodland period includes similarities observed in burial practices and mound construction throughout the region.
	Middle Woodland	Initially, the Middle Woodland period's settlement patterns do not differ much from the Early Woodland. Structures were semipermanent and found in dispersed patterns along with storage pits, shallow basins, and a few burials. However, the period is characterized by single-family base camps emerging toward a village settlement pattern and the presence in this region of artifacts indicating the establishment of far-reaching trade networks.

Cultural Time Period	Timeframe	Characteristics
	Late Woodland	During the Late Woodland period, people first began to use the bow and arrow; this is indicated by the appearance of true arrow points at Late Woodland sites. People also first began to grow corn. Other plant and animal remains that have been found at archaeological sites suggest that Late Woodland people were hunting white-tailed deer, turkey, and box turtle as well as gathering wild foods such as blueberry, wild grape, acorn, hickory, and walnut.
Late Prehistoric	AD 900–AD 1,600	This period is marked by the appearance of chiefdom-level sociopolitical organization, and people began to live in increasingly larger permanent villages along major river bottoms with permanent fortified villages with platform mounds and other earthworks. The fertile soils found at these sites were used in the new primary reliance on horticulture for subsistence. Copper, exotic cherts, and marine conch shells were often used for the production of special ceremonial items. At later sites, archaeologists have uncovered the remains of palisades, which may be evidence for warfare.
Protohistoric (Aboriginal Cultures of the Historic Period)		Although Europeans had colonized parts of the east coast, by AD 1600, they had not yet ventured into portions of what is now Virginia; however, the various trade items that Europeans used in trade with the Indians had reached the groups living here. Objects such as iron and brass trade axes, iron kettles, glass beads, and trade pipes have been recovered from a number of protohistoric period sites in Virginia. Archaeological sites from the protohistoric period are important because they help determine ties between prehistoric archaeological sites and the Indians that are living in Virginia and country today.

Source: Brockington 2009; http://www.wvculture.org/shpo/archindex.html.

Historical Period

The historical period is well represented in Virginia's cultural resources, marking the birth of a new nation and represented by the homes of the nation's founders, battlegrounds of both the American Revolution and Civil War, and public and private architecture that reflects the diverse array of activities, including immigration, frontier exploration and settlement, economic and industrial revolution, and growth. These historic places—the houses, stores, train stations, warehouses, iron furnaces, canals, landscapes, and bridges—are integral parts of the modern settings and activities. As one of the earliest areas settled by Europeans and a location where growth and expansion of European, and later American, settlements took place early in the settlement history, combined with a strategic location associated with the Revolutionary and Civil wars, Virginia has extensive cultural resources from the historical period.

Cultural Resource Sites

More than 105,000 historic buildings and structures and more than 32,000 archaeological sites have been identified through surveys and recorded since 1966 (Virginia Department of Historic Resources 2001). "These figures represent an 18.5-percent increase for archaeological sites and a 24-percent increase for buildings and structures since 1993 when data was gathered for the previous version of this plan" (Virginia Department of Historic Resources 2001). It is important to note that these figures represent all of the sites in Virginia and are not limited to those on or within any defined distance from FMO tracts. Virginia cultural resources data are not in a format to make such queries in a timely manner.

Although the precise number of inventoried cultural resource sites on specific FMO tracts in Virginia is unknown, numerous sites have been inventoried, and undoubtedly, numerous others have yet to be identified. Difficulty in sorting the Virginia cultural resources database and FMO identification also make the identification of specific trends in cultural resources difficult. Undoubtedly, more cultural sites will continue to be identified through inventory measures. Vandalism of the site or collection of cultural artifacts (e.g., unauthorized digging and "pothunting"), which are illegal under the ARPA, have occurred in the past. Cultural resource sites may also deteriorate from a variety of natural causes. Collectively, these agents may adversely affect known and unknown cultural resources.

Meadowood SRMA, the only BLM-administered surface tract in Virginia, has had five site-specific archaeological surveys conducted within the tract. Two archaeological surveys were completed in 2003 and account for approximately six acres of the approximately 800 acres within Meadowood SRMA. Beginning in 2004, BLM entered into a cooperative agreement with the Fairfax County Park Authority—Archaeology Program to complete an archaeological survey across the 800-acre BLM tract. The intensive field methods employed by the County Archaeology Program met or exceeded those prescribed by the Virginia Department of Historic Resources and the Secretary of the Interior. The proactive surveys identified several archaeological, historical, and cultural resources, and the survey team has filed all sites, forms, and data with the Virginia Department of Historic Resources. These surveys have identified several cultural resource sites. These surveys identified distinct prehistoric and historical occupations (sites). The property is set in an area of moderate to high potential for cultural resource sites throughout the 800-acre tract (Hill et al. 2000). In particular, archival and historic literature review indicates a very high potential for historic sites (particularly 18th- and 19th-century home sites, farmsteads, and transportation features) in key areas of the property. Archaeologists believe most historic sites located within Meadowood SRMA will be identified in an archaeological (below ground) context. With a few possible exceptions, historically significant standing structures and above-ground features are absent from the modern landscape.

Meadowood SRMA is also situated within favorable physiographic settings for prehistoric settlement. The location of the property in the Potomac River watershed and the presence of significant secondary drainages and upland terraces influence the tendency for higher prehistoric site potential. In general, the Mason Neck region demonstrates an abundance of prehistoric site activity, although relatively few archaeological sites have been formally tested and evaluated within the region. However, the complete nature and extent of historic and prehistoric cultural resources at Meadowood SRMA remains unknown.

Historically, the Meadowood SRMA property was used primarily for agricultural purposes with limited support activities, such as harvesting of trees for mulch and excavation of sand and gravel for internal roads. These activities, ongoing for more than 300 years, have probably affected cultural resources sites on Meadowood SRMA.

The number of known cultural sites will continue to increase as new inventories are performed. The sites that have already been identified will be monitored, as funding and staffing allows, to review site

conditions and ensure sites are protected from potential threats. Vandalism of the site or collection of cultural artifacts (e.g., unauthorized digging and “pothunting”), which are illegal under the ARPA, have occurred in the past. Cultural resource sites may also deteriorate from a variety of natural causes. Collectively, these agents may adversely affect known and unknown cultural resources. However, because Meadowood SRMA is managed to maintain historical uses, above-ground cultural resources have received protection. Such management has also limited the amount of subsurface disturbance, thereby protecting buried cultural resources. Such a trend is anticipated to continue until such resources are identified through cultural resources inventories.

3.10 PALEONTOLOGICAL RESOURCES

Paleontological resources constitute a fragile and nonrenewable scientific record of the history of life on earth. It is BLM policy to manage paleontological resources on public lands for scientific, educational, and recreational values, and to protect these resources from or mitigate adverse impacts. In addition, one of BLM's objectives for the paleontological resources program is to "ensure that proposed land uses, *initiated or authorized by BLM*, do not inadvertently damage or destroy important paleontological resources on *public lands*" (BLM-M-8270, .02(C), emphasis added).

Much of the FMO covered by this RMP occurs where the surface is privately owned. On these lands, the RMP decisions will guide and control mineral leasing and development actions only, not surface management actions. Paleontological resources are considered to be part of the surface estate. While BLM is required to disclose the nature of impacts on surface resources under the NEPA, it will not take management actions on split-estate lands beyond its limited authority. BLM may propose paleontological mitigation recommendations to protect the interests of the surface owner. The owner, however, may elect to waive these recommendations.

3.10.1 Arkansas Paleontological Resources

The surface geology of northwestern Arkansas is composed of Paleozoic rocks (Ozark Plateaus, Arkansas Valley, and Ouachita Mountain). The southeastern side of the state (Mississippi River Alluvial Plain and West Gulf Coastal Plain) has younger Mesozoic and Cenozoic sediments at the surface. Fossils, mainly of small plants and animals associated with carbonate depositional environments, may be present in some of these formations. Some chronologically younger fossils, specifically from the Pleistocene, may be preserved in caves or ancient sinkholes. The presence or scientific importance of fossils is unknown. In addition, thick soils covering the bedrock in many of the FMO tracts offer protection from erosion that may naturally destroy these resources.

All of the surface tracts are on the northwestern side of the state, in formations that are from the Pennsylvanian period or older. As with the FMO tracts, scientifically important fossils could occur, but the presence of such fossils is unknown. As with the FMO, thick soils cover the bedrock in many of the surface tracts and offer protection from erosion naturally destroying these resources.

3.10.2 Florida Paleontological Resources

The surface geology of Florida consists primarily of Tertiary and Quaternary units of carbonates or coastal clastics. Carbonate rocks by their nature are likely to contain fossils, although they are mainly of small plants and animals associated with carbonate depositional environments (e.g., rudistids, mollusks, calcareous algae, seaweed, foraminifera, and gastropods). The accumulation of mounds of these animals and debris on the seafloor created many of the carbonate rocks present in Florida. Some chronologically younger fossils, specifically from the Pleistocene, may be preserved in caves or ancient sinkholes. Although fossils may be present, most are common and of limited scientific importance. The presence or scientific importance of fossils on FMO tracts is unknown. In addition, thick soils covering the bedrock in many of the FMO tracts offer protection from erosion naturally destroying these resources.

All of the surface tracts are either on the coastal areas of the state or adjacent to inland bodies of water. As such, bedrocks will likely have received thick deposits of sediment over the past several hundred years. This will both mask and protect any potential paleontological resources in these areas. Such a depositional environment also reduces the potential for fossils associated with karst topography.

3.10.3 Kentucky Paleontological Resources

The surface geology of Kentucky is dominated by exposures of Paleozoic rocks from the Ordovician to Pennsylvanian. As with Arkansas and Florida, these rocks are generally carbonates and will contain fossils of small plants and animals associated with carbonate depositional environments, but the scientific importance of such fossils on FMO tracts is low because of soil cover and the presence of other similar rocks not on FMO tracts.

As with the karst regions of Arkansas, Kentucky caves and karst do contain chronologically younger fossils. There is a potential that such fossils, preserved in caves or ancient sinkholes, occur on FMO tracts. The presence or scientific importance of such fossils is unknown.

3.10.4 Louisiana Paleontological Resources

The surface geology of Louisiana is composed of sand, silt, and clay sediment from the Mississippi River, deposited over millions of years of the river meandering over the entire coastal region. As the seas rose and fell over this low-lying region, the Mississippi River was carrying vast amounts of sediment and depositing it in what is now Louisiana. The surface rocks are sediments that are poorly lithified rock units that belong to either the Quaternary or Tertiary systems. Such a system of rocks, generated in low physical energy but nutrient-rich environments, may contain fossils, especially plant and trace fossils. The movements of the river result in relatively thin sediment layers, alternating among fluvial, deltaic, terrestrial, shallow marine, coastal, and tidal depositional environments. Although there is potential for fossils in the Louisiana surficial rocks, lithified fossiliferous outcrops are rare in Louisiana for the following reasons: (1) "Outcrops exposed by road construction or by natural means will often be covered quickly by the state's abundant vegetation;" (2) "…in a geological context, the surface exposures of Louisiana are very young in age, and this affects the number and diversity of fossils," and (3) although the depositional environments that created Louisiana's surface geology usually have high amounts of life, the "terrestrial and transitional environments, which were common in the geologic past in Louisiana are not nearly as conducive for the preservation of fossils as the marine environment" (Stringer 2002). However, fossil localities in Louisiana have been identified that contain vertebrate, invertebrate, and microscopic fossils (Stringer 2002). The presence or scientific importance of such fossils within the FMO tracts is unknown.

The five surface tracts include the same types of rocks as described in the section above. Therefore, there is a potential for fossils to occur, but the presence or scientific importance of any such fossils is unknown.

3.10.5 Tennessee Paleontological Resources

Exposures of Paleozoic rocks from the Ordovician to Pennsylvanian dominate the surface geology of Tennessee. As with Arkansas and Florida, these rocks are generally carbonates. They contain fossils of small plants and animals associated with carbonate depositional environments. Surface rocks in western Tennessee are from the Quaternary and Tertiary and were deposited in the Mississippi Embayment. They are generally composed of clastic strata, including gravels, sands and sandstones, silts, and clays. The geologically young age and environments for these rocks make them unlikely to contain scientifically important paleontological resources. As with the karst regions of Arkansas, Tennessee caves and karst may contain chronologically younger fossils. Such fossils, preserved in caves or ancient sinkholes, could potentially occur on FMO tracts. The presence or scientific importance of fossils of FMO tracts is unknown.

3.10.6 Virginia Paleontological Resources

The surface geology of Virginia ranges from Atlantic Coastal Plain deposits on the east to the folded and faulted rocks of the Appalachian Mountains on the west. Virginia contains more igneous and metamorphic rocks than any of the other states considered in this document. Such rocks have little to no potential for paleontological resources. However, other surface rocks, such as the lower Mesozoic sediments near the Blue Ridge Province, were deposited in environments that could contain and preserve fossils, including fish and dinosaur tracks, indicating tropical lakes and mudflats during deposition. Fossils such as these would be important for scientific purposes, but the presence of such fossils is unknown.

The surface geology of Meadowood SRMA includes a mix of surface rocks. Although fossils could potentially exist, no scientifically significant paleontological resources have been identified. Deep soils will conceal most surface rocks and any associated paleontological resources.

3.11 VISUAL RESOURCES

Visual resources consist of the natural and manmade features that contribute to a particular environment's aesthetics. These features may be natural (e.g., canyon views) or manmade (e.g., city skyline). Together, they form the overall impression of an area referred to as the landscape character. Visual resources also have a social setting, which includes public values, awareness, and concern about visual quality. Visual resource management (VRM) classifications are established for public lands so that visual resource values can be maintained through informed management decisions.

A visual resource inventory (VRI) was completed for all the BLM-administered surface tracts. The VRI process contained in *BLM Handbook* H-8410-1 provides BLM managers with guidance for determining visual values. The inventory consists of scenic quality evaluation, sensitivity-level analysis, and delineation of distance zones. Based on these three factors, BLM-administered lands were placed into one of four VRM inventory (VRI) classes. These classes represent the relative value of the visual resource: VRI Classes I and II are the most valued; VRI Class III represents a moderate value; and VRI Class IV has the least value. VRM classes are assigned to an area during the land use planning process. An area may be inventoried as VRM VRI Class III, but a decision may be made to manage it to VRM Class IV, or vice versa. Cultural modifications may detract from the scenery, complement it, or improve the overall scenic quality of an area. Cultural modifications in landform/water and vegetation values and addition of structures will be considered in examining proposed resource management actions. The VRM inventory and management classes were designed to address larger tracts of land and more open vistas than the small often densely wooded surface tracts addressed in this planning effort. Accommodations were made to maintain the intent of the VRI process while complying with the direction in the inventory handbook.

The following VRM Class objectives from *BLM Handbook* H-8410-1 have been amended for the purpose of developing and implementing this RMP. Amendments incorporate the visual resource values provided by existing cultural features that are significant to the character of the landscapes in surface tracts of the Southeastern States RMP.

VRM Class I Objective: The objective of this class is to preserve the existing natural and cultural character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not detract from the existing landscape character.

VRM Class II Objective: The objective of this class is to retain the existing natural and cultural character of the landscape. The level of change to the characteristic should be low. Management activities may be visible but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural and/or cultural features of the characteristic landscape.

VRM Class III Objective: The objective of this class is to partially retain the existing natural and cultural character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may be visible but should not dominate the view of the casual observer. Changes should blend with the natural environment.

VRM Class IV Objective: The objective of this class is to provide for management activities that require significant modification of the existing landscape or the existing character of the natural and cultural landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of the casual observer's attention; however, every attempt should be made to minimize the impact of these activities through selective location, minimal disturbance, and repetition of basic elements.

The following sections contain the results of the VRI. Because of their small size, the individual surface tracts comprise a relatively small component of the visual landscape. The visual resources of adjacent lands consist of residences, paved and unpaved roads, cultivated fields and pastureland, and forested areas or areas where forest products have been harvested. More information on the evaluation of the visual resources is available in the VRI report.

3.11.1 Arkansas Visual Resources

The Arkansas surface tracts are not currently classified according to a VRM system. Because of their small size, the surface tracts are a relatively small component of the visual landscape. The topography of the tracts and of the region in Arkansas where the tracts are located is generally rolling hills with some areas of steeper cliffs and dense vegetation. Individuals visiting the tracts would generally not be able to see more than a few hundred feet in a given direction because of the dense vegetation on most tracts. Modifications to the visual resources, such as the construction of roads, residences, or mineral development, would be apparent to individuals visiting the tracts.

There has been little change to the visual characteristics of BLM's surface tracts under existing management. This has less to do with the existing management of the visual resources on these tracts than with the paucity of activities that would result in changes to the components of the visual resources (changes to form, line, function, texture, etc.). The greatest changes to visual resources in and around the surface tracts has been the result of changes to visual resources on lands adjacent to the small BLM surface tracts that, of themselves, do not include sufficient acreage to comprise a complete viewshed or be considered a landscape in and of themselves. However, these tracts, because they lack such activities, act as islands, maintaining the visual characteristics of a landscape that has not been affected by human activities for several years and usually several decades. Because no specific desired condition has been established for visual resources, there is no trend of departure from or achievement of such a condition. Table 3-79 shows the VRI class by surface tract.

Table 3-79. Results of Visual Resource Inventory—Arkansas

County	Tract Name/Description	Acres	Visual Resource Inventory Class
Baxter	Long Mountain Creek	80	IV
	Norfolk Lake	20	IV
Cleburne	Drasco	5	IV
Crawford	Locust Mountain	40	IV
Fulton	Bennett Bayou	40	IV
	Foster Branch	40	
	Gepp	40	
Marion	Marion	80	IV
	Mountain Creek	80	
Pike	Redland Mountain	40	IV
Searcy	Bear Creek	160	IV
	Buffalo River	40	III
	Calf Creek	40	IV

County	Tract Name/Description	Acres	Visual Resource Inventory Class
	Campbell Hollow	40	IV
	Middle Fork	40	
	Point Peter Mountain	40	
	Tilly	40	
Sharp	Martins Creek	40	IV
Van Buren	Dry Creek	40	IV
	Lost Creek	40	IV
	Rattlesnake Hollow	40	IV
	West Fork	10	IV
Washington	Henderson Mountain	40	IV

Source: BLM Southeastern States Field Office (Additional information regarding the VRI, including Scenic Quality,Sensitivity, and Distance Zones, are available in the VRI Report (BLM 2010)

3.11.2 Florida Visual Resources

Some of the Florida surface tracts are not currently classified in the existing RMP. In addition, because of their small size, the surface tracts are, for the most part, relatively small components of the visual landscape. However, in some areas (i.e., Jupiter Inlet Lighthouse ONA, Lathrop Bayou, and Egmont Key), the tract is important because natural scenery has been maintained where the adjacent landscapes have been altered through development or silviculture.

Visual resources on the Florida surface tracts are largely driven by management of adjacent lands, although for two tracts (Jupiter Inlet Lighthouse ONA and Egmont Key), there are historical human developments that dominate the visual resources. The size and location of most of the tracts limit the opportunities for management of visual resources, because they compose such a small amount of their various visual landscapes or have major considerations for cultural resources. One exception is the Lathrop tract, which is generally isolated from other developments because of its position on a peninsula. Table 3-80 shows the VRI class by surface tract.

Table 3-80. Results of Visual Resource Inventory—Florida

County	Tract Name/Description	Acres	Visual Resource Inventory Class
Bay	Lathrop Bayou	185.03	IV
Citrus	Citrus County	12.91	IV
Hillsborough	Egmont Key	55	III
Lee	Gasparilla	7.4	IV
Monroe	Park Key	1.36	IV
	Sugarloaf Key	3.57	IV
Palm Beach	Jupiter Inlet Lighthouse ONA	85.83	III
Polk	Lake Marion	22.27	IV

County	Tract Name/Description	Acres	Visual Resource Inventory Class
Suwannee	Suwannee	0.21	IV
Walton	Freeport	0.48	IV

Source: BLM Southeastern States Field Office (Additional information regarding the VRI, including Scenic Quality,Sensitivity, and Distance Zones, are available in the VRI Report (BLM 2010)

3.11.3 Kentucky Visual Resources

BLM does not manage visual resources on FMO where the surface is managed by other agencies. BLM is not required to assign VRI or management classes to these lands, even if the federal mineral resources are developed. However, inventory and analysis of visual resource values could be incorporated into the environmental review process of minerals management actions on a case-by-case basis.

3.11.4 Louisiana Visual Resources

The Louisiana surface tracts are not currently classified according to a VRM system. Because of their small size, the surface tracts are a relatively small component of the visual landscape. The topography of the tracts and of the region in Louisiana where the tracts are located is generally flat. Individuals visiting the tracts would not be able to see more than a few hundred feet in a given direction because of the dense vegetation. Modifications to the visual resources, such as the construction of roads, residences, or mineral development, would be apparent to individuals visiting the tracts.

There has been little change to the visual characteristics of the Baldwin, Rocky Bayou, Black Lake, and Duck Lake tracts under existing management. This has less to do with the existing management of the visual resources on these tracts than with the paucity of activities that would result in changes to the components of the visual resources (e.g., changes to form, line, function, texture). Areas adjacent to these tracts have land uses that have introduced visual features that draw attention to the features on the landscape and, in some instances, dominate the local viewsheds. However, these tracts, because they largely lack such activities, act as islands, maintaining the visual characteristics of a landscape that has not been affected by human activities for several years and usually for several decades. Mineral development on the Big Saline Bayou tract has resulted in several developments that draw viewers' attention. Vegetation density reduces the magnitude of this effect across the landscape. Because no specific desired condition has been established for visual resources, there is no trend of departure from or achievement of such a condition. Table 3-81 shows the VRI class by surface tract.

Table 3-81. Results of Visual Resource Inventory—Louisiana

Parrish	Tract Name/Description	Acres	Visual Resource Inventory Class
Desoto	Rocky Bayou	21	IV
Natchitoches	Black Lake	135.19	IV
Rapides	Big Saline Bayou—North	23	IV
	Big Saline Bayou—South	135	IV
St. Martin	Duck Lake	63.59	IV
St. Mary	Baldwin	360.27	IV

Source: BLM Southeastern States Field Office (Additional information regarding the VRI, including Scenic Quality,Sensitivity,

Parrish	Tract Name/Description	Acres	Visual Resource Inventory Class

and Distance Zones, are available in the VRI Report (BLM 2010)

3.11.5 Tennessee Visual Resources

BLM does not manage visual resources on FMO where the surface is managed by other agencies. BLM is not required to assign VRI or management classes to these lands, even if the federal mineral resources are developed. However, inventory and analysis of visual resource values may be incorporated into the environmental review process of minerals management actions on a case-by-case basis.

3.11.6 Virginia Visual Resources

BLM's sole surface tract in Virginia (Meadowood tract) is not currently managed as VRM Class III. Unlike the other states, the size of the one surface tract in Virginia enables visual values to be considered and managed more as a landscape. Visually, Meadowood SRMA does not maintain an unaltered natural landscape. It maintains a landscape that has historically been managed as a working equestrian farm, boarding, and recreation facility. Because of the increased pressures of development adjacent to the tract, the scenic values associated with these existing uses have increased in importance. Table 3-82 shows the VRI class by surface tract. Because of its size and varied vegetation and use patterns, the Meadowood tract was separated into seven separate units for evaluation of the visual resources. These units are depicted in Map B-40 of Appendix B.

Table 3-82. Results of Visual Resource Inventory—Virginia

County	Tract Name/Description	Acres	Visual Resource Inventory Class
Fairfax	Meadowood: West Meadow	35	III
	Meadowood: Horse Pasture, Undeveloped Areas Visible from the Road	26	II
	Meadowood: Horse Pasture, Undeveloped Areas Not Visible from the Road	16	III
	Meadowood: East Meadow	66	II
	Meadowood: South Meadow	24	III
	Meadowood: Horse Pasture, Developed Areas Not Visible from the Road	26	IV
	Meadowood: Woodlands (Remainder of tract)	611	III

Source: BLM Southeastern States Field Office (Additional information regarding the VRI, including Scenic Quality,Sensitivity, and Distance Zones, are available in the VRI Report (BLM 2010)

3.12 ENERGY AND MINERALS

Oil and gas exploration and development activities are generally occurring throughout the *decision area*. The occurrence and development potential vary by geographic area. Table 3-83 is a summary of the oil and gas reasonably foreseeable development (RFD) scenario for the *decision area* over the next 10 years. The total projected wells column shows the number of wells anticipated to be developed regardless of land ownership. The projected BLM wells column shows the number of wells to be developed on FMO. A more detailed RFD for each state is included in the sections below.

Table 3-83. Summary of Oil and Gas Reasonably Foreseeable Development Scenario

State	Total Projected Wells	Projected BLM Wells
Arkansas	12,120	440
Florida	230	3
Kentucky	4,290	29
Louisiana	17,794	320
Tennessee	191	2
Virginia	4,130	21
Total Wells	**38,755**	**815**

Source: BLM 2012.

Three major bituminous coal regions are found in the eastern half of the United States. They have been identified as the Appalachian Coal Region, the Eastern Interior Coal Region, and Western Interior Coal Region. Bituminous coal regions have been documented in Arkansas, Kentucky, Tennessee, and Virginia. The potential for coal deposits does not indicate commercial coal production, only the probability of finding coal deposits. It is anticipated that federal coal mining activity will be limited to Kentucky (BLM 2008a).

Phosphate is the only non-energy leasable mineral with high potential for development in the *decision area*. It is anticipated that development activities associated with phosphate will be limited to Hardee, Manatee, Polk, Hillsborough, and De Soto counties in Florida (BLM 2008b).

The potential for the occurrence of locatable minerals has been rated as low to none throughout the *decision area*. Therefore, there is no anticipated future locatable minerals activity projected for the *decision area* (BLM 2008b).

There is a low to no potential for future development of mineral materials throughout the *decision area*. Historically, there has been no exploration, development, or disposal of mineral materials on BLM land in the *decision area*. Although mineral materials are some of the most common and valuable types of mineral resources, existing quarries and pits for obtaining mineral materials on private and non-federal lands currently satisfy the market demands (BLM 2008b).

3.12.1 Arkansas Energy and Minerals

Oil and Gas

Oil and gas leasing activity in Arkansas is ongoing in three general areas (Map 3-13), the Fayetteville Shale play, trend development opportunities in the Arkoma Basin/Ouachita Mountain Folded Belt, and the southern Arkansas Gulf Coast plain province. The most active of these in the Arkoma Basin is the Fayetteville Shale unconventional shale-gas play, which is centered in the eastern part of the basin (BLM 2008a).

The statewide annual crude oil production trend in Arkansas decreased from 8,429 thousand barrels in 1997 to 6,031 thousand barrels in 2007 (Energy Information Agency [EIA] 2013a), then dropping to 5,733 in 2010 and showing a modest increase to 6,536 in 2012. This production decline trend is not expected to be significantly altered because most of the oil production located in the southern part of the state is categorized as mature production that is largely dependent on infill and trend development drilling and secondary recovery operations for sustaining this rate (BLM 2008a).

Unlike oil production, natural gas production has generally been on the rise since 2002 when annual production was 161,476 million cubic feet (MMcf) of gas. Since 2002, annual production has steadily increased. In 2007, annual production reached 269,724 MMcf, a 67-percent increase in production compared with the 2002 production rate, and by 2011 production rose dramatically to 1,071,944 MMcf (EIA 2013b). This increase in production is attributable to the increase in wellhead gas prices over that period, coupled with the increase in drilling operations and discoveries related to the Fayetteville Shale gas play (BLM 2008a).

Table 3-84 lists the counties with oil and gas development potential and the projected annual number of federal wells on BLM-administered FMO. BLM-administered gas wells are projected to increase over the next 10 years. The RFD projects 44 BLM-administered wells developed annually, 41 of which are horizontal Fayetteville Shale wells. BLM annual well development projections in these counties range from 10 wells in Van Buren County to one well in many counties.

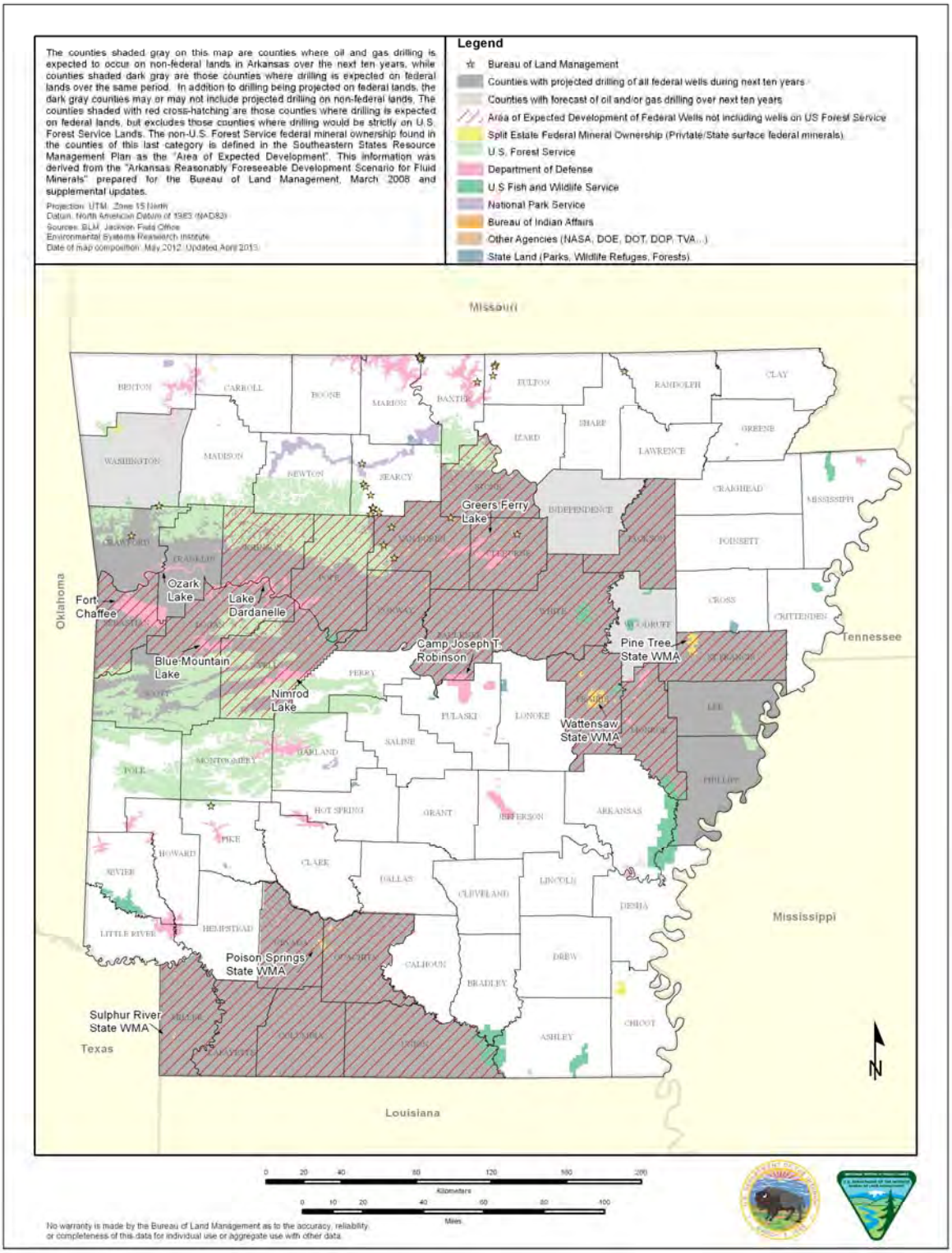
Table 3-84. Reasonably Foreseeable Development Scenario for Arkansas Over 10 Years

County	Total Projected Wells	Projected BLM Wells
Cleburne	440	60
Columbia	20	2
Conway	930	40
Crawford	130	0
Faulkner	440	10
Franklin	170	0
Independence	40	0
Jackson	70	8
Johnson	1,520	20
Lafayette	20	2
Lee	10	0

County	Total Projected Wells	Projected BLM Wells
Logan	930	20
Miller	20	2
Monroe	10	10
Nevada	10	2
Phillips	10	0
Ouachita	10	2
Pope	1,480	20
Prairie	10	10
Scott	270	0
Sebastian	680	20
St. Francis	40	40
Stone	10	10
Union	20	2
Van Buren	1,290	100
Washington	30	0
White	1,790	40
Woodruff	30	0
Yell	1,690	20
Total Wells	**12,120**	**440**

Source: BLM 2012

Map 3-13. Arkansas Oil and Gas Drilling Projection



3.12.2 Florida Energy and Minerals

Oil and Gas

There are two oil and gas producing areas in Florida (Map 3-14). These are insouthern Florida on the peninsula and 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. The Florida peninsula area has eight producing fields, and the Panhandle area has three producing fields. 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 (BLM 2008c). All of Florida's oil fields are declining in production and in number of producing wells. The statewide annual crude oil production trend in Florida decreased from 6,381 thousand barrels in 1997 to 2,147 thousand barrels in 2012 (EIA 2013a). Natural gas production in Florida peaked in the late 1970s, and was in more or less steady decline through 2009 when production reached a bottom of 257 MMcf. In the past two years, however, production has recovered somewhat, reaching 15,125 MMcf in 2011 (EIA 2013b).

In Florida, FMO occurs only in areas with medium potential. Based on the *BLM Manual for Energy and Mineral Resources Assessment* (BLM Manual 3031), areas with medium potential are those areas where the geological environment, the inferred geologic processes, and the reported mineral occurrences indicate a moderate potential for accumulation of mineral resources. No areas were ranked as high because the level of drilling has been very low since 1999, and no new fields have been found in the state in the past 20 years. Even with very optimistic estimates of future drilling, the forecast is for less than one well per year (three wells over the next 10 years) on FMO in the Florida peninsula area (BLM 2008c).

Non-Energy Leasable

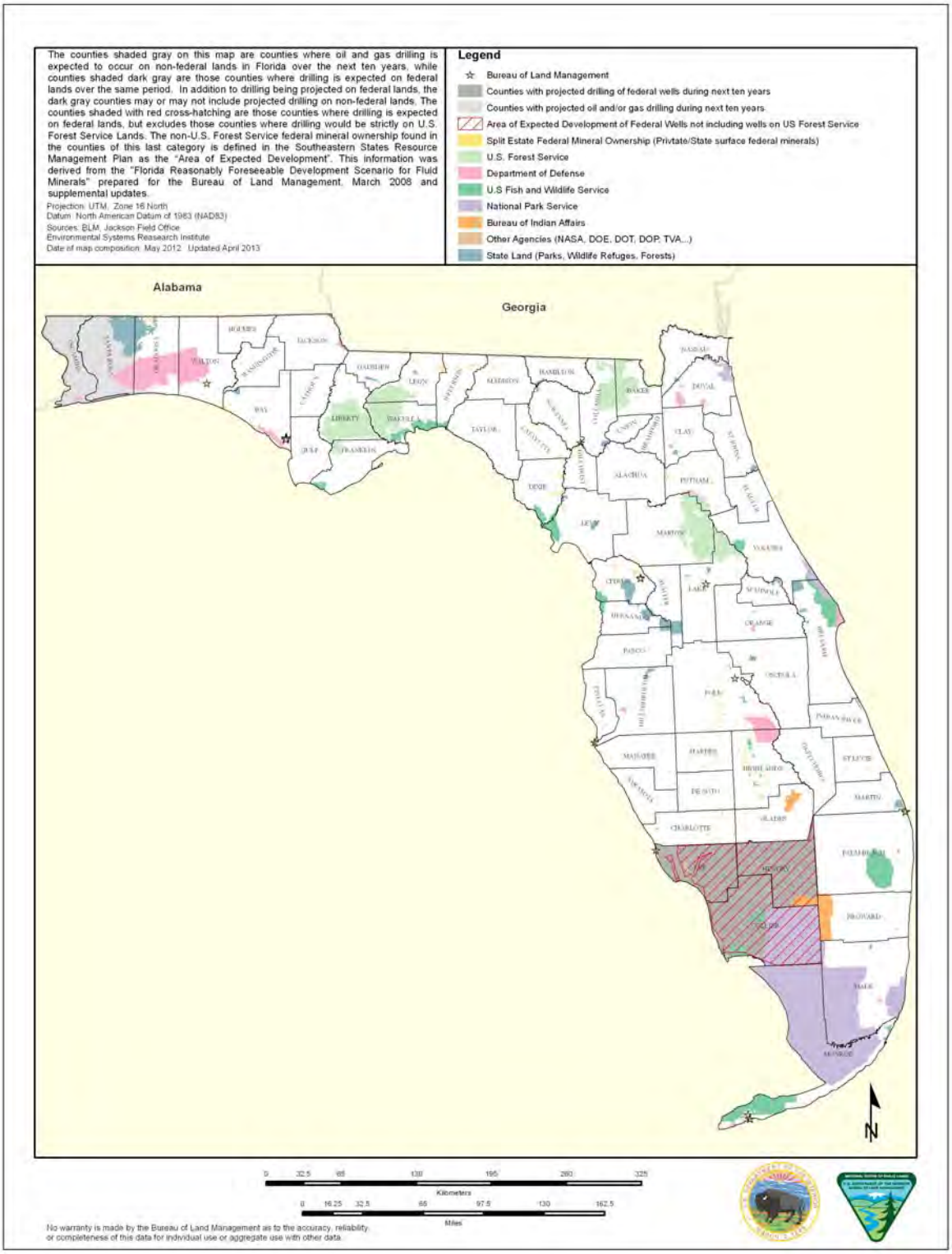
Phosphate

Phosphate is the only non-energy leasable mineral with high potential for development in the *decision area*. Hardee, Manatee, Polk, and Hillsborough counties are within the high potential area (Map 3-15). De Soto County is also within the high potential area, but mining is not expected to occur there within the next 10 years (BLM 2008b).

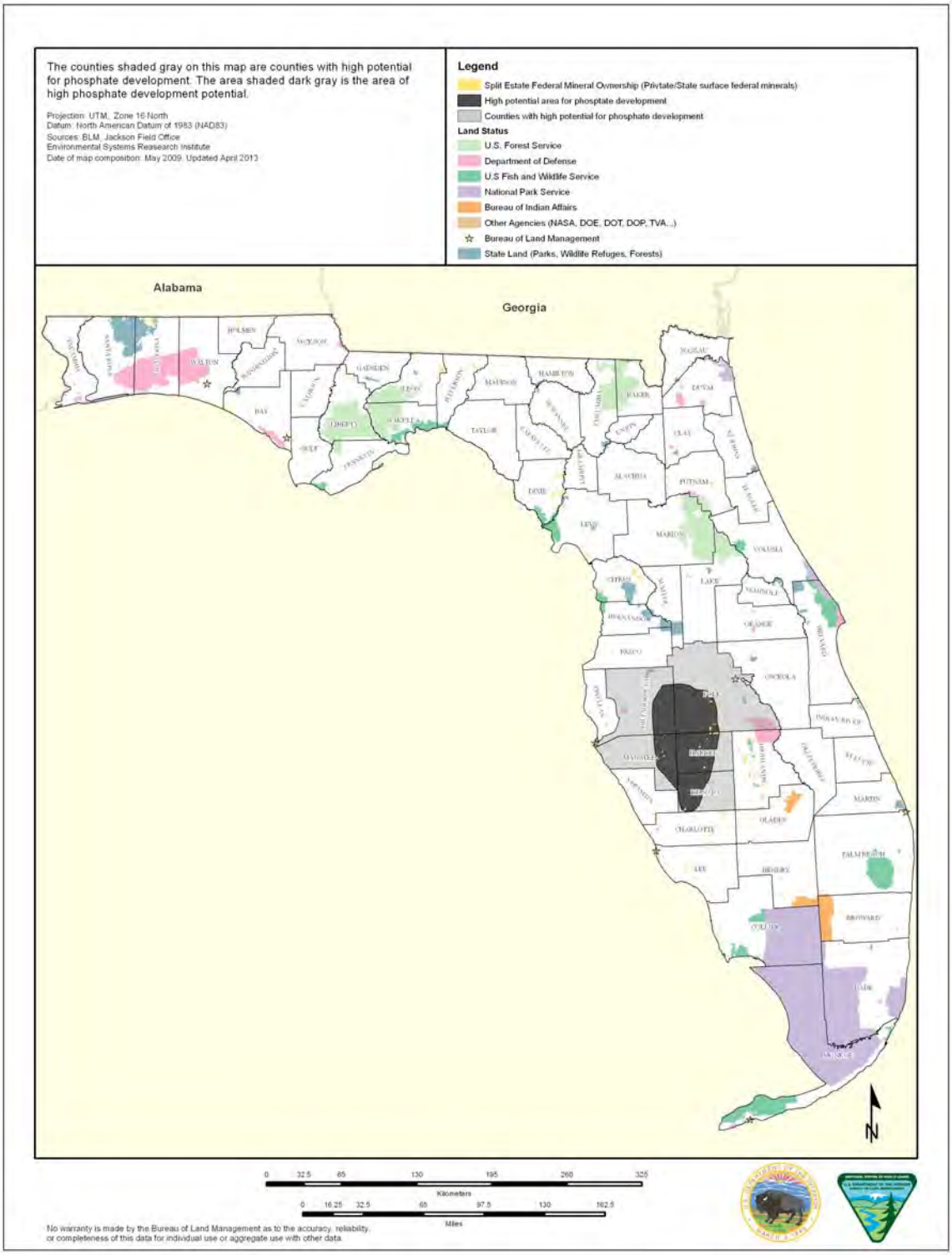
There are 983 acres of FMO currently under lease in Hardee, Polk, and Manatee counties. Of the 983 acres, 802 acres are expected to be mined in next 10 years. The remaining 181 acres have already been mined and are in reclamation. In addition, there are 15,144 acres of FMO identified within the five-county area, including 5, 657 acres mapped as having high development potential area. Of this, about 1,083 acres have the potential to be leased in next 10 years, but mining would not be expected until after 2020.

A proposed plan of operations was submitted in 2005 on 602 acres of the leased phosphate land in Hardee County. (The 602 acres includes a 40-acre pending lease modification.) The proposed plan is currently under NEPA review. The 602 acres represent about 5.5 percent of the South Fort Meade Mine in Hardee County, which covers 10,885 acres. Typically, on average, 6,000 tons of phosphate are recovered per acre of the mining operation (BLM 1995), equating to 65 million tons of phosphate for this mine expansion in Hardee County. BLM's mineral ownership of 602 acres will yield approximately 3.6 million tons of phosphate during the mining operations (likely within the BLM planning horizon). Mining of these Hardee County leases is expected to be completed by 2020. In Polk County, the mining of 320 acres of leased phosphate FMO was approved in 2001 after NEPA review. Of the 320 acres, 120 acres are already mined and in reclamation; the other 200 acres are expected to be mined by 2015. In Manatee County, there are 61 acres under lease, which have already been mined and are currently being reclaimed.

Map 3-14. Florida Oil and Gas Drilling Projection



Map 3-15. Florida Counties With High Phosphate Development Potential and Area of High Development Potential



3.12.3 Kentucky Energy and Minerals

Oil and Gas

Oil production in Kentucky has remained relativley steady in recent years. Between 2003 and 2012 production averaged 2,592 thousand barrels per year, with a low of 2,326 in 2011 and a high of 3,198 in 2012 (EIA 2013a). Natural gas production has increased in Kentucky over the past several years. Production from 2002 was 86,423 MMcf and increased to 119,559 MMcf in 2012 (EIA 2013b).

Three regions of Kentucky have oil and gas production (Map 3-16): central Kentucky, western Kentucky, and eastern Kentucky. The central Kentucky region has had a moderate level of oil production during the past 20 years. Since 1999, drilling permits have increased again, with the number of permits tripling from 1999 to 2006. When compared with the other two regions, the western Kentucky region has had the highest level oil development and minimal gas development during the past 20 years. Since 1980, the western Kentucky region has had the lowest percentage of drilling permit activity. Since the 1990s, drilling permit activity has remained consistently low. The eastern Kentucky region has had the highest level of permit activity during the past five years. Since 1980, this region has had the highest percentage of gas production and the greatest increase in permit activity in Kentucky (BLM 2008d). Table 3-85 summarizes the oil and gas activity projected for FMO in Kentucky (BLM 2008d).

Table 3-85. Reasonably Foreseeable Development Scenario for Kentucky Over 10 Years

County	Total Projected Wells	Projected BLM Wells
Eastern Counties		
Bell	130	1
Breathitt	100	0
Carter	30	1
Clay	90	0
Elliott	10	1
Estill	20	0
Floyd	190	2
Harlan	110	1
Johnson	100	1
Knott	240	2
Knox	210	0
Laurel	30	0
Lawrence	60	1
Lee	50	0
Leslie	450	0
Letcher	530	0
Magoffin	160	0
Martin	110	0

County	Total Projected Wells	Projected BLM Wells
Menifee	10	0
Morgan	30	1
Perry	260	1
Pike	270	4
Rowan	10	0
Whitley	70	0
Eastern Total	**3270**	**16**
Central Counties		
Adair	90	1
Allen	10	1
Barren	30	1
Clark	10	0
Clinton	80	2
Cumberland	70	1
Edmonson	10	1
Green	200	0
Metcalfe	240	0
Monroe	10	0
Russell	20	2
Taylor	70	1
Warren	80	0
Central Total	**920**	**10**
Western Counties		
Christian	10	1
Hancock	10	0
Henderson	10	0
Hopkins	20	0
Lyon	10	1
Muhlenberg	10	0
Trigg	10	1
Webster	20	0
Western Total	**100**	**3**
Commonwealth Total	**4,290**	**29**

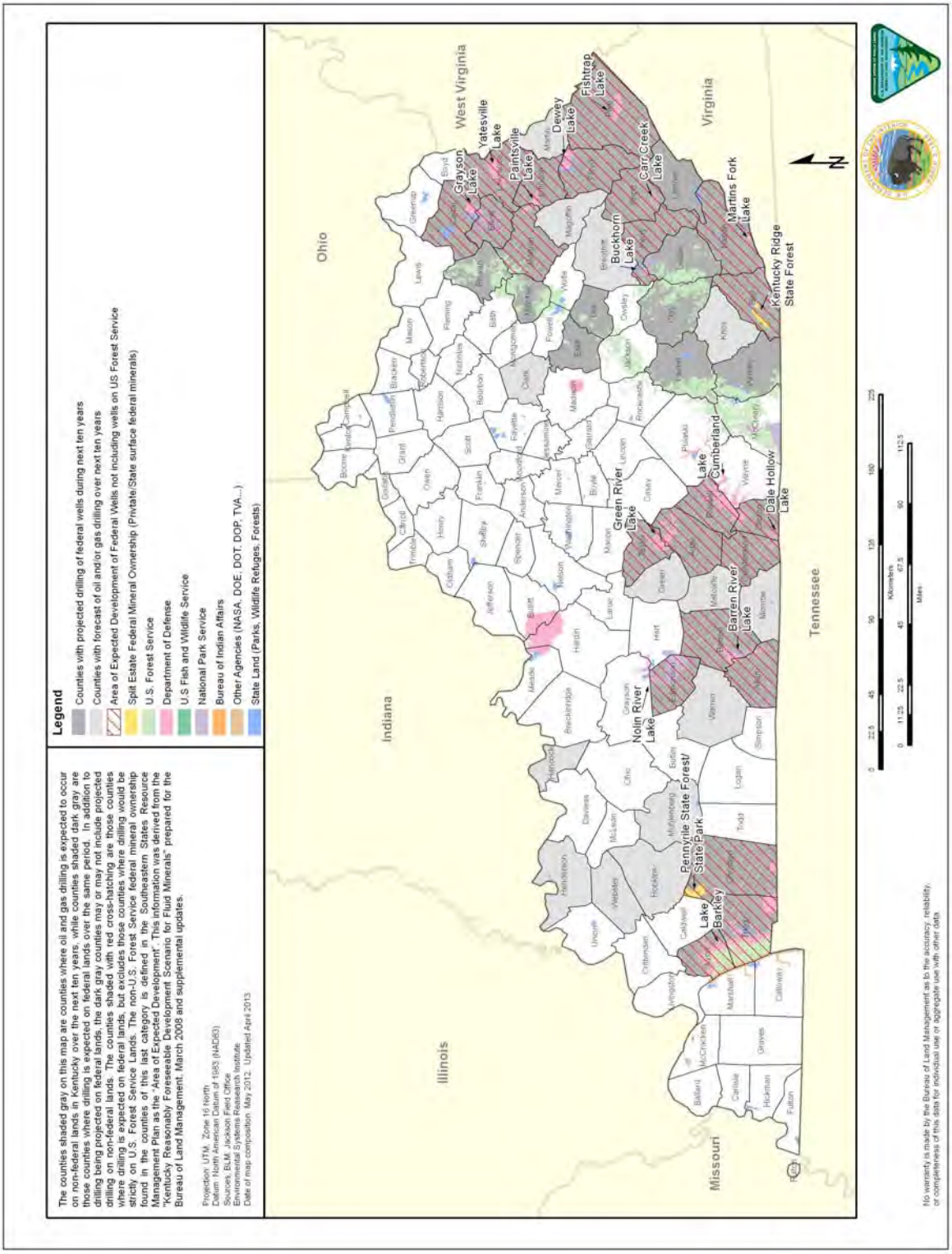
Source: BLM 2012.

Coal

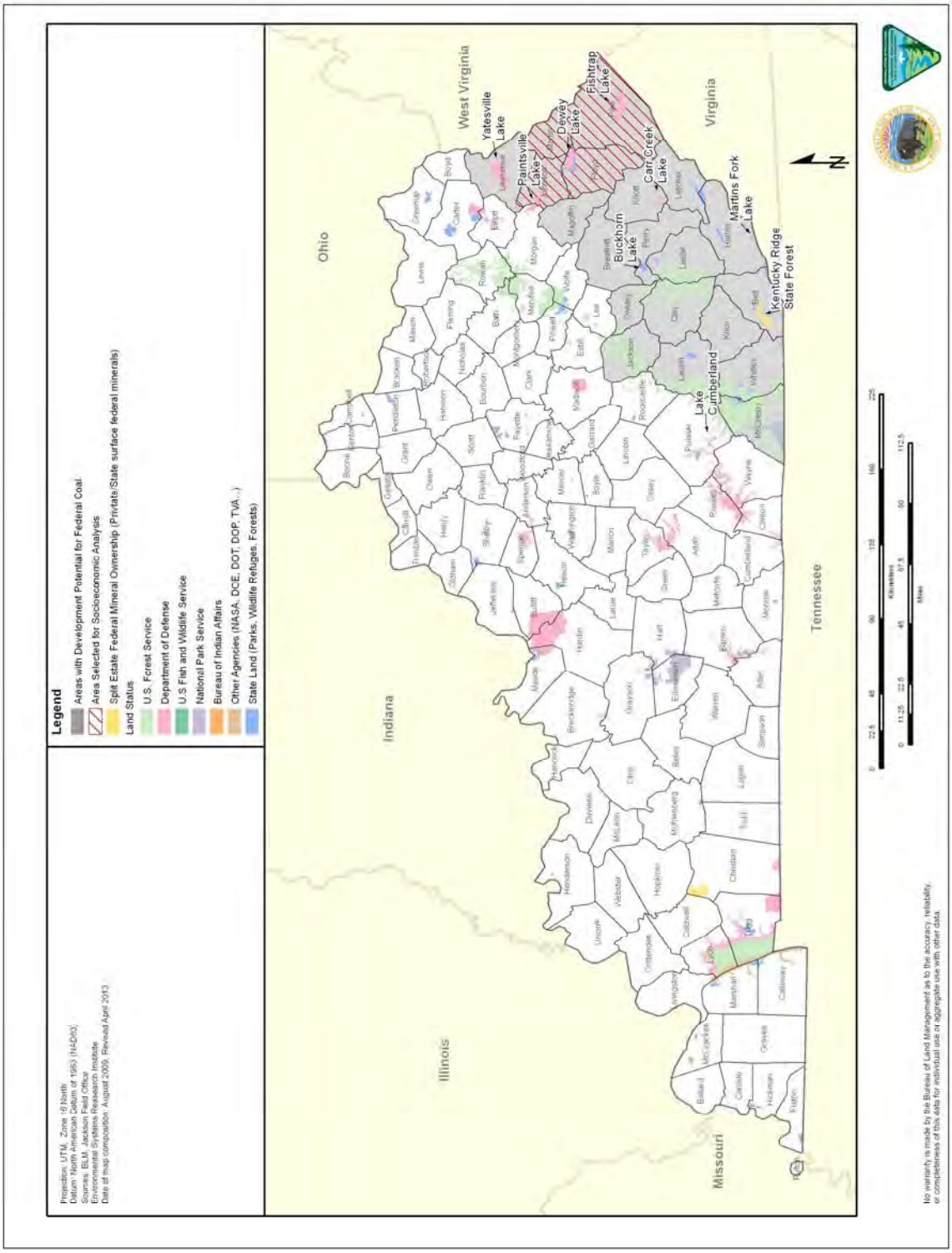
Three major bituminous coal regions are found in the eastern half of the United States: Appalachian Coal Region, Eastern Interior Coal Region, and Western Interior Coal Region. Bituminous coal regions have been documented in Kentucky, Tennessee, Virginia, and Arkansas. The potential for coal deposits does not indicate commercial coal production, only the probability of finding coal deposits. Most of the federal coal mining activity has occurred and will continue to occur in Kentucky. Currently, one active federal coal lease exists in Kentucky. This lease produced about 350,000 tons of federal coal in 2008.

Two leases by application (LBA) have been submitted on USACE land around Dewey Lake in Floyd County, Kentucky. The LBAs represent a nomination by the public for a particular tract of coal. After BLM's review and approval of the application, BLM would request bids through a lease sale. It is estimated that these two leases on BLM-administered FMO would generate between 2,180,000 and 2,300,000 tons of coal for the first four years and between 480,000 and 600,000 tons of coal for the remaining years of the leases. Based on these recently submitted LBAs, it is anticipated that there will be one additional federal coal lease request in Kentucky over the next 10 years (BLM 2008a). The area of existing activity and potential new leasing is shown on Map 3-17.

Map 3-16. Kentucky Oil and Gas Drilling Projection



Map 3-17. Kentucky Counties With High and Moderate Potential for Development of Federal Coal



3.12.4 Louisiana Energy and Minerals

Oil and Gas

Oil and gas have been produced in Louisiana for many years. There has been production of oil or natural gas, or both from all parishes (Louisiana Geological Survey 2000). Oil production in Louisiana has declined as compared to the 1980's and 90's when annual production was consistently over 100,000 thousand barrels, but has been relatively steady in recent years. Between 2003 and 2012 production averaged 74,729 thousand barrels per year, with a high of 90,019 in 2003 and a low of 67,367 in 2010 (EIA 2013a). As with oil, natural gas production in Louisiana has declined as compared to the 1980's and 90's. Average annual production between 2002 and 2011 was 1,513,508 MMcf, as compared to a high of in 5,149,901 MMcf in 1996. The recent trend, however, is upward, increasing from 1,209,027 MMcf in 2002 to 2,933,576 MMcf in 2011 (EIA 2013b).

According to the RFD, new wells are expected in every parish except Orleans (Map 3-18). The northern region of Louisiana produces natural gas with only a small amount of crude oil and condensate. This region has received the bulk of industry attention since 2000 and likely will continue to do so in the near future.

The southern region is dominated by oil production, although associated natural gas is also produced. Drilling in this region is historically slower than in northern Louisiana. It is assumed that no significant increases in the rate of drilling will occur in the near future. Forecast totals for the northern Louisiana and southern Louisiana regions are summarized in Table 3-86.

Table 3-86. Reasonably Foreseeable Development Scenario for Louisiana Over 10 Years

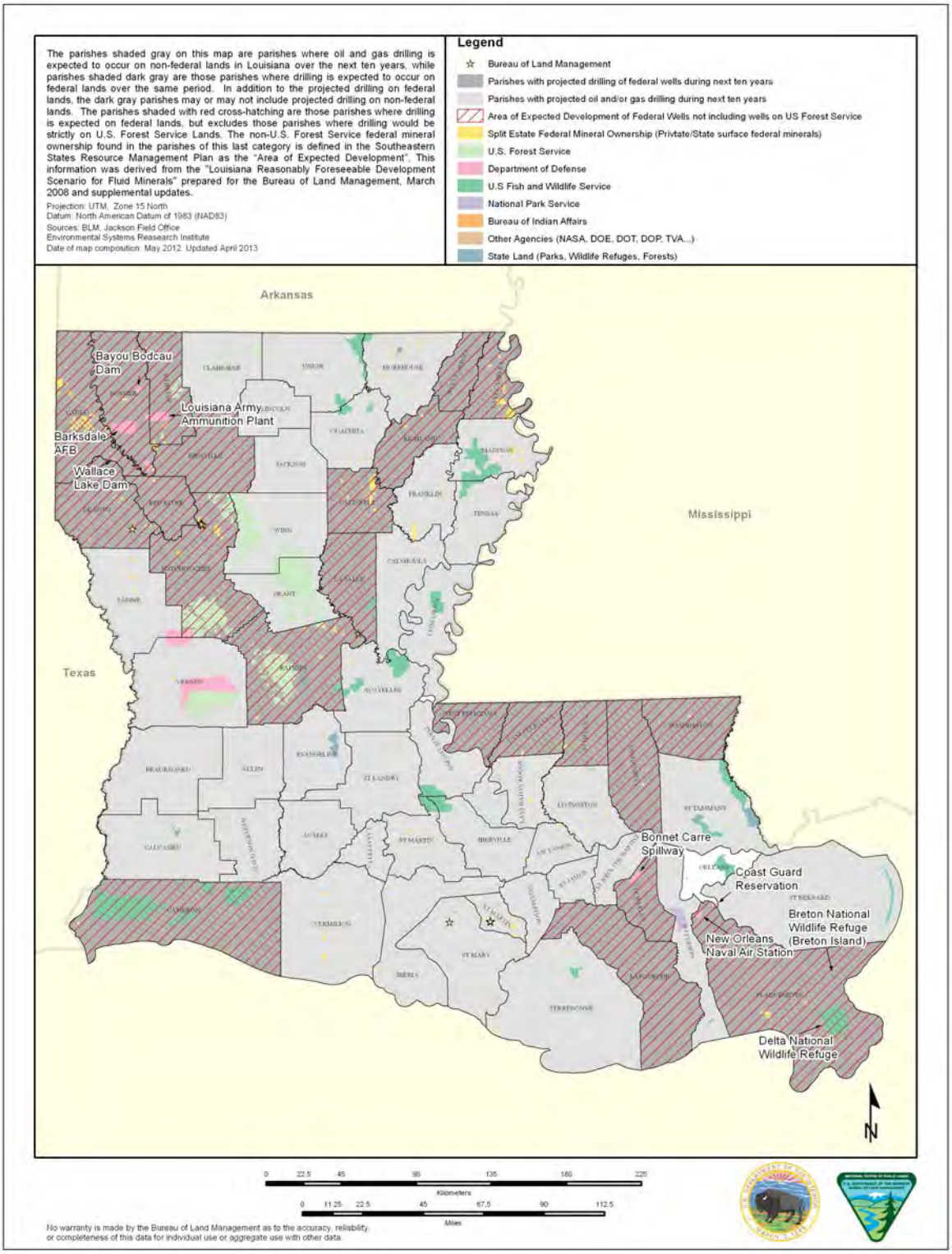
Parish	Total Projected Wells	Projected BLM Wells
Northern		
Avoyelles	200	0
Bienville	595	5
Bossier	489	59
Caddo	2,250	30
Caldwell	80	10
Catahoula	100	0
Claiborne	270	0
Concordia	120	0
De Soto	1,020	10
East Carrol	142	20
Franklin	28	0
Grant	90	0
Jackson	60	0
La Salle	1,531	1
Lincoln	220	0

Parish	Total Projected Wells	Projected BLM Wells
Madison	10	0
Morehouse	200	0
Natchitoches	40	10
Ouachita	150	0
Rapides	69	9
Red River	440	5
Richland	390	10
Sabine	610	0
Tensas	40	0
Union	40	0
Vernon	60	0
Webster	520	30
West Carroll	101	1
Winn	150	0
Northern Total	**10,015**	**200**
Southern		
Acadia	200	0
Allen	130	0
Ascension	10	0
Assumption	40	0
Beauregard	540	0
Calcasieu	470	0
Cameron	1,030	20
East Baton Rouge	151	0
East Feliciana	204	4
Evangeline	400	0
Iberia	190	0
Iberville	200	0
Jefferson	140	0
Jefferson Davis	120	0
Lafayette	30	0
Lafourche	650	25
Livingston	20	0
Orleans	0	0

Parish	Total Projected Wells	Projected BLM Wells
Plaquemines	700	48
Pointe-Coupee	120	0
Saint Bernard	20	0
Saint Charles	62	2
Saint Helena	103	3
Saint James	25	0
Saint Landry	80	0
Saint Martin	220	0
Saint Mary	360	0
Saint Tammany	10	0
St. John the Baptist	20	0
Tangipahoa	32	2
Terrebonne	590	0
Vermilion	510	0
Washington	151	15
West Baton Rouge	50	0
West Feliciana	201	1
Southern Total	**7,779**	**120**
Louisiana Total	**17,794**	**320**

Source: BLM 2012.

Map 3-18. Louisiana Oil and Gas Drilling Projection



3.12.5 Tennessee Energy and Minerals

Oil and Gas

Oil and gas have been produced in Tennessee for many years. In total, 13 counties have active or historical production of oil or natural gas: 13 with active oil production and nine with active natural gas production (Map 3-19). Oil production in Tennessee has been relatively low in recent years as compared to the other states; but it has also been relatively steady, averaging 287 thousand barrels per year from 2003 through 2012. There has been an upward trend in natural gas production in Tennessee over the last ten years, increasing from 2,050 in MMcf in 2002 to 4,335 MMcf in 2011 (EIA 2013b).

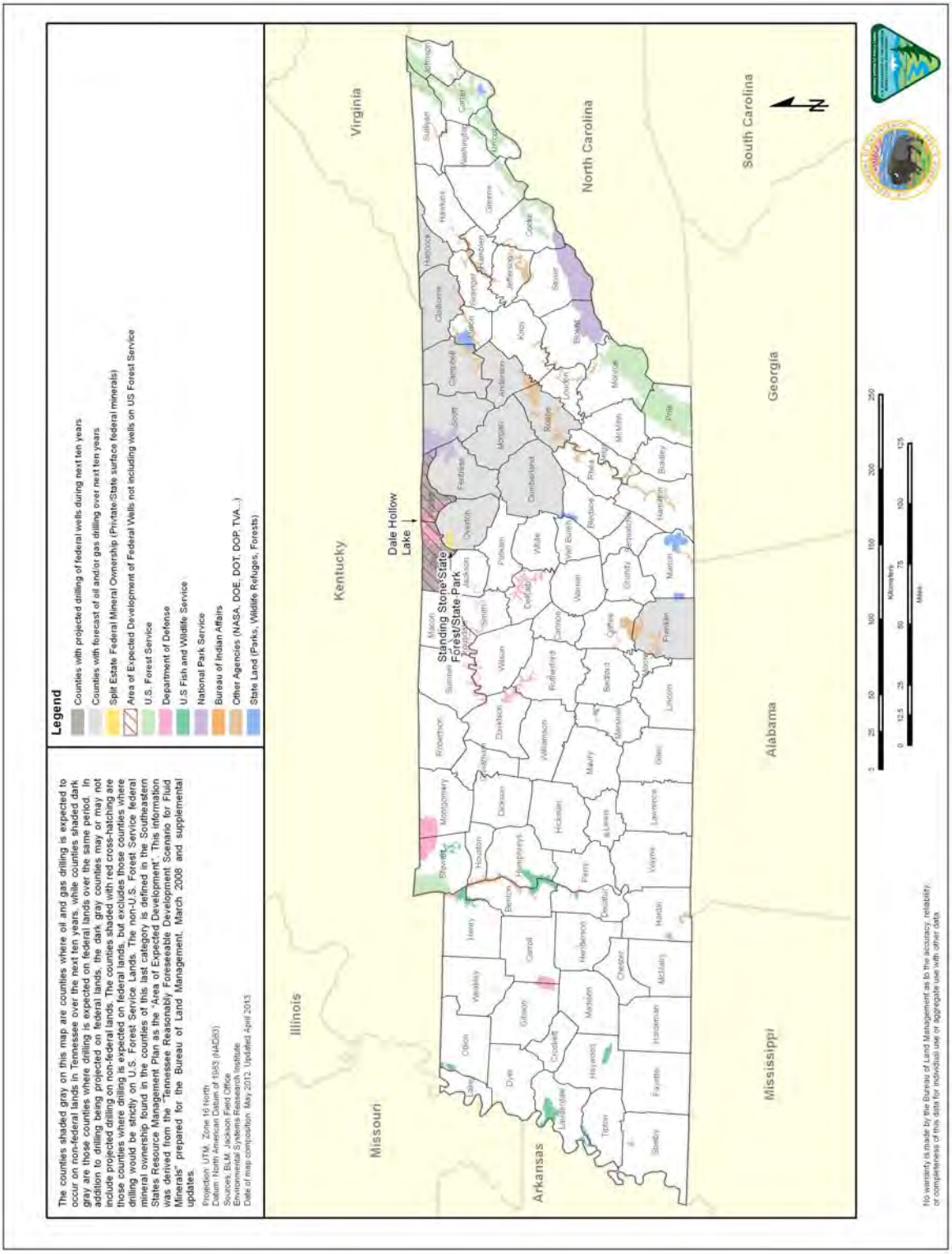
Table 3-87 shows the projected number of oil wells in Tennessee. Two oil wells are projected on BLM-administered FMO. Although natural gas production is projected for Tennessee, no natural gas wells are projected on BLM-administered FMO over the next 10 years.

Table 3-87. Reasonably Foreseeable Development Scenario for Tennessee Over 10 Years

County	Total Projected Wells	Projected BLM Wells
Anderson	90	0
Campbell	8	0
Claiborne	10	0
Clay	2	1
Cumberland	1	0
Fentress	10	0
Franklin	2	0
Hancock	6	0
Morgan	20	0
Overton	15	0
Pickett	5	1
Roane	2	0
Scott	20	0
Total	**191**	**2**

Source: BLM 2012.

Map 3-19. Tennessee Oil and Gas Drilling Projection



3.12.6 Virginia Energy and Minerals

Oil and Gas

No new fields or reservoirs have been discovered in Virginia over the past decade. As a result, leasing activity in Virginia has been slight and in just a few counties over the past decade (Map 3-20). Few minor tracts are available, and most trend acreage has already been leased. In addition, no extensive geophysical or geochemical surveys have been undertaken in recent years. Individual seismic operations have targeted specific exploration targets identified from surface or subsurface geologic studies (BLM 2008e).

Oil production in Virginia has been relatively steady in recent years averaging 16 thousand barrels per year from 2003 through 2012 (EIA 2013a). The trend of natural gas production has been upward, increasing from 76,915 MMcf in 2002 to 151,094 MMcf in 2011 (EIA 2013b).

The current oil and gas activity in Virginia occurs in seven counties. Coal bed natural gas (CBNG) activity is still accelerating, but the development of conventional gas (including shale gas) is low. The majority of the activity over the next 10 years will be from CBNG development.

Map 3-20. Virginia Oil and Gas Drilling Projection

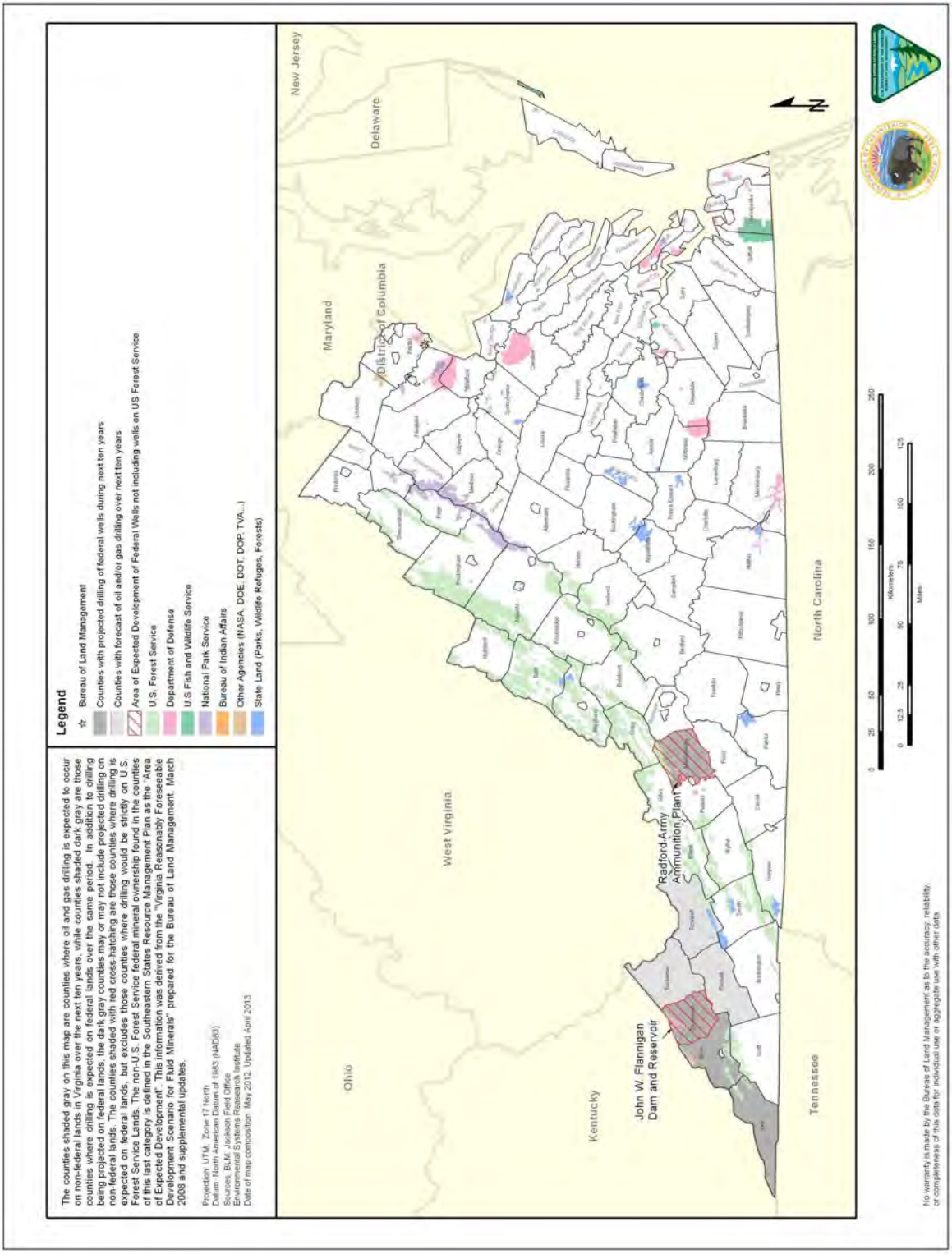


Table 3-88 shows the projected number of wells by county. The largest number of new wells in Virginia is forecasted for Buchanan County, but this county contains no FMO. There are 20 BLM wells projected for Dickenson County, and most of these wells will be shallow CBNG wells (BLM 2008e).

Table 3-88. Reasonably Foreseeable Development for Virginia Over 10 Years

County	Total Projected Wells	Projected BLM Wells
Buchanan	1,818	0
Dickenson	1,263	20
Lee	10	0
Montgomery	1	1
Russell	488	0
Tazewell	438	0
Wise	112	0
State Total	**4,130**	**21**

Source: BLM 2008e

3.13 RECREATION MANAGEMENT

Recreation on BLM lands within the *planning area* varies by tract, with most tracts open to dispersed recreation but receiving little visitation. Dispersed recreation is characterized by unstructured activities that are not confined to specific locations, such as developed recreation sites. Dispersed recreation can involve various activities, such as hunting, fishing, and hiking. Examples of tracts open to dispersed recreation but with little visitation include rural tracts in Arkansas and Louisiana. There are a few tracts within the *planning area* that receive year-round visitation with an emphasis on developed recreation or sightseeing. The Meadowood SRMA in Virginia and the Jupiter Inlet Lighthouse ONA in Florida are two examples.

The Meadowood SRMA in Virginia and Big Saline Bayou in Louisiana are the only tracts that have been administratively identified as SRMAs within the *planning area*. In addition, the congressional designation of the Jupiter Inlet Lighthouse ONA includes the direction to also manage the ONA for passive recreational values. All other tracts are not be designated as recreation management areas, but are be open recreational use. While recreation management is not emphasized, recreation activities may occur.

The following sections contain specific recreation information for each surface tract in the *planning area*. A map of each tract is available in Appendix B. The information was compiled during a recreation assessment that was done for this planning process. Because the states of Kentucky and Tennessee do not have land surface tracts managed by BLM, they are not discussed in this recreation section.

3.13.1 Arkansas Recreation Management

Recreation on BLM tracts in Arkansas varies by tract, with all tracts open to dispersed recreational activities. Recreational activities known or potentially occurring on BLM lands in Arkansas include the following:

- Hunting
- Fishing
- Bicycle riding
- Horseback riding
- Nature study
- Picnicking
- Hiking.

3.13.2 Arkansas Tract-Specific Recreation Management

This section contains recreation management information specific to each tract in Arkansas, including a description of the types of recreation that either are known to occur or could potentially occur on the tract. The recreation setting is also described, including the naturalness, remoteness, physical facilities, visitor experience, group sizes, visitor controls, user conflicts, and other recreation measurements.

Bear Creek

This 160-acre tract is somewhat unique to the surrounding area in that it is composed of steep mountainside on three sides, draining down into a basin. The tract is only accessible by foot across private property and is at least one-half mile away from all improved roads, although they may be in sight from various locations within the tract. Because the tract is not readily accessible, it is determined that there

would be very few people encountered on the tract at a given time, thus making the recreation experience somewhat primitive and isolated. There are no user fees or visitor controls on site.

Bennett Bayou and Foster Branch

The Bennett Bayou and Foster Branch tracts are described together because of their close proximity and similarity in recreation management. These 40-acre tracts are known to have hunting and potentially day hiking. There are off-highway vehicle (OHV) trails in close proximity to the tracts, thus making OHV use a potential activity. The tracts have no unique features when compared with surrounding lands, and there are no known conflicts with other uses. The landscape is in a natural setting with no modifications of the landscape readily noticeable. There are no physical facilities available.

Because the tracts see very little visitation, anyone who visits should be able to have a primitive type of experience without encountering other users. However, because there are OHV trails in close proximity, there is the possibility of encountering other users and their OHVs. For this reason, there may be some evidence of OHV tracks, some soil erosion, or vegetation becoming worn in specific areas. There are no individual user fees or visitor controls for these tracts.

Buffalo River

It is not known whether recreation occurs regularly on this 40-acre tract; however, there is a potential for hiking and other day uses, such as wildlife watching. The tract is not unique to the surrounding area, but because the tract is located on a mountain side, there is some variation to the landscape. There are no known user conflicts for this tract. The recreation setting for the Buffalo River tract is somewhat remote, being at least one-half mile from any highways but within proximity to improved county roads. The tract maintains a natural landscape without any readily visible modifications. There are no physical facilities provided on the tract. Because the tract sees very little visitation, visitors would have a primitive type of experience without encountering other users. However, because there are OHV roads in close proximity to the tract, there is the possibility of encountering these types of recreational users. Access to the tract is on foot, including from a hiking trail that crosses through the northwestern portion of the tract, and from an unpaved light-duty road on the southeastern corner. There are no individual user fees or visitor controls for this tract.

Calf Creek

There is a potential for hiking and other day-use-related activities on this 40-acre tract. Access to the tract is from a highway (Route 377) approximately 1,000 feet from the south-eastern corner of the tract. The tract is not unique to the surrounding area. There are no known user conflicts on this tract. Because of the tract’s close proximity to a highway, the tract is easily accessed; however, the user experience can be somewhat primitive because of low visitor use and the undeveloped surrounding landscape. An old road bed crosses through the tract, and is the only developed feature of this forested tract. There are no physical facilities on the tract. There are no individual user fees or visitor controls for this tract.

Campbell Hollow

Recreational uses for this 40-acre tract include hiking and hunting. Access to the tract is somewhat remote from a dirt road approximately 500 feet from the eastern boundary. There is also a highway approximately 1.5 miles from the western boundary; however, the terrain from the highway is steep and rugged, crossing a ridge and valley. The user experience would be primitive, with few or no encounters with other people. There are no noticeable modifications other than the apparent clearing of vegetation on

the southeastern portion. There are no physical facilities or structures within the tract, and there are no individual user fees or visitor controls for this tract.

Drasco

There are no known user conflicts on this five-acre tract. The area is known to have hunting and OHV use, although there are no OHV trails or roads within the tract. Access to the tract is from State Road 92, and the area is considered rural. The setting is natural with some modification from recent timber harvesting. The user experience is primitive with few visitors encountered. There are no physical facilities or structures within the tract, and there are no individual user fees or visitor controls for this tract.

Dry Creek

There is the potential for hunting and hiking on or through this 40-acre tract but it is not known whether these activities actually occur. Access to the tract is from an undeveloped road approximately 1,000 feet from the southeast corner of the tract boundary. The tract is not unique to the surrounding area, and there are no user conflicts. The recreation setting for the Dry Creek tract is somewhat remote and not easily accessed. Visitors to the tract would have a primitive type recreation experience without encountering other users. There are no physical facilities or structures within the tract, and there are no user fees or visitor controls.

Gepp

This 40-acre tract is known to have hunting and day hiking and is heavily used, probably by nearby residents. Dirt roads, some with gravel, are located on the outer boundaries of the tract, thus making OHV use a potential activity. The tract has no unique features when compared with surrounding lands. The area is rural, and the landscape is in a natural setting. Dumping can be seen on the tract, however, and nearby deerstands are noticeable. Visitors may encounter nearby residents. There are no individual user fees or visitor controls.

Henderson Mountain

With the identification of an OHV trail and fire pit in close proximity to this 40-acre tract, it is expected that this tract receives some visitation for recreational uses such as hiking, although it is believed that no OHV use is occurring on the tract itself. Hunting could potentially occur on the tract. The landscape lends itself to a backcountry recreation experience with no apparent modifications to the vegetation or topography. Visitors to the tract may encounter other users, although group size would be small. There are no visitor services, user fees, or management controls within the tract.

Locust Mountain

The area around this 40-acre tract is known for hunting, and there is also the potential for hiking and other day uses. Access to the tract is by foot. The tract is near improved county roads but no highways. The recreational setting is natural with no or little modification apparent. The user experience would be semi-primitive with the opportunity for isolation from other visitors and very few encounters, if any. However, because the tract is located on a hillside, visitors can see roads in the distance. There are no physical facilities on the tract and there are no user fees or visitor controls.

Long Mountain Creek

The Long Mountain Creek Tracts are two 40-acre tracts within one-quarter mile of each other. There is known hunting within the area of these tracts, and there is also the potential for hiking and other day uses. The remoteness of the tracts is that of a semi-primitive experience with no roaded access. The northern tract contains a trail, and there is a paved secondary road within 4,000 feet of the southern border. The southern tract comes within 1,500 feet of the paved road, and also contains a trail that crosses through the center of the tract. Visitors can drive within relatively close proximity to either tract and then hike to the tracts without too much difficulty. There are no known user conflicts. Although the area is mostly composed of a natural landscape, there is evidence of historic logging along the ridgelines and upper slopes of both tracts. The social visitor experience for these tracts is somewhat primitive, with encounters of other people limited in size and frequency, if at all. There are no physical recreational facilities, and there are no user fees or visitor controls.

Lost Creek

There is the potential for hunting, hiking, and other day-use activities in the area of this 40-acre tract, although it is not known whether these activities take place within the tract. Although the tract itself does not contain any roads or developed trails, there is a hiking trail that comes within 1,000 feet of the southern border of the tract. A paved secondary highway comes within 4,000 feet of the southwestern corner of the tract. The tract is not unique to the surrounding area. The tract is characterized by a natural appearing landscape without any obvious modifications. There are no physical facilities within the tract. It is anticipated that encounters with others would be minimal, with group sizes under three people and a low frequency of visitor use, creating a semi-primitive to backcountry experience. There are no visitor services, individual user fees, or visitor controls for this tract.

Marion

There is known hunting within the area of this 80-acre tract, and there is also the potential for hiking. The tract is not unique to the surrounding area, and there are no user conflicts. Visitors to the tract can expect to have a middle to backcountry type experience with very few, if any, people actually visiting the tract. There are no visitor facilities, management controls, or individual user fees associated with this tract.

Martins Creek

The area around this 40-acre tract is known to have hunting and also has the potential for hiking and other day use activities. The tract is not unique to the surrounding area. The tract can be accessed from a hiking trail that crosses through the northern portion of the tract, and an unpaved light-duty road that comes within 1,000 feet of the southeastern corner of the tract. The tract is characterized by a natural appearing landscape without any obvious modifications. There are no physical facilities within the tract. It is anticipated that encounters with others would be minimal, with group sizes under three people and a low frequency of visitor use, creating a semi-primitive to backcountry type of experience. There are no visitor services, individual user fees, or visitor controls for this tract.

Middle Fork

Recreational activities that may occur on this 40-acre tract include hunting, hiking, and wildlife viewing. There are no roads or developed trails that cross or enter this tract; however, there is a paved secondary road that runs along the western boundary and comes within 500 feet of the tract. The tract is not unique to the surrounding area, and there are no known user conflicts. The tract is characterized by a natural

appearing landscape having modifications not readily noticeable. There are no physical facilities within the tract. It is anticipated that encounters with others would be minimal, with group sizes under three people and a low frequency of visitor use, creating a semi-primitive to backcountry type of experience. There are no visitor services, individual user fees, or visitor controls for this tract.

Mountain Creek

Hunting is known to occur in the area of this 80-acre tract, and there is potential for hiking within the tract, although actual visitor use is not known and would be relatively small in group size, from one to three persons. The tract is not unique to the surrounding area. The visitor could expect a natural landscape within a backcountry type setting. There are no visitor services, facilities, user fees, or visitor controls for this tract.

Norfolk Lake

Access to this tract is possible from an OHV trail/road just north of this 20-acre tract; however, there are no roads or trails that enter or cross the tract. There is a secondary paved road within 1,500 feet of the western boarder of the tract. From there, a visitor could walk or hike into the tract. Hunting and OHV use is known to occur in the area of the tract, and there is also the potential for hiking and other day uses of the uses. The setting of the landscape is natural with no readily apparent modifications. There are no physical facilities within the tract. It is anticipated that encounters with others would be minimal, with group sizes under three people and a low frequency of visitor use, creating a semi-primitive to backcountry type of experience. There are no visitor services, individual user fees, or visitor controls for this tract.

Point Peter Mountain

Hunting and hiking, as well as other day-use type of activities, are potential recreation activities for this 40-acre tract. The landscape is natural, with some modification from trails, and is adjacent to the Ozark National Forest. There are no physical facilities within the tract. It is anticipated that encounters with others would be minimal, with group sizes under three people and a low frequency of visitor use, creating a somewhat primitive to backcountry type of experience. There are no visitor services, individual use fees, or visitor controls for this tract.

Rattlesnake Hollow

Visitors to this 40-acre tract can access it south of the tract boundary from an undeveloped road off Blossom Road. Hunting and OHV use is known to occur in the area but it is not known if these activities occur on the tract itself. Visitors to the tract could expect a semi-primitive to backcountry type experience with very few people actually visiting the tract. There are no visitor services, facilities, user fees, or visitor controls for this tract.

Redland Mountain

Hunting and hiking, as well as other day-use type of activities, are potential recreation activities for this 40-acre tract. The landscape is natural, with some modification from trails. There are no physical facilities within the tract. It is anticipated that encounters with others would be minimal, with group sizes under three people and a low frequency of visitor use, creating a somewhat primitive to backcountry type of experience. There are no visitor services, individual user fees, or visitor controls for this tract.

Tilly

Hunting and hiking, as well as other day use-type of activities, are potential recreation activities for this 40-acre tract. There are no roads or developed trails that enter or cross the tract. There is a paved secondary highway within 2,000 feet of the western boundary of the tract. The landscape is natural appearing with no readily noticeable modifications. There are no physical facilities within the tract. It is anticipated that encounters with others would be minimal, with group sizes under three people and a low frequency of visitor use, creating a somewhat primitive to backcountry type of experience. There are no visitor services, individual user fees, or visitor controls for this tract.

West Fork

Potential recreation opportunities for this 10-acre tract include hunting, hiking, and other day-use activities. There are no roads or developed trails that enter or cross this tract. There is an unpaved, light-duty road that comes within 2,500 feet of the southern boundary of the tract. There is also a developed trail that comes within 1,000 feet of the northern boundary. The tract is currently leased for oil and gas development, which could create a user conflict with recreation; however, no current development is taking place on the tract. The landscape is natural appearing with no readily noticeable modifications. There are no physical facilities within the tract. It is anticipated that encounters with others would be minimal, with group sizes under three people and a low frequency of visitor use, creating a somewhat primitive to backcountry type of experience. There are no visitor services, individual user fees, or visitor controls for this tract.

3.13.3 Florida Recreation Management

Florida BLM tracts offer a wide range of public recreational opportunities; however, most recreation occurs in areas with water access. Recreational activities in Florida include the following:

- Boating
- Hunting
- Fishing
- Bicycle riding
- Horseback riding
- Nature study
- Picnicking
- Beach swimming
- Hiking.

3.13.4 Florida Tract-Specific Recreation Management

This section contains recreation management information specific to each tract in Florida, including a description of the types of recreation that either are known to occur or could potentially occur on the tract. The recreation setting is also described, including the naturalness, remoteness, physical facilities, visitor experience, group sizes, visitor controls, user conflicts, and other recreation measurements.

Citrus County Tract

Because this tract (12.91 acres) is completely surrounded by water, access to the tract is possible only by travelling 0.5 miles on a deep 75-foot wide channel by boat. Many wetland birds, eagles, and small mammals inhabit this area. There are no known recreational activities occurring on this tract; however air

boating takes place adjacent to the tract on state lands. Visitors to the tract could expect a rural type of experience with urban suburbs surrounding the marsh area but at least 1,000 feet from the tract. There are no visitor services, individual user fees, or visitor controls for this tract.

Egmont Key

This 55-acre tract is unique to the area, with beaches and an historic lighthouse and the ruins of historic Fort Dade. Recreational activities associated with the tract include boating, beach swimming, picnicking, fishing, and viewing and exploration of historical structures. Access to Egmont Key is by private boat or public ferry; there are no roads accessing the key. The landscape is mostly natural with some modifications of historical structures and roads. There are some facilities located on the tract, although they are very basic, and personnel are seldom available to provide onsite assistance. There are a number of recreational users who visit the tract daily, and visitors should expect to encounter large groups of people. There are no individual user fees and only minor visitor controls in place.

Freeport

Boating takes place along this tract in open waters of the LaGrange Bayou. The tract (0.48 acres) is not unique to the surrounding landscape but the setting is natural with no apparent modifications. The area is rural, although near primary highways and other development. There are no visitor facilities on the tract. The tract can be accessed most readily by boat; however, there is a primary highway within one-half mile to the west of the tract. There are no roads or trails that enter or cross the tract. Although the tract is somewhat rural, encounters with others in the area, especially in the bayou are frequent. There are no individual user fees or visitor controls for this tract.

Gasparilla

This 7.4-acres tract is situated along a beach front, with development on all sides. The tract is unique to the surrounding area in that it contains an historic lighthouse. Recreational activities include beach swimming, picnicking, fishing, and cultural sites viewing. Access to the tract is from a primary highway that runs along the eastern boundary of the tract. Encounters with other visitors are frequent, and large groups frequently visit the site. Although in a natural setting, the surrounding area is urban. There are no visitor services; however, the tract requires continuous enforcement to redistribute use and reduce user conflicts, hazards, and resource damage. There are no individual user fees.

Jupiter Inlet Lighthouse ONA

The Jupiter Inlet Lighthouse ONAcontains 85.83 acres administered by BLM. The tract maintains some of Florida's oldest remaining plant communities, a delicate ecosystem that is home to 18 special status species. As a result of the highly urbanized development in Palm Beach County, less than three percent of the original oak scrub vegetation remains in the county. As a preservation effort, the Jupiter Inlet Lighthouse ONA has retained many of the ecological elements now rare along the urbanized coast of southeastern Florida, including one of the largest and most intact scrub remnants in the county.

The area is accessible by interstate highway I-95, and is less than 30 minutes from Palm Beach International Airport and the Port of Palm Beach. The Jupiter Inlet Lighthouse ONA is accessible year round. It is highly visible from U.S. Highway 1 and serves as a green backdrop for the picturesque Jupiter Inlet Lighthouse. Recreational activities include viewing the lighthouse and the surrounding landscape, walking, picnicking, enjoying time with family and friends, nature viewing, and learning about and viewing historical sites. A small parking lot, a paved trail, and a lagoon overlook are on the BLM tract,

and there are full-service facilities adjacent to the tract and within the Jupiter Inlet Lighthouse ONA. The Town of Jupiter manages a 26-acre park adjacent to the BLM tract. The park includes an historic World War II barracks building, which is used by several community groups, including the Florida History Center and Museum's lighthouse ticket office and gift shop. The Florida History Center and Museum manages the lighthouse and provides public tours. Visitors to the area can expect to encounter large groups of people.

Lake Marion

There are little to no recreational activities occurring on the 22.27-acre tract. Potential activities include walking and wildlife viewing. Although the tract is in a mostly natural setting, there some trails that run through the tract. There are no visitor facilities. Visitors to the tract would not encounter many people on the tract; however, the tract is within a short distance of a residential area. There are no individual user fees or visitor controls for this tract.

Lathrop Bayou

Potential recreational activities for this 185-acre tract include boating, and fishing, mostly by boat in areas surrounding the tract. Occasional OHV use has been noted at Lathrop Bayou with access gained through the marsh at the southeast end of the "island." The landscape is in a natural setting, and visitors to the tract would be able to have a primitive type of recreational experience with few, if any, encounters with other visitors. There are no visitor facilities and no individual user fees or visitor controls for this tract.

Park Key

Access to this tract is from Highway 1, which runs within a few feet of this 1.36-acre tract. There is little to no recreation actually occurring on the tract; however, the area surrounding the tract receives high visitation along the highway as well as from boats in the Upper Sugarloaf Sound. Visitors to the tract can expect to have a rural to urban type experience. The area immediately adjacent to the tract is not developed, but there are housing developments within approximately 2,000 feet. There are no visitor facilities and no individual user fees or visitor controls for this tract.

Sugarloaf Key

Potential recreation activities for these tracts (3.57 acres) include fishing and boat access. The tracts is accessible by a primary road and by boat. Although the setting is natural, modifications from road access and other uses can be seen. There are no visitor facilities. Visitors would expect to encounter other recreationists; however, they would be in small groups. There are no individual user fees or visitor controls for this tract.

Suwannee

Access to this tract (0.21 acres) is difficult because the visitor would need to pass through private property and use private roads, or access the tract from the Ichetucknee River. There is no known recreation occurring on the tract; however, tubing down the river adjacent to the tract is common. The visitor could expect to have a rural type experience with homes located within 1,000 feet of the tract, although the homes are on large tracts (one acre or more) of land and most have left natural vegetation intact. There are no visitor facilities, user fees, or visitor controls for this tract.

3.13.5 Louisiana Recreation Management

Recreation on BLM tracts in Louisiana varies by tract and ranges from boat launches and other water-related recreation to dispersed uses. Potentially occurring recreation activities on BLM tracts in Louisiana include:

- Hunting
- Boating
- Fishing
- Bicycle riding
- Horseback riding
- Nature study
- Picnicking
- Hiking.

3.13.6 Louisiana Tract-Specific Recreation Management

This section contains recreation management information specific to each tract in Louisiana, including a description of the types of recreation that either are known to occur or could potentially occur on the tract. The recreation setting is also described, including the naturalness, remoteness, physical facilities, visitor experience, group sizes, visitor controls, user conflicts, and other recreation measurements.

Baldwin

Consisting of 360 acres, the Baldwin tract is located adjacent to farmland, although the tract itself is undeveloped and not used for farming. It is not known whether any recreational activities occur within the tract. The tract is flat and in a natural setting with some modifications within the tract for pipelines and canals. Visitors to the area would expect to have few encounters with other visitors. There are no visitor facilities, individual user fees, or visitor controls for this tract.

Big Saline Bayou SRMA

The approximately 158-acre tract is very flat with a very slight increase in elevation near the extreme southwestern corner. Much of the tract is inundated seasonally. Vegetation includes large bald cypress along the edges of the bayou and ponds, swamp vegetation in areas that receive constant or regular inundation by the bayou, and bottomland hardwood forests scattered throughout the drier portions of the tract. The tract is adjacent to the Dewey W. Wills State WMA. The tract, like much of this area, has been developed for oil and gas production. Wells have been placed on raised manmade mounds and so are out of the flood zone; small ponds have formed in the borrow pits. A production facility supporting the federal wells is located just off the southwestern corner of the tract. Administrative vehicle access is available via service roads along the northern and western boundaries. These service roads provide access to well sites and a small private inholding. There also are several OHV trails in the area.

The market strategy for this tract is undeveloped recreation. Currently, the tract is used for access to the water and boat launching for fishing. When soils are wet, boat launching has created deep rutting in the shoreline. Access to the tract is from Muddy Boyce Road, an unpaved light-duty road. There are no other roads that enter or cross the tract, other than the OHV trails. The setting for the tract is somewhat natural except for modifications for oil wells and OHV trails. Visitors to the tract would experience a rural type area with few, if any, encounters from other visitors. There are no visitor facilities, individual user fees, or visitor controls for this tract.

Black Lake

With its proximity to private hunting clubs, this 135-acre tract is mostly used for hunting. There are no developed roads or trails that cross or enter the tract. The tract is accessible by an unpaved, light-duty road that comes within 1,000 feet of the tract. The tract could also be accessed by boat. The remoteness of the area lends itself to a backcountry type of experience in a natural appearing landscape. A visitor would experience very few encounters, if any, with other visitors. There are no visitor facilities, individual user fees, or visitor controls for this tract.

Duck Lake

The most prevalent recreational activities for this tract (63.59 acres) are hunting and fishing; however, there is potential for boating. Private property in the area poses some conflicts for all recreational activities, mostly because of access and trespass issues. The area also provides crucial habitat for a variety of species. The tract is quite remote, with no close access by road. The tract is best accessible by boat from Duck Lake. The setting is natural with some modifications outside of the tract for pipelines and canals. Visitors to the area would expect to have few encounters with other visitors. There are no visitor facilities, individual user fees, or visitor controls for this tract.

Rocky Bayou

Potential recreational activities for this 21-acre tract include hiking, bird watching, and wildlife viewing. The setting is not unique to the area, and these activities can be done outside the tract. Although there are no developed roads or trails that cross or enter this tract, there are two unpaved and unimproved roads that come within 250 feet of the tract by which visitors can access the tract. The landscape is natural in appearance with no readily noticeable modifications. Because the area is quite remote, visitor encounters would be few, if any, and group sizes would be small. There are no visitor facilities, individual user fees, or visitor controls for this tract.

3.13.7 Virginia Recreation Management

Recreation management in Virginia is limited to the Meadowood SRMA. There are no other BLM tracts within Virginia.

3.13.8 Virginia Tract-Specific Recreation Management

Meadowood SRMA

The Meadowood SRMA is a BLM-owned and managed recreational site in southeastern Fairfax County, Virginia. In 2001, BLM acquired the original Meadowood Farm from a private owner. Today, Meadowood has evolved into a public recreation area with a recently reconstructed network of hiking and horseback trails, equestrian facilities, four trailheads for public access, a universally accessible fishing pond and trail, and developing hiking/biking trails and trail connections to Pohick Bay Regional Park. Along with the neighboring parks of Mason Neck State Park, Pohick Bay Regional Park, and Occoquan Regional Park, Meadowood provides a valuable green respite in the densely populated Washington, DC/Northern Virginia metropolitan area.

Meadowood SRMA is unique in that it exists in one of the more populous metropolitan areas in the country, where useable open space is a limited resource and in high demand by the public. Meadowood SRMA encompasses approximately 804 acres of forests, meadows, hiking trails, and horseback riding

trails, along with other natural and manmade features. It contains an approximately 30-year old stable and associated facilities. Meadowood's equestrian facilities have historically focused on boarding of privately owned horses. BLM has endeavored to accommodate this use, while increasing opportunities for the general public to participate in equestrian activities through issuing Special Recreation Permits for public lessons, therapeutic riding, and equestrian events. These activities have increased the diversity of users and recreation use at Meadowood.

The trail system is open to the general public free of charge, but BLM has generated revenue through the Federal Lands Recreation Enhancement Act for Special Recreation Permits for activities such as running races, orienteering events, and Boy Scout jamborees.

Environmental education opportunities also abound at Meadowood SRMA. Several local schools participate in the "Hands on the Land Program," where students participate in programs such as bird identification, pathways to fishing, habitat hikes, tree identification, "Urban Leave No Trace," tracking, invasive weed activity kits, cleanup days, and various other environmental education activities. Although no identified threatened or endangered species reside onsite, the community actively supports the preservation of the pristine natural state that exists on Meadowood SRMA. Other activities occurring at the Meadowood SRMA include control-line flying, picnicking, spending time with family and friends, nature viewing, geocaching, orienteering, jogging, dog walking, and nature walks.

3.14 TRAVEL AND ACCESS MANAGEMENT

Most of the surface tracts are not accessible by public road. However, public travel routes administered and maintained by state and local agencies are often nearby and, in some cases, provide full access. Information on tract-specific travel resources are contained in the state tract-specific sections that follow. Because there are no surface tracts in Kentucky and Tennessee, these states are not included in this section.

3.14.1 Arkansas Tract-Specific Travel and Access Management

Bear Creek

There are no developed roads within or leading to the tract, but there are a few trails that can be accessed on foot. No motorized access is allowed, except for existing roads.

Bennett Bayou

The tract can be accessed by an unpaved unimproved road that comes within 500 feet of the northeastern corner. The road does not cross through the tract but instead follows along the edge of the tract boundary.

Buffalo River

This tract can be accessed by an unpaved light-duty road on the southeastern corner. A hiking trail crosses through the northwestern portion of the tract.

Calf Creek

This tract is characterized by steep terrain and does not contain any roads or trails. A paved secondary highway comes within 2,000 feet of the southeastern corner of the tract.

Campbell Hollow

This tract is characterized by steep terrain and does not contain any roads or trails. An unpaved light-duty road comes within 1,000 feet of the southeastern corner of the tract.

Drasco

There are no roads or trails that cross this tract; however, a secondary highway comes within 1,000 feet of the southeastern corner.

Foster Branch

No roads or developed trails cross or enter this tract; however, an unpaved and unimproved road follows along the northern border of the tract. The road comes within 250 feet of the tract.

Gepp

There are roads approximately one-half mile to the east and west of the tract. There is a trail leading to the tract from the east and dirt roads located on the outer boundaries of the tract.

Henderson Mountain

Access to the tract is from a well-defined OHV trail that leads from the road (Winfrey Valley Road/NF-1701) to a fire pit located just outside the southeast corner of the tract. The trail continues along the outside of the eastern boundary line for approximately 100 feet before heading further east away from the tract.

Locust Mountain

This tract is characterized by steep terrain, and no roads or trails cross or enter the tract. A trail comes within 1,500 feet of the southeastern corner of the tract, and an unpaved and unimproved road comes within 1,000 feet of the northwestern corner.

Long Mountain Creek

The Long Mountain Creek Tracts are two 40-acre tracts within one-quarter mile of each other. The northern tract contains a trail, and there is a paved secondary road within 4,000 feet of the southern border. The southern tract comes within 1,500 feet of the paved road and also contains a trail that crosses through the center of the tract.

Lost Creek

This tract is characterized by steep terrain and does not contain any roads or developed trails. A hiking trail comes within 1,000 feet of the southern border of the tract. A paved secondary highway comes within 4,000 feet of the southwestern corner of the tract.

Marion North

Access to this tract is from an unimproved road that comes within 500 feet of the southern boundary of the tract; however, there are no roads leading into the tract.

Martins Creek

This tract can be accessed from a hiking trail that crosses through the northern portion of the tract. An unpaved light-duty road comes within 1,000 feet of the southeastern corner of the tract.

Middle Fork

No roads or developed trails cross or enter this tract; however, a paved secondary road runs along the western boundary and comes within 500 feet of the tract.

Mountain Creek

Access to this tract is from an unimproved road within 1,000 feet of the northern boundary. There are no roads leading into the tract.

Norfolk Lake

This tract is characterized by steep terrain, and no roads or developed trails cross through or enter the tract. A paved, primary highway comes within 4,000 feet of the northern boundary of the tract. A developed trail comes within 250 feet of the southern boundary of the tract.

Point Peter Mountain

This tract is characterized by steep terrain, and no roads or developed trails cross or enter the tract. A paved secondary highway comes within 8,000 feet (approximately 1.5 miles) of the southeastern corner of the tract. An unpaved and unimproved road comes within 1.5 miles of the western border of the tract.

Rattlesnake Hollow

Visitors to this tract can access it south of the tract boundary from an undeveloped road off Blossom Road.

Redland Mountain

This tract is characterized by very steep terrain on the southern slope of Redland Mountain. No roads or developed trails enter or cross the tract. A paved, secondary highway comes within 3,000 feet of the southern boundary. An unpaved light-duty road comes within 2,500 feet of the southeastern corner of the tract.

Tilly

This tract is characterized by steep terrain, and no roads or developed trails enter or cross the tract. A paved secondary highway comes within 2,000 feet of the western boundary of the tract.

West Fork

No roads or developed trails enter or cross this tract. An unpaved, light-duty road comes within 2,500 feet of the southern boundary of the tract. A developed trail comes within 1,000 feet of the northern boundary.

3.14.2 Florida Tract-Specific Travel and Access Management

Citrus County Tract

This tract is completely surrounded by marsh grass. Access to the tract is possible by travelling 0.5 miles on a deep 75-foot wide channel by boat.

Egmont Key

Although somewhat remote in location, there are roads within this tract. Access to Egmont Key is by boat.

Freeport

The area around this tract is rural, although near primary highways and other development. The tract can be accessed by boat; however, there is a primary highway within a half-mile to the west of the tract and a residential area adjacent to the north. There are no roads or trails that enter or cross the tract.

Gasparilla

This tract is situated along a beach front, with development on all sides. Access to the tract is from a primary highway that runs along the eastern boundary of the tract.

Jupiter Inlet Lighthouse ONA

The ONA is accessible by US Highway 1 that runs along the western border of the tract and Beach Road that bisects the tract. The tract also contains developed roads and parking as well as developed trails.

Lake Marion

This tract is situated between extensive residential development to the east and north, and a state-owned tract that borders Lake Marion. The tract can be accessed from an adjacent residential area. Several old trails run throughout the tract.

Lathrop Bayou

This tract is composed of three disjunct units, all of which are on a peninsula separated from the mainland by a shallow marsh. There are no developed roads or trails within this tract. The tract is most accessible by boat.

Park Key

Access to this tract is from Highway 1, which runs within a few feet of the tract. The area surrounding the tract receives high visitation along the highway as well as from boats in the Upper Sugarloaf Sound.

Sugarloaf Key

This tract is composed of two disjunct units on Sugarloaf Key, each adjacent to a road and other developments. The tract is accessible by a primary road and by boat.

Suwannee

The Suwannee tract sits along the Ichetucknee River. Although the tract boundary itself does not reach the river shoreline, it does come within approximately 500 feet. Access to the tract is difficult because the visitor would need to pass through private property and use private roads, or access the tract from the river.

3.14.3 Louisiana Tract-Specific Travel and Access Management

Big Saline Bayou SRMA

This tract is accessible by Muddy Boyce Road, an unpaved light-duty road. There are 7,513 feet of routes on the tract. Appendix G contains additional information about the routes.

Black Lake

There are no developed roads or trails that cross or enter the two parcels that make up this tract. The tract is accessible by an unpaved, light-duty road, which comes within 1,000 feet of each parcel. The parcels are also accessible by boat.

Duck Lake

This is an isolated tract with no developed roads or trails. This tract is best accessed by boat from Duck Lake.

Rocky Bayou

There are no developed roads or trails that cross or enter this tract. There are two unpaved and unimproved roads that come within 250 feet of the tract.

Baldwin

Access to the Baldwin tract is possible from Highway 90 and then from Rosebud Street, which reaches the tract from the north.

3.14.4 Virginia Tract-Specific Travel and Access Management

Access to Meadowood SRMA is from Gunston Road, Old Colchester Road, and Belmont Boulevard. Interstate 95 and U.S. Highway 1 provide access to the Mason Neck Peninsula. The SRMA has a network of eight miles of horseback and hiking trails and is beginning construction of a network of six miles of new trails on the West parcel, which will include a four-mile hiking/biking loop, and two miles of technical mountain biking trails. There are 4,930 feet of routes on the tract. Appendix G contains additional information about the routes.

3.15 LANDS AND REALTY

The goals of the lands and realty program are to manage the public lands to support the goals and objectives of other resource programs and provide for realty-related uses of public lands, such as ROWs and communications sites, in accordance with regulations and compatibility with other resources, and improve management of the public lands through land tenure adjustments.

BLM has a rich history in the management of real property, having inherited the land survey and federal real property recordkeeping functions of the General Land Office. With the passage of Federal Land Policy and Management Act (FLPMA) in 1976, BLM acquired responsibilities to retain and manage public lands for multiple use, in addition to its responsibilities to maintain the survey and land record systems. The BLM lands and realty program provides the basic products and services required to meet the internal and external demands for land record information, use authorizations, and land tenure adjustments. Land tenure adjustments include land sales, exchanges, withdrawal actions, and Recreation and Public Purposes (R&PP) Act transfers.

The BLM Eastern States Office reviews land and title records to identify remaining public domain land. The goal is to develop and maintain accurate land records to efficiently provide accurate information to the public and to facilitate management of the public domain lands. For many cases, land title is clouded, with citizens claiming ownership and paying real estate taxes to local governments despite government land records showing the land was never transferred from federal ownership. This results in a significant title resolution workload, because any individual, group, or corporation that has evidence giving the appearance of having title to public lands may file a claim under the Color-of-Title Act. The Act provides that an applicant will receive a patent conveying clear title to the lands upon payment of the sale price of the lands, if that applicant meets the claim requirements. Lands of uncertain title within the *planning area* that could involve Color-of-Title Act claims can be found in Appendix A.

A total of 38 BLM administered surface tracts with clear title were identified to be included in this planning effort. The majority of these are widely scattered public domain tracts in the states of Arkansas, Florida, and Louisiana. The only acquired land tract is the Meadowood SRMA in Virginia. Descriptions of the surface tracts are available in Appendix B. Land tenure adjustment criteria and alternatives are presented in Appendix E.

Some lands are leased or patented under the R&PP Act of 1926. The objective of the Act is to meet the needs of state and local government agencies and nonprofit organizations by leasing or conveying public land needed for public uses. The vast majority of R&PP tracts in the *planning area* are for state and local parks. The lands must continue to be used for public purposes and may not be conveyed without approval. Compliance inspections are scheduled every five to 10 years following lease or conveyance. A list of the existing leased and patented R&PP lands within the *planning area* is included in Appendix H.

3.16 AREAS OF CRITICAL ENVIRONMENTAL CONCERN

Areas of critical environmental concern (ACEC) are defined in the FLPMA, Section 103(a) as "areas within the public lands where special management attention is required (when such areas are developed or used or where no development is required) to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources or other natural systems or processes, or to protect life and safety from natural hazards." BLM prepared regulations for implementing the ACEC provisions of FLPMA. These regulations are found at 43 CFR 1610.7-2. BLM also developed policy on ACECs that can be found at 45 CFR 57318 and in *BLM Manual 1613*. An ACEC's management is determined at the time of its designation and serves to protect and manage the relevant and importance (R&I) values, resources, processes, systems, or hazards (collectively values). ACECs are also protected by the provisions of 43 CFR 3809.1-4(b)(3), which require an approved plan of operations for activities under the mining laws except for casual use.

There is one existing ACEC within the *planning area*. The Jupiter Inlet Lighthouse ACEC is composed of Lot 15 (54.33 acres) of the Jupiter Inlet Lighthouse ONA tract and is managed to maintain a viable scrub community and improve habitat conditions for the Florida scrub jay, gopher tortoise, and other endemic scrub species.

As part of the RMP revision, ACEC nominations were requested and reviewed. Three ACEC nominations, including the existing ACEC and the remainder of the acreage of the Jupiter Inlet Lighthouse ONA tract, were identified during the scoping process and subsequent data requests (Table 3-89). Nominations were evaluated in accordance with *BLM Manual 1613*. Values meeting mandatory relevance and importance criteria were identified and are the basis for establishing potential ACECs for further consideration in the Draft EIS. Appendix F documents the ACEC nomination and evaluation process and contains more information on the potential ACECs and their associated relevant and important values and threats. All three of the nominated ACECs were reviewed and determined to meet the relevance and importance criteria, and as such are considered potential ACECs in this planning process. The potential size of each area and the associated relevant and important values are listed in Table 3-89.

Table 3-89. Potential Areas of Critical Environmental Concern

Nominated Area	Public Land Acres	State, County	Relevant and Important Values
Jupiter Inlet Lighthouse ONA Existing ACEC and Expansion to Include Entire Tract	85.83	Florida, Palm Beach	Cultural Resources, Fish and Wildlife Resources (a variety of species/habitats), Natural Processes or Systems (a variety of species and vegetation communities)
Lathrop Bayou	185.03	Florida, Bay	Fish and Wildlife resources (a variety of species/habitats), Natural Processes or Systems (a vegetation community in a rare ecological state)
Egmont Key	55.0	Florida, Hillsborough	Cultural Resources, Fish and Wildlife Resources (a variety of species/habitats), Natural Processes or Systems (a variety of species and vegetation communities)
Total	**325.86**		

3.17 NATIONAL TRAILS AND NATIONAL WILD AND SCENIC RIVERS

3.17.1 National Trails

National trails within the planning area are shown in Table 3-92. There are two National Trails associated with the Meadowood SRMA, as discussed below.

Potomac National Heritage Scenic Trail

National scenic trails are extended trails so located as to provide for maximum outdoor recreation potential and for the conservation and enjoyment of the nationally significant scenic, historic, natural, or cultural qualities of the areas through which such trails may pass. National scenic trails may be located so as to represent desert, marsh, grassland, mountain, canyon, river, forest, and other areas, as well as landforms which exhibit significant characteristics of the physiographic regions of the Nation.

The Potomac Heritage National Scenic Trail was designated a National Scenic Trail in 1983. It encompasses urban parklands of the Nation's Capital and landscapes from tidewater marshlands and the Piedmont's rolling foothills to mountains and valleys of the Blue Ridge and Alleghany Highlands.

As of 2010, 830 miles of existing and planned trails have been recognized as segments of the Potomac Heritage NST. This National Scenic Trail links the Potomac and upper Ohio River basins from Chesapeake Bay and Potomac tidewater to the Allegheny Highlands, and the network lets you retrace by foot, bicycle, horse or boat the corridor that George Washington considered essential to the nation's development.

Segments of the trail have been proposed within the Meadowood SRMA boundary on existing trails in coordination with the National Park Service. The trails provide passage through mature hardwood forests, rolling meadows near creeks and streams and even riparian wetlands providing a diverse habitat for wildlife. The trail would pass near historic routes, cultural sites, and remnants of past agricultural use. The trail segment would link to other planned Potomac Heritage NST segments in the area including those that currently exist on the Mason Neck Peninsula. The trail use would likely be limited to non-motorized uses such as hiking, bicycling, and horseback riding.

Washington-Rochambeau Revolutionary Route National Historic Traii

National historic trails are extended trails which follow as closely as possible and practicable the original trails or routes of travel of national historic significance. National historic trails shall have as their purpose the identification and protection of the historic route and its historic remnants and artifacts for public use and enjoyment.

The Washington-Rochambeau Revolutionary Route National Historic Trail was designated as a National Historic Trail on March 30, 2009, as part of the Omnibus Public Land Management Act of 2009. The Washington-Rochambeau Revolutionary Route National Historic Trail, also known as the W3R-NHT, commemorates the over 680 miles of land and water trails followed by the allied armies under General Washington and General Rochambeau in 1781 and 1782 through Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia and what is now Washington D.C.

The NHT will identify, preserve, interpret, and celebrate the French and American alliance in the War for Independence. The military, logistical, and cultural significance of the trail to the final land battle of the

American Revolution deserves recognition as a pivotal point in American history. Without the assistance of thousands of French soldiers, many of whom gave their lives, the outcome of the war may have been different. The Washington-Rochambeau Revolutionary Route National Historic Trail honors the cross-cultural significance of the French-American alliance and America's great success in the War for Independence.

The State of Virginia and Fairfax County support the inscription of the Giles Run Site on the National Register and suggest interpretation of the site. A wayside exhibit will be placed on the knoll just off of Giles Run Trail at Meadowood SRMA where the structures occupied by the highest-ranking French offers where found. The exhibit will look over the area that was covered with the tents and kitchens of the French soldiers. Today, a small, intermittent stream flows through the old course of Colchester Road, which was realigned decades ago. Across that road, the artillery and supply wagons were arranged for the day, where they were under the watchful and protective eyes of all.

The Giles Run Site is on the Washington Rochambeau Revolutionary Route (WR3) National Historic Trail, established by the National Park Service. People following that route can be expected to stop at the Giles Run Site, more commonly known as the encampment at Colchester. This site (site 44FX3446) on Meadowood SRMA is eligible for listing in the National Register at the national level under Criteria A, B, and D.

Segments of the trail have been proposed within the Meadowood SRMA boundary on existing trails in coordination with the National Park Service. The trails provide passage through mature hardwood forests over creeks and streams that provide a diverse habitat for wildlife. The trail would pass near historic routes (Colchester Road-Washington Rochambeau Revolutionary Route), cultural sites, and remnants of past agricultural use. Interpretive literature, signs, and exhibits along the trail will describe the key role of French diplomatic, military, and economic aid to the United States during the Revolutionary War. The trail use would likely be limited to non-motorized uses such as hiking, bicycling, and horseback riding.

3.17.2 National Wild and Scenic Rivers

National Wild and Scenic Rivers within the planning area are shown in Table 3-92. None of these are associated with BLM surface

Table 3-90. Designated National Trails within the Planning Area

State	Trail Name - Designation	On or Near BLM Surface Tract	On or Near FMO	On or Near FMO in Area of Expected Development – Oil and Gas	On or Near FMO in Area of Expected Development – Coal	On or Near FMO in Area of Expected Development – Phosphate	Comments
AR	Trail of Tears - NHT	No	Yes	Yes	No	No	Several segments follow highways, roads, and waterways across the central and northwestern part of Arkansas including the Arkansas River waterway route adjacent to a part of Chaffee Maneuver Training Center, through Ozark Lake and Lake Dardanelle and a highway route through the Pine Tree State Wildlife Management Area. Federal mineral ownership exists on these facilities. Small scattered split estate tracts are near segments of this trail and a few appear to be adjacent to roads designated as part of this trail. No BLM surface tracts are on, adjacent to, or near any segment of this trail.
AR	Study for potential extension of Lewis and Clark - NHT	No	Yes	No	No	No	A segment of the study trail in Arkansas follows the Mississippi River. BLM surface and federal miner ownership is not near this part of the trail.
AR	Study for Butterfield Overland Stage Trail	No	Yes	Yes	No	No	The study routes are along highways that run through central and northwestern Arkansas including the Chaffee Maneuver Training Center where there is federal mineral ownership and development. Small scattered split estate tracts are near segments of this trail and some may also be adjacent to it. No BLM surface tracts appears to be near any segment of this trail.
FL	Florida - NST	No	Yes	No	No	No	Small segments of this trail travel through Areas of Expected Development of phosphate and oil and gas

State	Trail Name - Designation	On or Near BLM Surface Tract	On or Near FMO	On or Near FMO in Area of Expected Development – Oil and Gas	On or Near FMO in Area of Expected Development – Coal	On or Near FMO in Area of Expected Development – Phosphate	Comments
							but are more than two miles from any split estate tract. The closest BLM surface tract is approximately two miles from the trail.
GA	Trail of Tears - NHT	No	No	No	No	No	
GA	Appalachian - NST	No	No	No	No	No	
KY	Trail of Tears - NHT	No	Yes	Yes	No	No	The Trail of Tears is slightly over one mile south of the south boundary of Pennyrile State Forest. In this area it follows State Highway 91. A water route of the Trail of Tears follows the Tennessee River through Kentucky Lake and is about 0.6 miles south of Lake Barkley. There is federal mineral ownership at Lake Barkley.
KY	Study for potential extension of Lewis and Clark - NHT	No	Yes	Yes	No	No	A NPS map of the Preliminary Study Corridors for this trail shows that highways near Pennyrile State Forest and Kentucky Ridge State Forests are in close proximity to route segments. There is federal mineral ownership on these properties.
LA	El Camino Real de Los Tejas - NHT	No	Yes	No	No	No	A few small split estate tracts are as close as 1.25 miles north of State Highway 6 in Natchitoches Perish which is a segment of this trail. No BLM surface tracts appears to be near any segment of this trail.
NC	Overmountain Victory - NHT	No	No	No	No	No	
NC	Appalachian - NST	No	No	No	No	No	

State	Trail Name - Designation	On or Near BLM Surface Tract	On or Near FMO	On or Near FMO in Area of Expected Development – Oil and Gas	On or Near FMO in Area of Expected Development – Coal	On or Near FMO in Area of Expected Development – Phosphate	Comments
SC	Overmountain Victory - NHT	No	No	No	No	No	
TN	Appalachian - NST	No	No	No	No	No	
TN	Natchez Trace - NST	No	No	No	No	No	
TN	Overmountain Victory - NHT	No	No	No	No	No	.
TN	Trail of Tears - NHT	No	No	No	No	No	
TN	Study for potential extension of Lewis and Clark - NHT	No	No	No	No	No	
VA	Appalachian - NST	No	Yes	No	No	No	The Appalachian NST is approximately 13 miles northwest of Radford Army Ammunition Plant but not within the area of expected development.
VA	Washington-Rochambeau Revolutionary Route - NHT	Yes	Yes	No	No	No	A segment of this trail follows Old Colchester Road on the northwester boundary of Meadowood Special Recreation Area.
VA	Potomac Heritage - NST	Yes	Yes	No	No	No	The existing trails at Meadowood Special Recreation Area are proposed for inclusion in this system of trails.
VA	Star Spangled Banner - NHT	No	No	No	No	No	
VA	Captain John Smith	No	No	No	No	No	

State	Trail Name - Designation	On or Near BLM Surface Tract	On or Near FMO	On or Near FMO in Area of Expected Development – Oil and Gas	On or Near FMO in Area of Expected Development – Coal	On or Near FMO in Area of Expected Development – Phosphate	Comments
	Chesaoeake - NHT						
VA	Study for potential extension of Lewis and Clark - NHT	No	Yes	No	No	No	A NPS map of the Preliminary Study Corridors of this potential trail shows that one study route would run through Pulaski and Montgomery counties but is not close to Radford Army Ammunition Plant. Another study route runs through Fairfax County within a few miles of Meadowood Special Recreation Management Area.

Table 3-91. Designated National Wild and Scenic Rivers within the Planning Area

State	River Name	On or Near BLM Surface Tract	On or Near FMO	On or Near FMO in Area of Expected Development – Oil and Gas	On or Near FMO in Area of Expected Development – Coal	On or Near FMO in Area of Expected Development – Phosphate	Comments
AR	North Sycamore Cr.	No	Yes	Yes	No	No	Located within the Ozark National Forest in Stone County. There are a few scattered split- estate tracts within 2 miles.
AR	Richland Cr.	No	Yes	Yes	No	No	Located within the Ozark National Forest in Newton, Pope, and Searcy Counties. There are a few scattered split-estate tracts within 2 miles and BLM surface tracts within 1.5 miles
AR	Hurricane Cr.	No	No	No	No	No	Located within the Ozark National Forest in Newton and Johnson Counties. There are no BLM surface tracts or split-estate tracts in the area.
AR	Big Piney Cr.	No	Yes	Yes	No	No	The northern segments of this river are within the Ozark National Forest in Newton, Johnson, and Pope Counties. A 40 acre split-estate tract located on the southernmost end of this river is intersected by it. This tract is located in T.9N., R. 22W., Sec. 12, SW1/4SW1/4. This part of the river is outside of the Forest Service boundary in Johnson County and is within the Area of Expected Development of oil and gas. This tract was leased in the mid 90's but is not currently under a lease or agreement.
AR	Mulberry R.	No	Yes	Yes	No	No	Mostly located within the Ozark National Forest in Franklin and Johnson Counties. However, in the southernmost part there are a few small split-estate tracts located less than a mile from the river and one 80 acre tract intersected by it. The location of this later tract is T.11N., R.28W., Sec. 22, E1/2SE1/4. It is

State	River Name	On or Near BLM Surface Tract	On or Near FMO	On or Near FMO in Area of Expected Development – Oil and Gas	On or Near FMO in Area of Expected Development – Coal	On or Near FMO in Area of Expected Development – Phosphate	Comments
							immediately adjacent to National Forest property. This tract is under an authorized oil and gas lease that was issued in 1975 and also participates in a communitization agreement with the Forest Service property in the section.
AR	Cossatot R.	No	Yes	Yes	No	No	The northern branch of this river is located within the Ozark National Forest in Polk County. There are a few small split-estate tracts outside of the National Forest near the mid to lower part of the river in Howard County. The closest of these is approximately 0.37 miles from the river.
AR	[1]Buffalo R.	No	No	No	No	No	This segment is within the Ozark National Forest in Newton County. There are a few scattered split-estate tracts within 2 miles and a BLM surface tract within 1.5 miles. This segment is not within any Area of Expected Development.
AR	Little Missouri R.	No	Yes	No	No	No	Located on the Ouachita National Forest in Montgomery, Pike and Polk Counties. No BLM or split-estate lands are located in the vicinity.
FL	Loxahatchee R.	No	No	No	No	No	The designated river segment is approximately five miles west of the Jupiter Inlet tract in Palm Beach County. A tract of split-estate is located approximately 1.2 miles south southeast of this segment.
FL	Wekiva R.	No	Yes	No	No	No	This river segment is within Seminole, Orange, and Lake Counties. There are several small split-estate tracts near the River and branches of the River. One tract is about 1/2 mile from the main channel and

State	River Name	On or Near BLM Surface Tract	On or Near FMO	On or Near FMO in Area of Expected Development – Oil and Gas	On or Near FMO in Area of Expected Development – Coal	On or Near FMO in Area of Expected Development – Phosphate	Comments
							another immediately adjacent to a branch.
KY	Red R.	No	No	No	No	No	Located in Wolfe, Menifee, and Powell Counties.
LA	Saline Bayou	No	No	No	No	No	This river segment is within the Kisatchie National Forest and forms part of the boundary of Winn and Natchitoches Parishes.
NC, SC, GA	Chattooga R.	No	No	No	No	No	This river segment flows generally in a south-southwest direction beginning in Jackson County, NC, then follows the border of Jackson and Macon Counties, NC. It then follows the border of Oconee County, SC and Rabun County, GA. It ends at the border of Oconee County, SC and Habersham, County, GA.
NC	Lumber R.	No	No	No	No	No	This segment begins in Robeson County, NC and flows southeastward to the boundary of Robeson and Columbus Counties. From there it runs south-southwest to the NC - SC state line.
NC	Horsepasture R.	No	No	No	No	No	This segment is in Transylvania County.
NC	New R.	No	No	No	No	No	This segment is in Alleghany and Ashe Counties.
NC	Wilson Cr.	No	No	No	No	No	This segment is in Avery and Caldwell Counties,
TN	Obed R.	No	No	No	No	No	This segment lies within Morgan and Cumberland Counties.

[1]There is also a 135 mile segment of the Buffalo River which is not part of the NWSR system, but was designated as the Buffalo National River in 1972. .This segment is in Baxter, Marion, Searcy, and Newton Counties; it is under the jurisdiction of the National Park Service. A 40 acre BLM surface tract in Searcy County, known as the Buffalo River tract, is located adjacent to the Park Service northern boundary. The southeast corner of this tract is approximately 800 feet from the north bank of the River. It is not within any Area of Expected Development.

3.18 SOCIOECONOMICS

3.18.1 Introduction

Appendix D of the *BLM Land Use Planning Handbook (H-1601-1)*, "Social Science Considerations in Land Use Planning Decisions," provides guidance on analysis of social and economic information in the BLM planning process. The purpose of such analysis is to contribute to informed, sustainable land use planning decisions. Earlier in the process of developing the Southeastern States RMP, BLM prepared a *Socioeconomic Baseline Report* (BLM 2009). The purpose of the baseline, as described in Appendix D of the Handbook, is to "characterize existing conditions and trends in local communities and the wider region that may affect and be affected by land use planning decisions." This section of Chapter 3 excerpts key information from the *Socioeconomic Baseline Report*.

Selection of Socioeconomic Study Areas

A socioeconomic study area is defined as the area where social and economic conditions may affect or be affected by BLM's land use and mineral leasing decisions. This area is invariably larger than the *decision area*, because BLM decisions can affect conditions on adjacent parcels and communities, and beyond. A socioeconomic study area may differ from the *planning area*, depending on social and economic relationships across communities, regions, and states. In addition, the geographic basis on which social and economic data are available may affect the determination of a socioeconomic study area's boundaries. For example, while impacts of decisions may be mostly experienced within a few communities, often counties are the smallest geographic units for which important data are available.

For each state in the Southeastern States RMP, the socioeconomic study area considered for FMO was determined largely by the distribution of high-potential mineral development areas for which BLM administers the federal mineral leasing program. In some states, these areas are distributed across major portions of the state, and the socioeconomic study area is defined as a statewide area. In other states, the distribution of these areas is limited to a small number of counties, and the socioeconomic study area is defined by those counties and, in some cases, surrounding counties that have strong social or economic ties to the counties with the mineral development potential. In Kentucky, there is both a statewide socioeconomic study area and a more localized one because of the broad geographic distribution of high-potential areas for oil and gas development on the one hand, and the limited extent of areas with potential for coal mining on the other.

The socioeconomic study areas for surface tracts were determined on a different basis. BLM-managed surface tracts are relatively limited in the *planning area*—approximately 3,000 acres that combine BLM-administered surface land and subsurface mineral estate. In some states, there are no BLM-managed surface tracts, and therefore no socioeconomic study area for surface tracts was defined. In others, because of the relationship between BLM surface tracts and BLM-administered mineral estate, the socioeconomic study area for the surface tracts is defined as the same study area defined for BLM-administered FMO. In two states, Florida and Virginia, BLM manages specific surface tracts with significant natural and recreational values. The socioeconomic study area for each of these states focuses on these tracts and is defined as the county in which the notable tract is located.

Structure and Scope of the Analysis

Each state section below provides socioeconomic information in the following topical subsections addressing the socioeconomic study areas for FMO:

- Social and Economic Features—This section describes mineral production in the state, focusing on the mineral(s) most pertinent to the FMO. It describes the location of BLM-administered FMO and defines the socioeconomic study area(s) for the state.
- Socioeconomic Conditions—This section profiles trends in population, employment and income (usually by industry), and earnings.
- Demographic Characteristics—Topics in this section include age and gender, ethnicity and race, poverty, and household income.
- Attitudes and Beliefs—This section briefly describes stakeholders' attitudes and beliefs related to mineral development and extraction to provide a social context for land use planning decisions.
- Public Finance—The focus of this section is the sources of public revenues from minerals. In particular, it addresses federal mineral royalties, severance taxes, and ad valorem taxes produced in the state or the socioeconomic study area.
- Projected BLM-Attributed Economic Activity—This section describes the amount of mineral development expected under the RFD for each state. Based on reasonable assumptions, it projects the number of jobs and the amounts of federal mineral royalties, severance taxes, and ad valorem taxes that may be produced from BLM-administered FMO during the planning period.
- Environmental Justice (EJ)—"EJ" analysis is a requirement on federal agencies to address the potential for disproportionate impacts on minority and low-income populations. This section examines the socioeconomic study area for the presence of relevant population groups that could potentially be affected.

In a few cases, additional topics are considered. Some topics have multiple subsections. For Florida and Virginia, an additional subsection addresses socioeconomics pertaining to a significant BLM surface tract.

3.18.2 Arkansas Socioeonomics

Social and Economic Features

The social and economic analysis for BLM FMO in Arkansas focuses on natural gas development and production. These are important industries in Arkansas, and these activities on BLM-administered resources contribute to the local, state, and national economies. There are also important social values connected with these activities, in terms of both the livelihoods provided and the concerns some stakeholders have about the environmental and other impacts of these activities.

The RFD for oil and gas development on BLM-land in Arkansas is 44 wells per year or 440 wells over the next 10 years. Based on the RFD, the socioeconomic study area for Arkansas focuses on the 21 counties where development is projected to occur. These 21 counties are:

- Cleburne
- Columbia
- Conway
- Faulkner
- Jackson
- Johnson
- Lafayette
- Logan
- Miller
- Monroe
- Nevada
- Ouachita

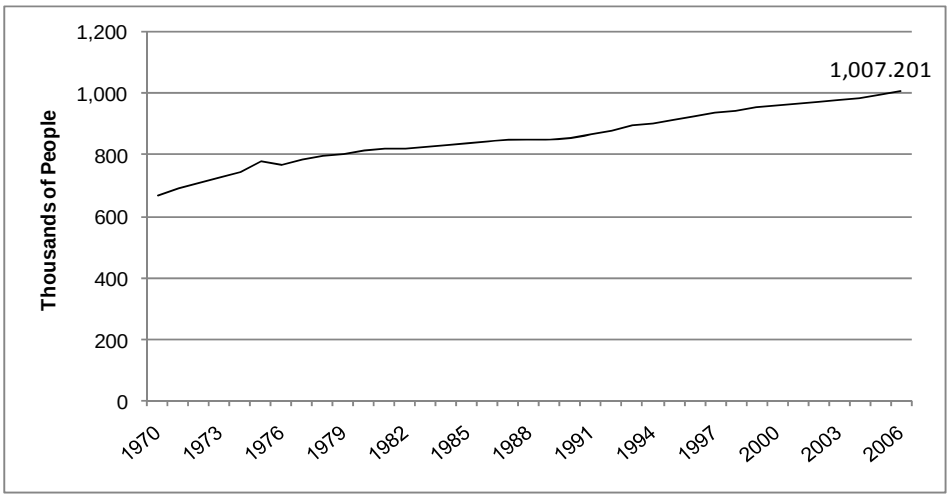
- Pope
- Prairie
- St. Francis
- Sebastian
- Stone
- Union
- Van Buren
- White
- Yell.

Socioeconomic Conditions

Within the study area, there are a number of cities, including the state capital of Little Rock (Pulaski County), North Little Rock (Pulaski County), Fort Smith (Sebastian County), Russelville (Pope County), and Conway (Faulkner County) with populations in 2000 of 183,133; 60,422; 80,268; 23,682; and 43,163 respectively.

Population in the 18-county study area grew by 336,892 people between 1970 and 2006 to a total of 1,007,201 in 2006. At an annual rate, this represents an increase of 1.1 percent. Figure 3-1 shows this rate of growth.

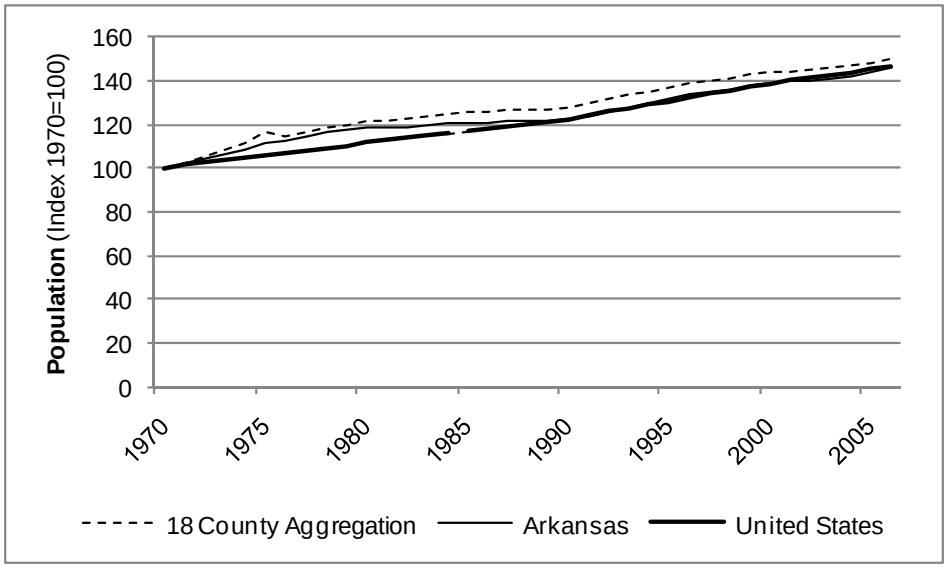
Figure 3-1. Population Trends in the Study Area



Source: U.S. Bureau of Economic Analysis (BEA) Regional Economic Information System (REIS) 2006

Over the last almost four decades, population growth in the study area slightly outpaced Arkansas and the nation (Figure 3-2).

Figure 3-2. Population Comparison

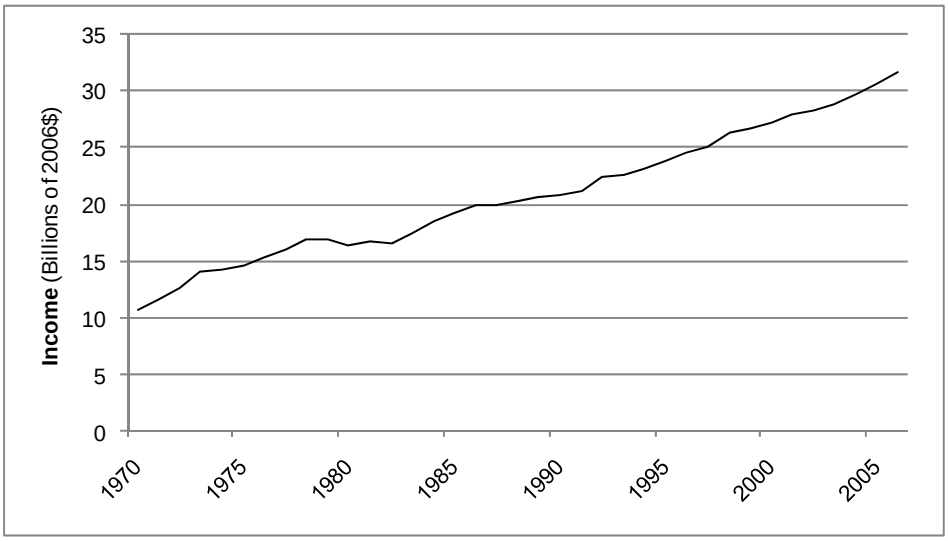


Source: BEA REIS 2006; Data are indexed by dividing the current value by the value in 1970 multiplied by 100.

Employment and Income

Real personal income, composed of labor earnings, investment income, and transfer payments, increased across the study area between 1970 and 2006, with an annualized growth rate of 3.0 percent, as shown in Figure 3-3. Total personal income in the state was $79,983 million, of which the study area's share was $31,646 million or 40 percent.

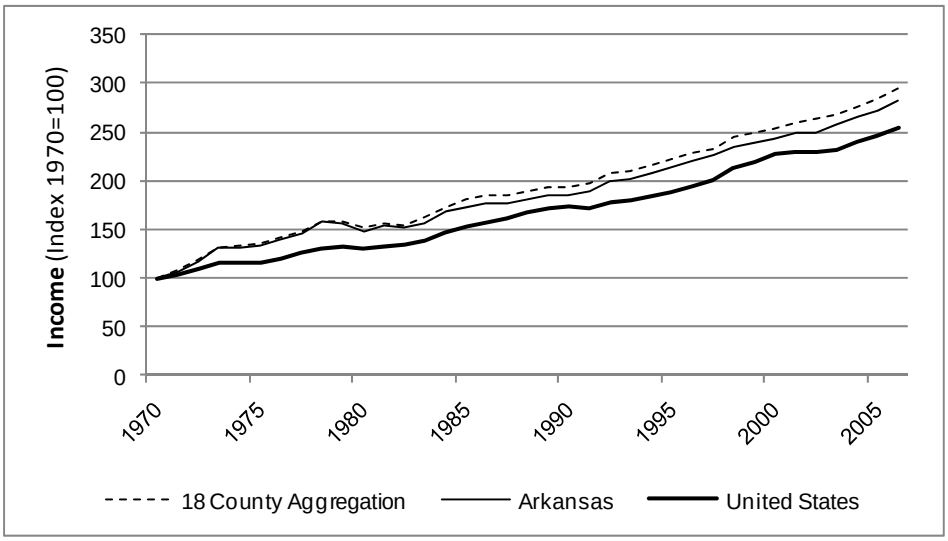
Figure 3-3. Study Area Real Personal Income, 1970 to 2006



Source: BEA REIS.

Personal income growth in the study area over the past four decades slightly outpaced Arkansas and the nation. Arkansas' personal income growth outpaced the nation's growth as well. Figure 3-4 summarizes the income index for these areas.

Figure 3-4. Real Income Growth in the Study Area, Arkansas, and the United States



Source: BEA REIS.

The share of non-labor sources of personal income, including transfer payments and investment income, grew between 1970 and 2007, from 23 to 36 percent (Table 3-92). The increase of total personal income from 1970 to 2006 was composed of 42-percent from non-labor sources and 58-percent from labor sources.

Table 3-92. Real Labor and Non-Labor Personal Income

All Income in Millions of 2006 Dollars	1970	1970 Percentage of Total	1995	1995 Percentage of Total	2006	2006 Percentage of Total
Total Personal Income	10,741	100%	23,846	100%	31,646	100%
Labor Sources	8,257	77%	15,953	67%	20,293	64%
Non-Labor Sources	2,484	23%	7,893	33%	11,353	36%
Dividends, Interest, and Rent	1,287	12%	3,939	17%	5,390	17%
Transfer Receipts	1,197	11%	3,954	17%	5,963	19%

Note: Dividiens, Interest and Rent and Transfer Receipts are a subset of the Non-Labor Sources category.
Source: BEA REIS.

Employment increased across Arkansas and in the study area from 1970 to 2000 (Table 3-93). Study area employment grew at an annual rate of 10,628 jobs per year, almost half of the state new job total—the state added a total of 23,286 jobs every year. The study area employment as a percentage of total state

employment increased between 1970 and 1990; since 1990, the study area's share has been relatively steady at 42 percent.

Table 3-93. Employment in Study Area and State, 1970 to 2000

Area	1970	1980	1990	2000	1970 to 2000 Percentage Change
Study Area	308,667	415,998	505,812	627,497	103%
Arkansas	805,274	1,035,202	1,211,177	1,503,867	87%
Study Area as a Percentage of Arkansas	38%	40%	42%	42%	4%

Source: BEA, Regional Economic Accounts, Standard Industrial Classification (SIC) Employment.

Since 2001, employment has grown modestly in the study area and in the state, six and seven percent, respectively, between 2000 and 2006 (Table 3-94).[2] The study area's share of the state's employment has remained relatively constant at approximately 41 percent over this time period.

Table 3-94. Employment in Study Area and State, 2001 to 2006

Area	2001	2002	2003	2004	2005	2006	2001 to 2006 Percentage Change
Study Area	623,362	619,302	621,632	633,854	647,661	661,945	6%
Arkansas	1,498,575	1,496,959	1,499,834	1,530,274	1,563,972	1,601,339	7%
Study Area as a Percentage of Arkansas	42%	41%	41%	41%	41%	41%	-1%

Source: BEA, Regional Economic Accounts, North American Industry Classification System (NAICS) Employment.

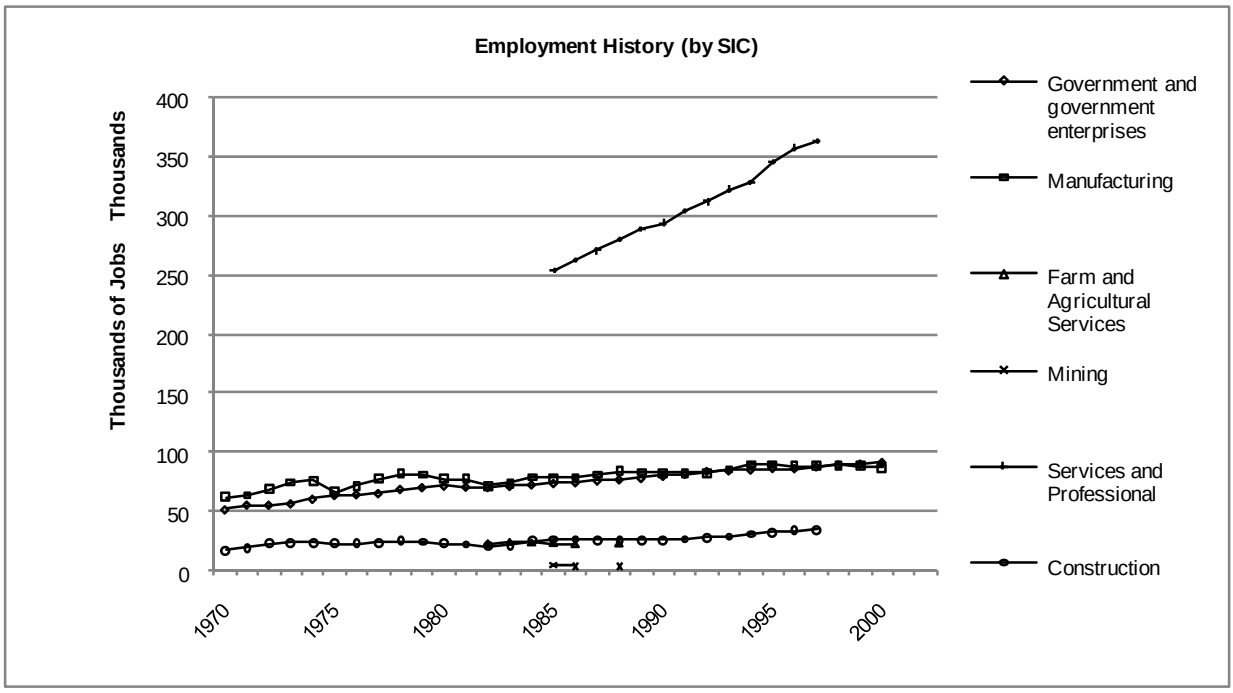
Employment and Income by Industry

Employment by industry for the years between 1970 and 2000 showed increases across a number of industry sectors in the study area (Figure 3-5). Services and professional industries, which comprises transportation and public utilities; wholesale trade; retail trade; finance, insurance, and real estate; and health, legal, and business services, showed both the largest number of jobs and the rapidest increase in jobs in the 1980s and 1990s. Government and manufacturing employment were the second and third largest industries in the study area, with government jobs overtaking manufacturing in the number of jobs in 1998. Prohibition against disclosure of propriety information prevents employment data from being shown here for all industries and years. Farming and agricultural services and construction appear to be

[2] *In 2001, the BEA switched from the SIC to the NAICS to better capture new industries that did not exist when the SIC classifications were created. The employment and earnings trends by industry have been separated to avoid mixing the SIC and NAICS classifications. The trends for 1990 to 2000 use the SIC, and trends from 2001 to 2006 use the NAICS. BEA estimates annual employment and earnings for counties nationwide. BEA will not show confidential information such as the total employment for an industry sector that has few companies. BEA REIS data from 2001 to 2006 show undisclosed data for many industry sectors.*

the next most important industries. Mining employment figures are sparse owing to disclosure issues, although the federal data show that in 1985, 1986, and 1988, mining employment (which includes oil and gas) was 4,048; 3,483; and 2,893, respectively) accounted for one percent of jobs in the study area in these years.

Figure 3-5. Employment by Industry in the Study Area, 1970 to 2000



Source: BEA, Regional Economic Accounts, SIC Employment.

Census data, as summarized in Table 3-95, show the employment by sector in 1999 (U.S. Census Bureau 2000). Top employing industries in the study were manufacturing, healthcare, and retail trade. Table 3-95 also summarizes how the distribution of local employment by sector compares with that for the nation, indicating a higher proportional share for manufacturing, and healthcare and social assistance; and a lower share for professional, scientific, and technical services; and finance and insurance.

Table 3-95. 1999 Employment Sector Analysis in the Study Area

Industry	Study Area	United States	Difference in Share
Manufacturing	17%	14%	2%
Healthcare and Social Assistance	13%	11%	1%
Retail Trade	12%	12%	1%
Transportation and Warehousing	5%	4%	1%
Agriculture, Forestry, Fishing, and Hunting	2%	1%	1%
Other Services (except public administration)	5%	5%	0%

Industry	Study Area	United States	Difference in Share
Utilities	1%	1%	0%
Public Administration	5%	5%	0%
Information	3%	3%	0%
Construction	7%	7%	0%
Management of Companies and Enterprises	0%	0%	0%
Mining	0%	0%	0%
Wholesale Trade	3%	4%	0%
Real Estate and Rental and Leasing	2%	2%	0%
Accommodation and Food Services	6%	6%	0%
Educational Services	8%	9%	-1%
Administrative Support and Waste Management Services	3%	3%	-1%
Arts, Entertainment, and Recreation	1%	2%	-1%
Finance and Insurance	4%	5%	-1%
Professional, Scientific, and Technical Services	3%	6%	-2%

Source: U.S. Census Bureau 2000.

More recently, there are still considerable federal data disclosure issues regarding the NAICS employment by industry figures (Table 3-96). Between 2001 and 2006, there is no forestry, fishing, mining, utilities, wholesale trade, transportation and warehousing, professional and technical services, management of companies, administrative and waste services, education services, healthcare and social assistance, arts, entertainment and recreation, or accommodation and food services information for any of the six years. From the available information, government comprised approximately 15 percent of the jobs, while the retail industries comprised 10 percent, construction six percent, and finance and insurance four percent.

Table 3-96. Employment in the Study Area, 2001 to 2006

Area	2001	2002	2003	2004	2005	2006
Farm Employment	16,478	16,468	16,219	15,924	15,750	15,786
Private Employment	513,918	509,083	510,124	521,344	533,722	546,535
Forestry, Fishing, and Related Activities	N/A	N/A	N/A	N/A	N/A	N/A
Mining	N/A	N/A	N/A	N/A	N/A	N/A
Utilities	N/A	N/A	N/A	N/A	N/A	N/A
Construction	N/A	N/A	36,440	37,170	N/A	N/A

Area	2001	2002	2003	2004	2005	2006
Manufacturing	N/A	N/A	N/A	72,250	N/A	N/A
Wholesale Trade	N/A	N/A	N/A	N/A	N/A	N/A
Retail Trade	67,019	66,269	65,902	67,001	68,004	68,712
Transportation and Warehousing	N/A	N/A	N/A	N/A	N/A	N/A
Information	12,901	N/A	N/A	N/A	N/A	N/A
Finance and Insurance	23,731	24,298	24,665	24,670	24,538	25,323
Real Estate and Rental and Leasing	15,808	15,855	15,689	16,815	18,196	19,824
Professional and Technical Services	N/A	N/A	N/A	N/A	N/A	N/A
Management of Companies and Enterprises	N/A	N/A	N/A	N/A	N/A	N/A
Administrative and Waste Services	N/A	N/A	N/A	N/A	N/A	N/A
Educational Services	N/A	N/A	N/A	N/A	N/A	N/A
Healthcare and Social Assistance	N/A	N/A	N/A	N/A	N/A	N/A
Arts, Entertainment, and Recreation	N/A	N/A	N/A	N/A	N/A	N/A
Accommodation and Food Services	N/A	N/A	N/A	N/A	N/A	N/A
Other Services, Except Public Administration	31,196	N/A	N/A	33,885	33,832	35,116
Government and Government Enterprises	92,966	93,751	95,289	96,586	98,189	99,624
Federal, Civilian	12,211	11,893	12,282	12,082	12,087	12,026
Military	9,911	9,851	10,060	9,923	10,630	10,530
State and Local	70,844	72,007	72,947	74,581	75,472	77,068
Total Employment	623,362	619,302	621,632	633,854	647,661	661,945

N/A: Not available (data not disclosed by BEA to protect confidentiality).
Note: Total Employment is a sum of Farm Employment, Private Employment, and Government and Government Enterprises.
Source: BEA REIS.

Statewide employment by industry information does not have as many industry disclosure issues. Table 3-97 summarizes this employment in 2001 and 2006. In 2006, local, state, and federal government employment had the largest share in the state (14 percent), followed by (listed in decreasing importance): manufacturing, retail trade, healthcare and social assistance, construction, accommodation and food services, and transportation and warehousing. Arkansas mining employment comprised approximately one percent of the state employment, although mining job growth increased by 16 percent or 1,121 jobs from 2001 to 2006.

Table 3-97. Arkansas Employment by Industry, 2001 to 2006

Area	2001	2006	2006 Share to Total	Percentage Change 2001 to 2006
Farm Employment	62,395	59,633	4%	-4%
Private Employment	1,226,562	1,315,119	82%	7%
Forestry, Fishing, and Related Activities	19,577	18,035	1%	-8%
Mining	7,015	8,136	1%	16%
Utilities	7,042	7,082	0%	1%
Construction	91,700	107,209	7%	17%
Manufacturing	232,852	204,877	13%	-12%
Wholesale Trade	50,263	52,802	3%	5%
Retail Trade	165,672	170,735	11%	3%
Transportation and Warehousing	70,947	77,024	5%	9%
Information	23,473	23,630	1%	1%
Finance and Insurance	47,770	51,797	3%	8%
Real Estate and Rental and Leasing	37,667	49,332	3%	31%
Professional and Technical Services	49,847	60,483	4%	21%
Management of Companies and Enterprises	22,493	24,690	2%	10%
Administrative and Waste Services	68,340	77,532	5%	13%
Educational Services	13,557	17,258	1%	27%
Healthcare and Social Assistance	137,891	159,827	10%	16%
Arts, Entertainment, and Recreation	15,991	17,874	1%	12%
Accommodation and food services	83,844	94,937	6%	13%
Government and government enterprises	209,618	226,587	14%	8%
Federal, Civilian	20,550	20,919	1%	2%
Military	19,035	20,866	1%	10%
State and Local	170,033	184,802	12%	9%
State Government	**66,532**	**72,869**	**5%**	**10%**

Area	2001	2006	2006 Share to Total	Percentage Change 2001 to 2006
Local Government	**103,501**	**111,933**	**7%**	**8%**
Total Employment	**1,498,575**	**1,601,339**	**100%**	**7%**

Note: Total Employment is a sum of Farm Employment, Private Employment, and Government and Government Enterprises.
Source: BEA REIS.

In Arkansas, real income by industry generally increased as summarized in Table 3-98. Leading industries included services and professional sectors, non-labor sources, manufacturing, government, construction, and farming and agriculture.

Table 3-98. Arkansas Personal Income by Industry and Type, 1970 to 2000 (2005$)

Industry	1970	2000	New Income 1970-2000	Percentage of New Income
Total Personal Income*	**28,357**	**68,753**	**40,395**	**100%**
Farm and Agricultural Services	2,331	1,853	(478)	N/A
Farm	2,134	1,426	(708)	N/A
Agricultural Services	197	427	230	1%
Mining	210	338	128	0%
Manufacturing (including forest products)	5,735	10,867	5,113	13%
Services and Professional	9,431	26,021	16,590	41%
Transportation and Public Utilities	1,658	4,225	2,567	6%
Wholesale Trade	1,112	2,610	1,498	4%
Retail Trade	2,790	5,622	2,832	7%
Finance, Insurance, and Real Estate	945	2,496	1,551	4%
Services (Health, Legal, Business, Other)	2,926	11,068	8,141	20%
Construction	1,429	2,856	1,427	4%
Government	3,749	8,489	4,740	12%
Non-Labor Income	6,892	24,664	17,772	44%
Dividends, Interest, and Rent	3,341	12,189	8,848	22%
Transfer Payments	3,551	12,475	8,924	22%

Note: All figures in millions of 2005 dollars
*The sum of the above categories does not add to the total because of adjustments made for place of residence and personal contributions for social insurance made by the U.S. Department of Commerce.

Source: BEA REIS 2006 CD Table CA05

Between 2001 and 2006, real personal income increased across the state by 13 percent (Table 3-99). Earnings in the mining sector increased by $141 million during this time period, accounting for one percent of the share of the personal income in the state in 2006.

Table 3-99. Personal Income in Arkansas by Industry, 2001 and 2006

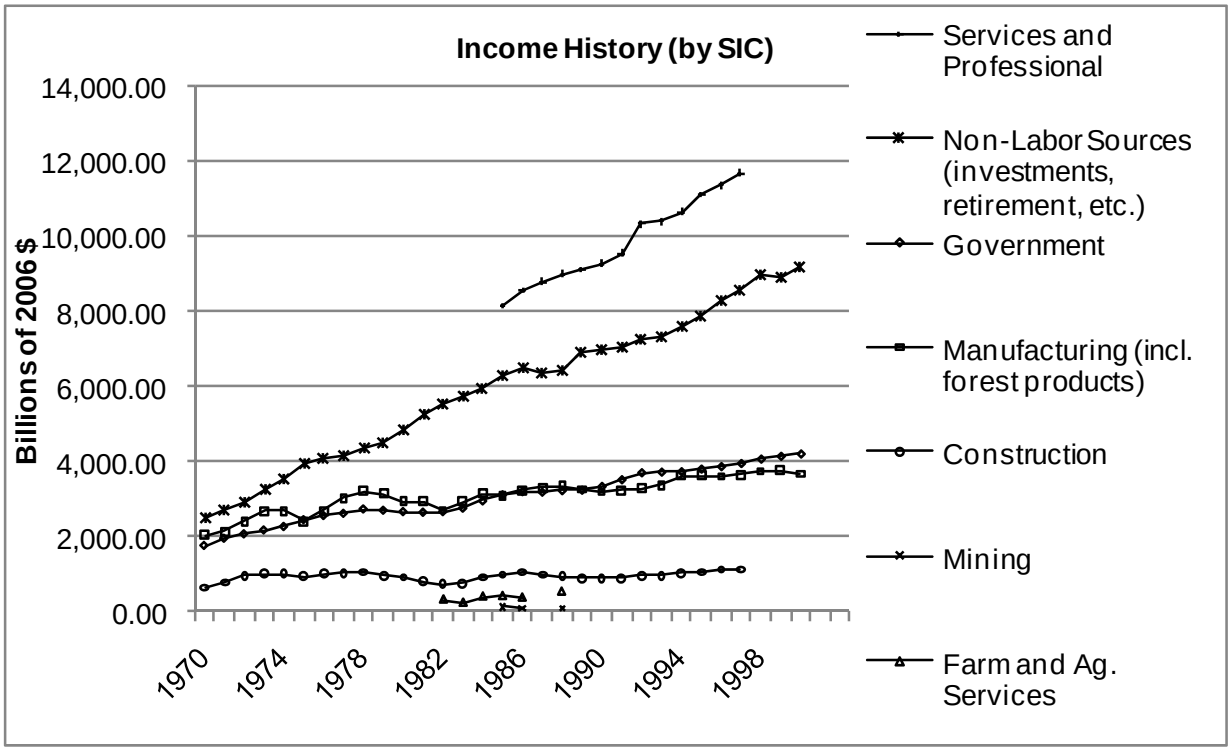
Industry	2001	2006	2006 Share of Total	New Income
Personal Income	**70,540**	**79,983**	**100%**	**9,443**
Wage and Salary Disbursements	37,063	40,247	50%	3,183
Proprietors' Income	6,364	6,494	8%	130
Farm Proprietor	1,157	763	1%	(395)
Nonfarm Proprietor	5,207	5,731	7%	524
Farm Earnings	1,494	1,010	1%	(484)
Private Earnings	41,304	45,215	57%	3,910
Forestry, Fishing, Related Activities, and Other	598	514	1%	(83)
Mining	433	574	1%	141
Utilities	536	644	1%	108
Construction	2,790	3,256	4%	466
Manufacturing	9,856	9,456	12%	(400)
Wholesale Trade	2,398	2,909	4%	510
Retail Trade	3,641	3,824	5%	183
Transportation and Warehousing	3,073	3,381	4%	308
Information	1,563	1,608	2%	45
Finance and Insurance	1,991	2,229	3%	238
Real estate and Rental and Leasing	730	884	1%	154
Professional and Technical Services	2,402	2,867	4%	465
Management of Companies and Enterprises	1,747	2,032	3%	285
Administrative and Waste Services	1,218	1,488	2%	270
Educational Services	268	345	0%	77
Healthcare and Social Assistance	5,129	5,967	7%	838
Arts, Entertainment, and Recreation	238	286	0%	3
Accommodation and Food Services	1,143	1,306	2%	163

Industry	2001	2006	2006 Share of Total	New Income
Other Services, Except Public Administration	1,507	1,646	2%	140
Government and Government Enterprise	8,710	10,762	13%	2,052
Federal, Civilian	1,557	1,830	2%	273
Military	598	993	1%	395
State and Local	6,556	7,939	10%	1,383
State Government	2,708	3,205	4%	497
Local Government	3,848	4,734	6%	886

Source: BEA REIS 2006 CD Table CA05N

Within the study area, there are no federal data for forestry, utilities, and transportation, and warehousing because of a limited number of companies providing this information. Personal income by type was led by services and professional sectors, followed by non-labor sources, government, manufacturing, construction, farming and agricultural services, and mining (Figure 3-6).

Figure 3-6. Study Area Personal Income by Type, 1970 to 2000



Source: BEA, Regional Economic Accounts, SIC Employment

Oil and Gas Employment

State-level data in Table 3-100 below show some discrepancies between the local area and state level NAICS employment data in 2006 (BEA REIS). The state-level data indicate mining employment of 8,694, while the state-level data shown in the Local Area NAICS statistics show mining employment of 8,136. Regardless, mining employment driven by employment in the support activities for mining grew significantly between 2005 and 2007, with an increase of 46 percent. Industries in the support activities sector included drilling companies, stimulation and cementing companies, and other companies that support development of oil and gas wells. In 2007, mining employment comprised less than one percent of total employment in the state.

Table 3-100. Employment in Arkansas, 2001 to 2007

	2001	2002	2003	2004	2005	2006	2007
Total Mining	7,015	6,408	7,141	6,986	7,350	8,694	10,741
Annual Percentage Change In Employment	N.A.	-9%	11%	-2%	5%	18%	24%
Oil and Gas Extraction	3,139	2,805	3,463	3,048	3,257	3,801	4,230
Annual Percentage Change in Employment	N.A.	-11%	23%	-12%	7%	17%	11%
Mining (except oil and gas)	2,383	2,270	2,190	2,272	2,171	2,302	2,377
Annual Percentage Change in Employment	N.A.	-5%	-4%	4%	-4%	6%	3%
Support Activities for Mining	1,493	1,333	1,488	1,666	1,922	2,591	4,134
Annual Percentage Change in Employment	N.A.	-11%	12%	12%	15%	35%	60%
Total Oil and Gas Employment (extraction+support)	4,632	4,138	4,951	4,714	5,179	6,392	8,364
Percentage of Oil and Gas to Total	66%	65%	69%	67%	70%	74%	78%
N.A.: Not applicable							

Source: BEA, Regional Economic Accounts, NAICS Employment.

Employment in the sectors of oil and gas extraction, drilling, and support activities for mining also creates jobs through the ripple or multiplier effect on other supporting and downstream industry sectors, such as construction, trucking and transportation, wholesale trade, and geological engineering services. Employment also produces ripple effects from oil and gas workers spending their money in the local economies, creating induced jobs in sectors such as accommodations and food services, auto dealerships, real estate, and healthcare.

In 2006, the University of Arkansas Sam M. Walton College of Business undertook a study to project the economic impact of exploration and development activities associated with the Fayetteville Shale Play for 2005 to 2008 (Collins 2006). The study, sponsored by SEECO, Inc, a wholly owned subsidiary of the Southwestern Energy Company, analyzed the economic impacts of 2005 planned expenditures and projected 2006, 2007, and 2008 investments by energy and service companies in this area. Companies with activities in this area include SEECO, Chesapeake, XTO Energy, Maverick Oil and Gas, Touchstone Energy, Shell, Contango, Onetec, Stephens Production, Storm Cat Energy, Schlumberger, CDX Gas,

Edge Petroleum, Aspect, Antero Resources, Hallwood, Dan Hughes, and Noble Energy. Investments were assessed for 10 counties in central and eastern Arkansas, eight of which are included in the study area.

A regional economic model, IMPLAN, was used to translate these investments and expenditures into economic activity, state and local taxes, and employment impacts. Job impacts associated with leasing and development activities per year are summarized in Table 3-101.

In 2005, 2006, and 2007, respectively, a total of 2,160; 4,394; and 6,661 jobs were estimated to be associated with these activities for the state, mostly associated with the counties within the study area (Table 3-101). Sixty-six percent of these jobs were in the mining sector, or 1,440; 2,929; and 4,441, respectively (i.e., the direct impacts), which includes support industries and drilling services. The remaining jobs were indirect, supporting businesses and induced household spending from jobs impacts. This projected increase in mining employment was approximately 1,489 jobs between 2005 and 2006. Projected jobs increases for the state (likely located within the study area) included 1,512 (between 2006 and 2007); and 2,014 jobs (between 2007 and 2008).

The BEA estimates that total employment in mining in Arkansas was 7,448 in 2005 and 8,694 in 2006 (BEA REIS), an increase of 1,246 jobs. Between 2006 and 2007, mining employment increased 2,047. According to Table 3-100 above, 90 and 96 percent of these new jobs are associated with oil and gas activities (e.g., extraction and support activities) in 2006 and 2007, respectively. These job increases were likely attributable to the Fayetteville Shale Play development activities.

Table 3-101. Employment Impacts Associated with the Fayetteville Shale Gas Play Exploration and Development Activities in Central Arkansas and the State

County	2005	2006	2007	2008	Multiplier
Cleburne	89.8	316.3	469.6	600.9	1.2
Conway	511.6	1,177.6	1,764.5	2,464.0	1.2
Faulkner	68.8	299.4	428.1	484.0	1.3
Independence	63.0	70.0	107.9	187.1	1.3
Johnson	6.4	22.6	33.5	42.9	1.2
Prairie	22.7	25.3	28.9	67.4	1.2
St. Francis	61.0	67.8	104.5	181.3	1.2
Van Buren	182.5	638.9	948.8	1,2.13.3	1.2
White	474.6	644.2	985.3	1,597.8	1.3
Woodruff	353.4	388.0	595.7	1,029.5	1.1
Other Counties	326.6	743.9	1,183.9	1,814.5	N.A.
State of Arkansas	**2,160.4**	**4,393.9**	**6,660.7**	**9,682.8**	**1.5**

N.A.: Not applicable

Source: Collins 2006

Average Earnings

On average across Arkansas, the highest paying jobs are with the Federal Government, followed by mining, information services, financial activities, and professional and business services. According to the Bureau of Labor Statistics (BLS), the Federal Government accounts for 2.1 percent of the employment and pays an average of $56,986 per year. In 2006, goods-producing employees were paid an average of $34,774, while service-providing employees were paid an average of $34,682 annually in Arkansas. Average earnings by industry were not available for the study area. Employment and average earnings per industry for the state are provided in Table 3-102.

Mining employment in 2006, as reported by the BLS, Quarterly Census of Employment and Wages, was 4,921 while the BEA REIS reports mining employment of 8,694. BEA employment includes all full-time and part-time employment. If one person holds multiple jobs, BEA counts the number of jobs. BLS employment counts the number of employed (e.g., occupied) persons and not the number of jobs. BLS employment does not include sole proprietors or self-employed jobs. The significant difference between the BLS and BEA mining employment figures would indicate that there are a considerable number of part-time, sole proprietors, and self-employed positions supporting these oil and gas production and development operations.

Table 3-102. Arkansas Employment and Average Earning by Industry (2006$)

Industry	Employment	% of Total	Average Annual Wages
Total Private & Public	**1,167,925**	**100%**	**32,389**
Total Private	**973,615**	**83%**	**31,835**
Goods-Producing	274,328	23%	34,774
Natural Resources and Mining	18,550	2%	34,323
Agriculture, Forestry, Fishing, and Hunting	13,629	1%	27,852
Mining	4,921	0%	2,246
Construction	56,956	5%	33,928
Manufacturing (Including Forest Products)	198,822	17%	35,058
Service Providing	699,287	60%	30.682
Trade, Transportation, and Utilities	244,917	21%	30,964
Information	19,911	2%	43,198
Financial Activities	51,171	4%	39,493
Professional and Business Services	114,216	10%	39,331
Education and Health Services	145,778	12%	32,638
Leisure and Hospitality	97,450	8%	11,646
Other Services	25,845	2%	23,441

Industry	Employment	% of Total	Average Annual Wages
Unclassified	N/A	N/A	N/A
Total Public	194,310	17%	35,166
Federal Government	20,853	2%	56,986
State Government	62,170	5%	36,389
Local Government	111,286	10%	30,395
N/A: Not available (data not disclosed by BEA to protect confidentiality).			

Source: BLS, Quarterly Census of Employment and Wages

Demographic Characteristics

Age and Gender

Since 1990, the population has gotten older in the study area. In 1990, the median age was 33.1, and in 2000, it was 35.5. The share of the population that is over 65 remained constant over this time period, although the Baby Boom generation (40 to 54 years) share increased from 17 percent in 1990 to 21 percent in 2000. These demographics are similar for the State of Arkansas as well. The study area and state age and gender demographic statistics are summarized in Table 3-103 and Table 3-104.

Table 3-103. Study Area Age and Gender Demographics

	Total Number	Under 20 Years		40–54 (Baby Boom in 2000)		65 Years and Over		Median Age	Density (Pop./mi.^{2})
		Number	Share	Number	Share	Number	Share		
Total Population									
2000	961,230	272,847	28%	201,631	21%	123,847	13%	35.5	78.5
1990	854,379	251,831	29%	147,674	17%	114,510	13%	33.1	69.7
10-Year Change	106,851	21,016	-1%	53,957	4%	9,337	-1%	2.4	8.7
10-Year Percentage Change	13%	8%		37%		8%		7%	13%
2000 Sex Breakout									
Male	467,476	139,542	30%	98,609	21%	50,218	11%	34.1	N.A.
Female	493,754	133,305	27%	103,022	21%	73,629	15%	36.8	N.A.
Male/ Female Split	49%/51%	51%/49%		49%/51%		41%/59%		N.A.	N.A.
Notes: 2000 Table SF1-P12 and 1990 SF1-P05 and P12 N.A.: Not applicable									

Source: U.S. Census Bureau 1990, U.S. Census Bureau 2000.

Table 3-104. Arkansas Age and Gender Demographics

	Total Number	Under 20 Years		40–54 (Baby Boom in 2000)		65 Years and Over		Median Age	Density (Pop./ mi.^{2})
		Number	Share	Number	Share	Number	Share		
Total Population									
2000	2,673,400	760,509	28%	547,306	20%	374,019	14%	36.0	51.3
1990	2,350,725	695,437	30%	400,391	17%	350,058	15%	33.8	45.1
10-Year Change	322,675	65,072	-1%	146,915	3%	23,961	-1%	2.2	6.2
10-Year Percentage Change	14%	9%		37%		7%		7%	14%
2000 Sex Breakout									
Male	1,304,693	389,994	30%	269,084	21%	154,428	12%	34.6	N.A.
Female	1,368,707	370,515	27%	278,222	20%	219,591	16%	37.4	N.A.
Male/ Female Split	49%/51%	51%/49%		49%/51%		41%/59%		N.A.	N.A.

Notes: 2000 Table SF1-P12 and 1990 SF1-P05 and P12
N.A.: Not applicable

Source: U.S. Census Bureau 1990, U.S. Census Bureau 2000.

Ethnicity and Race

Race and ethnicity percentages in the study area are very similar to those in the State of Arkansas. In 2000, the study area population was generally white (78 percent) and African American (17 percent). Race and ethnicity demographic information is provided in Table 3-105 for 2000.

Table 3-105. Population by Race in Study Area and State, 2000

Population	Study Area	Percentage of Total	Arkansas	Percentage of Total
White	754,131	78%	2,138,598	80%
Black or African American	160,470	17%	418,950	16%
American Indian and Alaska Native	6,571	1%	17,808	1%
Asian	11,003	1%	20,220	1%
Native Hawaiian and Other Pacific Islander	330	0%	1,668	0%

Population	Study Area	Percentage of Total	Arkansas	Percentage of Total
Some other race	13,861	1%	40,412	2%
Two or more races	14,864	2%	35,744	1%

Source: U.S. Census Bureau 2000.

In 2007, the Census Bureau estimates the white, non-Hispanic population to be 76 percent, 5.3 percent Hispanic, and 15.8 percent African-American. This compares with the U.S. estimates of 66 percent white non-Hispanic, 15 percent Hispanic, and 12.8 percent African-American. Arkansas generally has a higher percentage of both white and African American population and a lower percentage of Hispanics compared with the nation.

Poverty

The percentage of the population in poverty in Arkansas increased between 2000 and 2007 by 11.4 (Table 3-106). In 2007, Arkansas' poverty levels were 4.6 percent higher than those of the nation. Overall, the study area poverty levels were slightly lower than those of the state, yet higher than those of the nation.

Table 3-106. Poverty Level in the Study Area, State, and Nation (Percentage of Population below the Poverty Level)

Area	2000	2007
Arkansas	15.8	17.6
United States	**12.4**	**13.0**
Study Area	**14.5**	**N/A**

N/A: Not available
Source: U.S. Census Bureau.

Household Income

Real median household income, when inflation increases have been removed, decreased in Arkansas and in the United States between 1999 and 2007 (Table 3-107). Arkansas figures indicate a drop of six percent over this time period, when these figures are adjusted for inflation. The U.S. figures dropped at a slightly lower rate of four percent. In 1999, the study area had a slightly higher median household income when compared with the state, although lower than the national median household income.

Table 3-107. Median Household Income in the Study Area and in the State (2006$)

Area	1999 (1999$)	1999 (2007$)	2007 (2007$)	Percentage Change 1999 to 2007 (2007$)
Study Area	$34,180	$42,274	N/A	N/A
Arkansas	$32,182	$39,803	$37,555	-6%

Area	1999 (1999$)	1999 (2007$)	2007 (2007$)	Percentage Change 1999 to 2007 (2007$)
United States	$41,994	$51,938	$50,007	-4%

N/A: Not available
Source: U.S. Census Bureau; deflated with BLS, South Region Consumer Price Index.

Attitudes and Beliefs

BLM has control over a number of issues and decisions that could be important to stakeholders and their beliefs, including federal land disposal and mineral development, such as coal, phosphate, and oil and gas. Although BLM federal mineral leases comprise only approximately four percent of the projected gas wells in this region, these federal lands and minerals do contribute to local oil and gas operations, and thus jobs, income, fiscal receipts, and potential environmental degradation of these areas can be attributed to them. This section briefly describes stakeholders' attitudes and beliefs related to oil and gas development and extraction to provide a social context for these decisions.

Public lands are important in providing a natural resource base for economic activities. Gas development and production will be supported by some stakeholders and not by others. Stakeholders who support gas development and production believe domestic production of resources provides products on which the public relies heavily, generating economic and social benefits, including local and regional jobs, income, and Gross State Product. Without the availability and access for development of these resources, stakeholders often feel that many adverse impacts could occur, including worsening trade gaps, increasing prices, and potentially strategic vulnerabilities. In addition, the mineral industries have contributed to the tax base of counties and the state, providing funds for local, regional, and state governments, infrastructure, schools, and other community services. Many people believe that this funding is important to the economy of Arkansas counties and the state. Some stakeholders will support these oil and gas activities because of the economic benefits (both from the direct industries and downstream supporting industries) in income, jobs, and government revenues, while others will be concerned that the economic benefit may not offset the risks to environmental and water resources from the activity.

Conservation-focused stakeholders may not support oil and gas development or might support development delays and conditions and stipulations on development and production to reduce negative impacts on the surface and subsurface. These environmental stakeholders are concerned about erosion and water quality impacts associated with mining operations and reclamation. Some stakeholders believe that the potential long-term environmental risks of development are considerable compared with the short-term benefit of the resource extracted. In addition, these types of stakeholders believe that mineral development impacts, such as increased road building, associated road traffic, dust, and noise, add to the negative impacts associated with this type of development.

Local and state government representatives and environmental stakeholders may also be concerned about the volatility of the oil and gas industry (often driven by volatile prices), and the financial and economic sustainability risks inherent in such operations. This type of boom and bust industry is often difficult to predict and plan for, creating challenges for local and state governments in budgeting, forecasting revenues, and planning for government expenditures for infrastructure and other social services. The boom and bust phenomenon can also exacerbate economic cycles, contributing to unemployment rates during economic downturns or recessions.

Public Finance

The Fayetteville Shale Play Economic Impact Report (Collins 2006) estimated that state and local tax receipts in 2005 were more than $28 million, with a projection of increased tax receipts of more than $154 million in 2008. These taxes primarily include sales taxes, personal income taxes, and corporate profits taxes, and were estimated based on exploration and development activities of the Fayetteville Shale Play in 12 counties in central Arkansas, 10 of which are included in the study area. Annual projected BLM-administered horizontally drilled shale wells are estimated to be 41 of 1,069 total annual forecasted horizontal wells in this area or 3.8 percent.

The oil and gas industry also pays severance and property taxes on the value of the oil and gas extracted. When extracting the resources from federal minerals, the industry pays an additional mineral royalty to the Federal Government. Federal mineral royalties (FMR), severance taxes, and property taxes are assessed in this analysis.

Federal Mineral Royalties

Leasable mineral production taking place on BLM-administered public lands is assessed an FMR. Oil and gas and surface-mined coal production is assessed at 12.5 percent of value after allowable deductions. Some of the other mineral production is assessed at lower rates. For example, production of underground mined coal is assessed at eight percent, and federal royalties for trona production varies from five to eight percent. The Federal Government returns 50 percent of the total royalties collected to the state in which the mineral production occurred (Minerals Management Service [MMS], 2009b). As shown in Table 3-108, FMR associated with gas production from federal lands increased 36 percent between 2007 and 2008, and 77 percent between 2005 and 2008. This increase is likely driven by the Fayetteville Shale production and generally increasing, though volatile, prices over this time period.

Table 3-108 separates the FMR into production-based royalties, which are typically ongoing payments based on production levels, and bonuses or bonus bids, which are lump sum payments to the Federal Government for the private leasing of federal minerals. Between 2005 and 2008, the Fayetteville Shale gas leasing and bonus payments were considerable, accounting for 70 and 63 percent of the FMR in 2008 and 2007, respectively. These one-time payments may not continue because many of the federal minerals have already been leased. The states typically receive approximately half of these royalties in disbursement from the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE), formerly known as the MMS. In 2008, this would have amounted to approximately $17 million.

Table 3-108. Arkansas Federal Mineral Royalties for Gas 2005 to 2008

	2005	2006	2007	2008	Percentage Charge 2005 to 2008
Production-Based FMR[a]	$7,151,064	$10,434,345	$9,359,025	$10,321,912	44%
Bonus FMR	$12,455,404	$6,006,323	$16,225,469	$24,357,727	96%
Total FMR	$19,606,468	$16,440,668	$25,584,494	$34,679,639	77%
Bonuses as a Percentage of Total FMR	64%	37%	63%	70%	6%
Price of Processed Gas	$6.05	$8.97	$7.06	$9.74	61%

	2005	2006	2007	2008	Percentage Charge 2005 to 2008
Price of Unprocessed Gas	$5.70	$7.21	$5.63	$7.17	26%
a. Includes unprocessed and processed gas royalty, and other oil and gas revenues and rentals fee royalties.					

Source: MMS

The volume of production of gas from federal lands in Arkansas in 2008 was (MMS 2009a):

- Processed Residue Gas: 3,656 thousands of cubic feet (mcf)
- Unprocessed Wet Gas: 9,001,662 mcf.

In 2007, of the total of 4,773 well producing gas, BLM had approximately 173 wells, with expected additional development of 44 wells annually, on average. According to BLM officials and the Revised Oil and Gas RFD, BLM wells account for 20 percent of the currently projected federal well development in the area, although there is some uncertainty surrounding these figures. If it is assumed that approximately 20 percent of currently producing federal wells are associated with BLM, then 20 percent of this FMR or $6.8 million can be attributed to BLM-administered production in 2008. This assumes that the price remains relatively constant at $9.74 for processed gas and $7.17 for unprocessed gas, and production rates increase proportionally to well development as predicted by the Oil and Gas RFD. Again, approximately 50 percent or $3.4 million of the BLM portion is returned to the states.

Severance and Ad Valorem Taxes

Mineral production is also subject to severance and ad valorem taxes, as well as sales taxes on mining services, although these sales taxes are often difficult to estimate. Property taxes fund local government expenditures, such as schools, police, fire stations, and other local community and county services. Severance taxes fund state services, such as road maintenance and improvements and transportation. The mining industry is responsible for paying these taxes on the value of production. However, because BLM owns and manages approximately 20 percent of the federal mineral estate in the study area and two percent of the wells in Fayetteville Shale gas area, a portion of the fiscal revenue can be attributed to the leasing of BLM minerals. These amounts are estimated here.

In response to the Fayetteville Shale play, the Arkansas Legislature recently increased the state's natural gas production severance tax. The tax was raised from 0.3 percent per mcf of natural gas to five percent of the market value of the natural gas, although there are stipulations that reduce these rates for new discovery, high-cost, and marginal gas. On "high-cost" gas, which essentially means gas from the Fayetteville Shale play, the rate will be 1.5 percent for at least the first three years of a well. If gas companies have not recovered their investment on the well by the end of the third year, they can apply to have the 1.5 percent rate extended for a fourth year. After that, the rate goes up to five percent until the well stops production. The tax applies retroactively to wells that have already been built. According to one source, 95 percent of the tax receipts will go to roads, and the rest to general state revenue funds (Blomeley 2008). The severance tax increase, which became effective January 1, 2009, generated an estimated $57 million in 2009 and an estimated $100 million by 2013 (Blomeley 2008).

A study by University of Arkansas (2008) estimates severances taxes from Fayetteville Shale Gas production in 2007 were $266,550, as shown in Table 3-109. If BLM-administered wells were approximately 173 of 4,586, approximately 3.7 percent of these tax receipts, or $9,900 in 2007, were

attributable to BLM-administered wells. Because the severance tax rates are expected to increase over the next several years, these receipts are expected to increase significantly.

Table 3-109. Severance Tax Receipts Associated With Fayetteville Shale Gas Production (Dollars)

County	2004	2005	2006	2007	Total
Cleburne	0	97	473	7,066	**7,636**
Conway	154	3,806	16,748	76,085	**96,793**
Faulkner	0	876	7,494	23,085	**31,455**
Franklin	94	534	603	567	**1,797**
Johnson	0	1	0	80	**81**
Pope	0	40	25	1,163	**1,227**
Van Buren	54	1,839	15,489	94,963	**112,345**
White	0	0	3,603	63,541	**67,144**
Fayetteville Shale Play Counties	**302**	**7,192**	**44,434**	**266,550**	**318,477**

Source: University of Arkansas 2008.

Property or ad valorem taxes are assessed on the taxable valuation or market value of the minerals, typically determined by the millage rate, production volume, and current price of the minerals. The local millage rate is applied to the taxable value of the gas produced. These rates vary across the counties within the study area. The state's average millage rate for school districts without cities is 43.39 (Arkansas Assessment Coordination Department 2007).

The University of Arkansas (2008) estimated property tax receipts associated with the Fayetteville Shale gas production. Table 3-110 shows that in 2007, property tax receipts associated with this production were approximately $4.8 million, increasing more than four-fold between 2006 and 2007. Using the same approach as above, if 3.7 percent of the gas wells in the area in 2007 are BLM-administered, their contribution to property taxes is estimated to be $177,000.

Table 3-110. Property Taxes from Fayetteville Shale Gas Production (Dollars)

County	2004	2005	2006	2007	Total
Cleburne	0	1,030	7,741	110,889	**119,660**
Conway	1,834	51,257	325,858	1,419,346	**1,798,295**
Faulkner	0	11,772	145,936	439,436	**597,144**
Franklin	1,083	6,951	11,823	10,660	**30,516**
Johnson	0	15	0	1,516	**1,530**
Pope	0	459	434	20,181	**21,074**
Van Buren	647	24,971	297,638	1,709,40	**2,032,661**
White	0	0	62,772	1,061,426	**1,124,197**

County	2004	2005	2006	2007	Total
Fayetteville Shale Play Counties	**3,564**	**96,455**	**852,201**	**4,772,858**	**5,725,078**

Source: University of Arkansas 2008.

The severance and ad valorem tax receipts associated with 2007 BLM gas production, as estimated above, are shown in Table 3-111.

Table 3-111. Estimated 2007 Severance and Property Taxes Associated With BLM-Administered Gas Production

Tax	Tax Receipts Associated with BLM Production
Severance Tax	$9,900
Property Tax	$177,000
Total	**$186,900**

Projected BLM-Attributed Economic Activity

In 2007, oil and gas employment in Arkansas was approximately 8,364, composed of extraction (4,230 jobs) and support activity (4,134 jobs) sectors (BEA REIS). It is assumed that the mining support sector in Arkansas consists primarily of support services for drilling and completing oil and gas wells.

In the past few years, the number of jobs in the oil and gas industries has grown primarily as a result of the Fayetteville Shale gas development. The extraction sector has grown seven percent, 17 percent, and 11 percent annually between 2004 and 2007, while the mining (i.e., oil and gas) support sector has grown 15, 35, and 60 percent over this time period as well. It is assumed that the extraction employment sector will grow at a rate similar to the rate of increase of total operating wells in the state. For the first few years, this will be 10 percent, nine percent, and eight percent, which are conservative figures considering the recent job growth in the extraction sector. Once the extraction sector jobs are determined, the percentage of BLM wells to total wells is applied for each year to determine the jobs attributed to BLM-administered minerals activity. In 2007, it is estimated that 60 jobs were attributable to BLM gas activity, while in 2017, this figure grows to 212 jobs, as shown in Table 3-112.

Regarding support activity jobs, well development activities (e.g., drilling, stimulating, cementing, and casing wells) are much more labor intensive than production or extraction of the gas resource. The last four years have shown annual jobs increases in the mining support sector of 15, 35, and 60 percent. The Fayetteville Shale gas area is currently under considerable development. In the longer term, as development of these Fayetteville Shale wells remains constant or tapers off and extraction activities continue, employment in general is likely to remain constant and then fall.

It is assumed that the ramp-up will continue for the next four years, 2008 to 2012, at 37 percent annual growth in the state mining support sector, an average of the growth rates for the past four years. It is also assumed that from 2013 to 2017, the support sector will be developing the same number of wells, and mining support sector jobs will remain constant. After development of the gas wells tapers off (assumed

to be after this BLM planning horizon), oil and gas support sector employment is assumed to decrease. Certainly, other factors that are not controlled by BLM, such as natural gas prices and drilling technologies, will play a role in determining the development time frame of the Fayetteville Shale Play. Once these state support sector employment numbers were estimated, the percentage of BLM wells to total gas wells was applied to these figures. This assumes that the ramp-up in development and employment (i.e., support sector) is centered on the gas wells in the northern and central parts of the state. In 2007, BLM-attributed mining support jobs are estimated to be 150 and are estimated to grow to 724 in 2017, as shown in Table 3-112.

Both extraction and support activity oil and gas jobs support additional jobs in the economy. This "multiplier effect" is not estimated in this analysis.

Table 3-112. Estimated Annual BLM-Attributed Oil and Gas Jobs, 2008 to 2017

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
State											
Extraction	4,230	4,650	5,070	5,489	5,909	6,329	6,749	7,168	7,588	8,008	8,428
Mining Support	4,134	5,664	7,759	10,630	14,563	19,951	19,951	19,951	19,951	19,951	19,951
BLM											
Extraction	60	75	90	106	121	136	151	167	182	197	212
Mining Support	150	205	281	386	528	724	724	724	724	724	724
Total BLM Jobs	210	281	372	491	649	860	875	890	906	921	936

Assumes job growth in the extraction sector is consistent with the growth in total number of wells (see above table); mining support annual growth of 37 percent 2008 to 2012, and constant thereafter. Assumes BLM extraction employment growth as a percentage of BLM wells of total wells; assumes BLM support sector employment growth as a percentage of BLM wells of total gas wells.

BLM-attributed wells in the study area in 2017 are estimated to be more than six times the number of BLM wells in 2007. Over the next 10 years, it is likely that severance taxes, FMR, and property tax receipts will all increase. Twenty percent, the BLM's estimated proportion of actual total FMRs, is shown in 2007 and 2008. After 2008, the FMRs are separated into production-based FMRs and bonus royalties. Bonuses are one-time payments to the Federal Government for the lease/title to the minerals for a specified period of time. Bonus royalties are assumed to continue for two more years (2009 and 2010) at an amount equal to the average of the past four years of bonus payment royalties, of which 20 percent is attributed to BLM. Production-based royalties are based on the 2008 production royalty figures in 2008 prices and increase at the rate of BLM well development projections as a percentage of all federal wells, generally ranging from 21 to 23 annual percent increase. These FMRs are summarized in Table 3-113.

Table 3-113. Projected Federal Mineral Royalties Associated with BLM Gas Production

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Totals
BLM FMR actual[a]	$5,182,807	$6,935,928	-	-	-	-	-	-	-	-	-	**$12,118,735**
BLM FMR—production based	-	-	$2,554,304	$3,016,979	$3,479,653	$3,942,328	$4,405,002	$4,867,676	$5,330,351	$5,793,025	$6,255,700	**$39,645,018**
BLM FMR—bonuses	-	-	$2,952,246	$2,952,246	0	0	0	0	0	0	0	**$5,904,492**
State's distribution of BLM FMR[b]	$2,591,404	$3,467,964	$2,753,275	$2,984,612	$1,739,827	$1,971,164	$2,202,501	$2,433,838	$2,665,175	$2,896,513	$3,127,850	**$28,834,123**

a. Source: MMS data and estimate that 20% of total FMR is attributable to BLM wells.
b. Assumes that the state receives approximately half of the FMR. Assumes 20 percent of all FMRs are attributable to BLM gas wells.

Severance taxes will be also increase in the future, likely consistent with the provisions in the New Severance Tax Act on Natural Gas described previously. Because the new tax policy only became effective in 2009, it is assumed that BLM-associated severance taxes for 2007 and 2008 were consistent with those reported in the Fayetteville Shale Economic Impact Study (University of Arkansas 2008), as displayed in Table 3-114. BLM wells as a percentage of total gas wells are applied to these figures. Between 2009 and 2010, the severance tax rate is assumed to be 1.5 percent; between 2011 and 2012, three percent; and after 2013, five percent of market value. To determine these tax receipts, it was first necessary to estimate the market value of the gas for the years projected by University of Arkansas. This was done by dividing the tax receipt values by 0.003. Between 2012 and 2017, it was assumed that the market value would increase annually consistent with the rate of growth of gas wells projected by the Revised Oil and Gas RFD (BLM 2012), ranging from eight to 11 percent annually. The severance tax percentages were then applied to these market values. BLM well percentages were then applied to the severance tax receipts. Estimated severance tax receipts attributable to BLM-administered minerals are shown in Table 3-115.

Table 3-114. Projected Severance Taxes for the Fayetteville Shale Gas Area

Year	Severance Tax
2008	$660,975

Year	Severance Tax
2009	$1,055,400
2010	$1,449,825
2011	$1,844,250
2012	$2,238,675
Total	**$7,249,125**

Source: University of Arkansas 2008.

Table 3-115. Projected Severance Taxes Associated With BLM Gas Production

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Totals
Projected Shale Gas Severance Tax (0.3% of production)[a]	$266,550	$660,975	$1,055,400	$1,449,825	$1,884,250	$2,238,675	-	-	-	-	-	-
Estimated Market Value	$88,850, 000	$220,325,000	$351,800,000	$483,275,000	$628,083,333	$746,225,000	$829,712,926	$913,200,852	$996,688,777	$1,080,176,703	$1,163,664,629	-
Annual Percentage Increase in Market Value	N.A.	148%	60%	37%	30%	19%	11%	10%	9%	8%	8%	-
Annual Percentage Increase	N.A.	148%	60%	37%	30%	19%	11%	10%	9%	8%	8%	-
Projected Shale Gas Severance Tax (1.5, 3, and 5% of market value)	-	-	$5,277,000	$7,249,125	$18,842,500	$22,386,750	$41,485,646	$45,660,043	$49,834,439	$54,008,835	$58,183,231	-

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Totals
BLM-Attributed Severance Tax	**$9,661**	**$23,965**	**$191,371**	**$262,931**	**$683,508**	**$812,147**	**$1,505,125**	**$1,656,670**	**$1,808,216**	**$1,959,762**	**$2,111,308**	**$11,024,665**

a. Source: University of Arkansas. Assumes 2007 prices; assumes market valuation will grow as predicted by University of Arkansas (2008) between 2008 and 2012, after which time it will grow consistent with the percentage increase in gas wells predicted for the area (BLM 2012).
N.A.: Not applicable

In total between 2007 and 2017, BLM-attributed severance tax receipts are estimated to be approximately $11 million, 3.6 percent of total severance tax receipts paid to the state associated with the Fayetteville Shale gas production. It is possible that as a result of the new severance tax policy becoming effective, operators may reduce or delay their development plan because their operating costs have effectively increased, perhaps making the operations less economically viable. These risks are further described in the University of Arkansas report (2008). Therefore, there is uncertainty surrounding these severance tax receipts, which are highly dependent on production volumes and gas prices.

Ad valorem or property taxes are typically assessed at the county level on both development operations (i.e., equipment) and on production by applying a millage rate to the assessed valuation of the production and property. University of Arkansas projected these property taxes for 2008 to 2012 for the Fayetteville Shale Gas Area based on projected prices, production, and estimates from the IMPLAN regional economic model. These projections are summarized in Table 3-116.

Table 3-116. Projected Property Taxes From Fayetteville Shale Gas Activities

Year	School District Property Taxes	City, County, and Other Property Taxes	Total Property Taxes
2008	9,334,311	2,659,950	11,994,261
2009	16,942,859	4,828,118	21,770,977
2010	26,458,030	7,539,607	33,997,637
2011	38,259,033	10,902,477	49,161,510
2012	52,793,143	15,044,187	67,837,330
Total	**143,787,376**	**40,974,340**	**184,761,716**

Source: University of Arkansas 2008.

For the years 2007 through 2012, University of Arkansas property tax estimates and projections were used. BLM well percentages as a percentage of total gas wells (3.6 percent) were applied to these years to determine the BLM-attributed property tax receipts. For 2013 through 2017, an

annual rate of increase consistent with the annual growth in gas wells was applied, beginning in 2012. BLM well percentages were then applied to these property tax estimates. The property tax receipts attributable to BLM-administered minerals are summarized in Table 3-117.

Table 3-117. Projected Property Taxes Associated With BLM Gas Production and Development Activities

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Totals
Property Taxes[a]	$4,772,858	$11,994,261	$21,770,977	$33,997,637	$49,161,510	$67,837,330	$75,426,995	$83,016,661	$90,606,326	$98,195,991	$105,785,656	**$637,793,344**
Annual Percentage Increase	N.A.	151%	82%	56%	45%	38%	11%	10%	9%	8%	8%	**N.A.**
BLM Property Taxes	**$172,995**	**$434,880**	**$789,527**	**$1,233,117**	**$1,783,325**	**$2,461,005**	**$2,736,538**	**$3,012,070**	**$3,287,603**	**$3,563,135**	**$3,838,667**	**$23,312,861**

a. Source: University of Arkansas (2008).
Assumes the state receives approximately half of the FMRs. Years 2013 to 2017 were increased at a rate consistent with the growth in gas wells (BLM 2012).
N.A.: Not applicable

Table 3-118 provides the aggregated BLM-attributed severance, property, and FMR tax receipts for this 11-year period.

Table 3-118. BLM-Attributed Total Fiscal Receipts, 2007 to 2017

Type of Payment	Tax	Percentage of Total
FMR (State %)	$28,834,123	46%
Severance Tax	$11,024,665	17%
Property Tax	$23,312,861	37%
Total	**$63,171,649**	**100%**

Environmental Justice

EJ is a goal to be achieved for all communities so that all people will be treated fairly with respect to the development and enforcement of protective environmental laws, regulations, and policies; and potentially affected community residents are meaningfully involved in the decisions that will affect their environment and/or their health. Conversely, allegations of environmental injustice describe the situations in which communities believe that the goal has not been achieved because there is disproportionate exposure to environmental harms and risks. These environmental harms and risks include, for example, air pollution, water quality concerns, and the cumulative impacts associated with living in some urban and rural areas.

The concept of EJ first became an expressed consideration with the publication of Executive Order (EO) 12898 on February 11, 1994. The EO requires each federal agency to make achieving EJ part of its mission by "identifying and addressing…disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority and low-income populations in the United States" (EO 12898, §59 Fed.Reg.7629, 1994). The broad goal of EO 12898 is then tempered in §6-609 by the caution that "this order is intended only to improve the internal management of the executive branch and is not intended to create any right enforceable against the United States."

The EPA defines a community with potential EJ populations of concern as one that has a greater percentage of minority or low-income population than an identified reference community. EPA has provided two approaches for identifying EJ populations with regard to minority status: 50 percent minority population in the affected area (EPA 1998); or whether the affected area has a significantly greater minority population than the reference area. No specific thresholds are provided for low-income or poverty populations. Because there is no consistent guidance for these indicators, some assumptions were developed specifically for this analysis. This analysis assumed that populations residing within a study area constitute an EJ community if the percentage of population in minority and/or poverty status is at least 10 percentage points higher than for the reference community. This threshold was chosen based on past experience evaluating EJ indicators and the feeling that this threshold defines a percentage that would represent a significant population difference from the reference community. In addition, poverty threshold levels determined by the U.S. Census were used as a proxy for low-income populations in the affected area and reference community.

Three counties in the study have either poverty percentages or minorities percentages in excess of 10 percent above the state's average percentages. In Pulaski County, the percentage of African-Americans is 31.9, while the State of Arkansas' average (the reference population) is 15.7. Monroe and St. Francis

counties have African-American and poverty populations greater than 10 percent higher than those of Arkansas, as summarized in Table 3-119. For these reasons, these three counties are identified as potential EJ populations of concern.

Table 3-119. Environmental Justice Indicators for Selected Counties Within Study Area and Arkansas

	Percentage Below Poverty (2000)	Percentage of the Population African-American (2000)
Monroe County	27.5%	38.8%
St. Francis	27.5%	49.0%
Pulaski County	13.3%	31.9%
Arkansas	15.8%	15.7%

Source: U.S. Census Bureau 2000.

3.18.3 Florida Socioeconomics

Social and Economic Features

The social and economic analysis for BLM FMO in Florida focuses on phosphate production. This is an important industry in Florida, and phosphate production on BLM-administered resources contributes to the local, state, and national economies. Important social values are also connected with this activity, in terms of both the livelihoods provided and the concerns some stakeholders have about the environmental and other impacts of these activities.

The affected environment in Florida centers on the counties in southwest-central Florida, an area where phosphate production is occurring or is planned to occur in conjunction with BLM-managed FMO. Therefore, the socioeconomic description is limited to the counties with high potential for phosphate mining, which include Hardee, Manatee, Polk, and Hillsborough counties. De Soto County also encompasses lands with high potential for phosphate mining, but it is expected that mining will not occur there within the planning horizon, and it is not included in the socioeconomic study area. Hillsborough County also encompasses Tampa, which is an economic center and metropolitan area with companies that support these phosphate mining operations. The four counties compose the proposed study area in Florida to assess the socioeconomic features with respect to BLM's mineral estate.

In Florida, federal phosphate leases are typically contained within a larger area of private phosphate ownership. Historically, BLM's phosphate surface and mineral estate accounts for a relatively small amount of the mining operations, estimated to be between one and five percent. For example, the BLM Solid Minerals RFD (BLM 2008b) estimates that the BLM mineral estate in the Hardee County extension of the South Fort Meade Mine comprises approximately five percent of the mine area and operations.

Socioeconomic Conditions

Population

The three primary mining counties, Hardee, Manatee, and Polk, are somewhat more sparsely populated than Hillsborough County, which encompasses Tampa, a major metropolitan area (Table 3-120). However, these three central Florida counties lie very close to the major metropolitan areas of Orlando and Tampa. Hardee County has the fewest residents, with fewer than 43 people per square mile. Manatee and Polk counties were more densely populated with 258 to 356 people per square mile; these figures are similar to the state's average of 296 people per square mile. Hillsborough County had a much higher population density because of its proximity to the coast and the city of Tampa. Table 3-120 summarizes the population and land area data.

Table 3-120. Population and Land Area

Area	Land Area (Square Miles)	Population 2006 Estimate	Population per Square Mile
Hillsborough County	1,050.9	1,157,738	950.5
Manatee County	741.0	313,298	356.3
Hardee County	637.3	28,621	42.3
Polk County	1,874.4	561,606	258.2
Study Area	4,303.6	2,061,263	479.0
Florida	53,926.8	18,089,888	296.4

Source: U.S. Census Bureau 2000.

The population in the study area grew between 2000 and 2006, with an average change of 16 percent, which is a rate of growth slightly more than the state's average. During this same time period, Hardee County, the least populated county, grew at six percent, while Manatee County grew at 19 percent. Population growth in the study area preceding 2000 was below the state average. This trend changed slightly post 2000, when the study area population grew at a slightly higher rate. Table 3-121 summarizes these population estimates.

Table 3-121. Population Growth in the Study Area and Florida, 1980 to 2006

Area	1980	1990	2000	2006	Percentage Change 1980 to 1990	Percentage Change 1990 to 2000	Percentage Change 2000 to 2006
Hillsborough County	646,960	834,054	998,948	1,157,738	29%	20%	16%
Manatee County	148,442	211,707	261,002	313,298	43%	23%	19%
Hardee County	19,379	19,499	26,938	28,621	1%	38%	6%
Polk County	321,652	405,382	483,924	561,606	26%	19%	16%

Area	1980	1990	2000	2006	Percentage Change 1980 to 1990	Percentage Change 1990 to 2000	Percentage Change 2000 to 2006
Study Area	1,136,433	1,470,642	1,770,812	2,061,263	29%	20%	16%
Florida	9,746,324	12,937,926	15,982,378	18,089,888	33%	24%	13%

Source: U.S. Census Bureau 1990, U.S. Census Bureau 2000.

Employment and Income

Nominal personal income, composed of labor earnings, investment income, and transfer payments, increased across the study area between 2000 and 2006, consistent with those for the State of Florida, as shown in Table 3-122. However, if inflation or cost of living increases are removed from these personal income figures, the real person income growth is much less (Table 3-123). In fact, Hardee County, the least populated county, experienced zero personal income growth; it also had the smallest total personal income compared with the other counties in the study area. The other counties saw real income growth, and the study area overall saw a 21-percent increase, consistent with the income growth in the state. Polk County experienced slightly higher real personal income growth of 25 percent.

Table 3-122. Nominal Personal Income, 2001 to 2006

Area	2001	2002	2003	2004	2005	2006	Percentage Change 2001 to 2006
Hillsborough County	$29,977,256	$31,070,635	$32,485,969	$35,247,287	$38,203,575	$40,757,703	36%
Manatee County	$8,762,299	$8,920,616	$8,941,453	$9,949,354	$11,233,298	$12,197,737	39%
Hardee County	$482,982	$473,716	$485,653	$497,540	$526,746	$552,236	14%
Polk County	$12,211,632	$12,462,296	$13,051,067	$14,435,083	$15,961,320	$17,308,624	42%
Study Area	$51,434,169	$52,927,263	$54,964,142	$60,129,264	$65,924,939	$70,816,300	38%
Florida	$478,637,023	$495,489,345	$514,377,645	$565,680,690	$617,179,386	$663,077,399	39%

Source: BEA REIS.

Table 3-123. Real Personal Income, 2001 to 2006 (2006$)

Area	2001	2002	2003	2004	2005	2006	Percentage Change 2001 to 2006
Hillsborough County	$34,112,050	$34,907,401	$35,674,101	$37,748,332	$39,502,050	$40,757,703	19%
Manatee County	$9,970,892	$10,022,181	$9,818,956	$10,655,331	$11,615,099	$12,197,737	22%
Hardee County	$549,600	$532,213	$533,314	$532,844	$544,649	$552,236	0%
Polk County	$13,895,995	$14,001,206	$14,331,882	$15,459,355	$16,503,818	$17,308,624	25%
Study Area	$58,528,537	$59,463,001	$60,358,254	$64,395,862	$68,165,617	$70,816,300	21%
Florida	$544,655,923	$556,674,988	$564,858,023	$605,819,749	$638,156,274	$663,077,399	22%

Source: BEA REIS, Inflated with BLS South Region Consumer Price Index.

Employment has been increasing across Florida and in the study area since 2001 (Table 3-124). The largest increases in employment during this time period were in Polk County with an 18-percent change, and the smallest rate of growth was in Manatee County (11 percent). Across the study area, employment has grown at a slightly lower rate (13 percent) than that of the state (16 percent). Since 1990 and 1980, employment in the study area increased 56 and 130 percent, respectively, consistent with the growth experienced by the state, which was 55 and 124 percent, respectively.

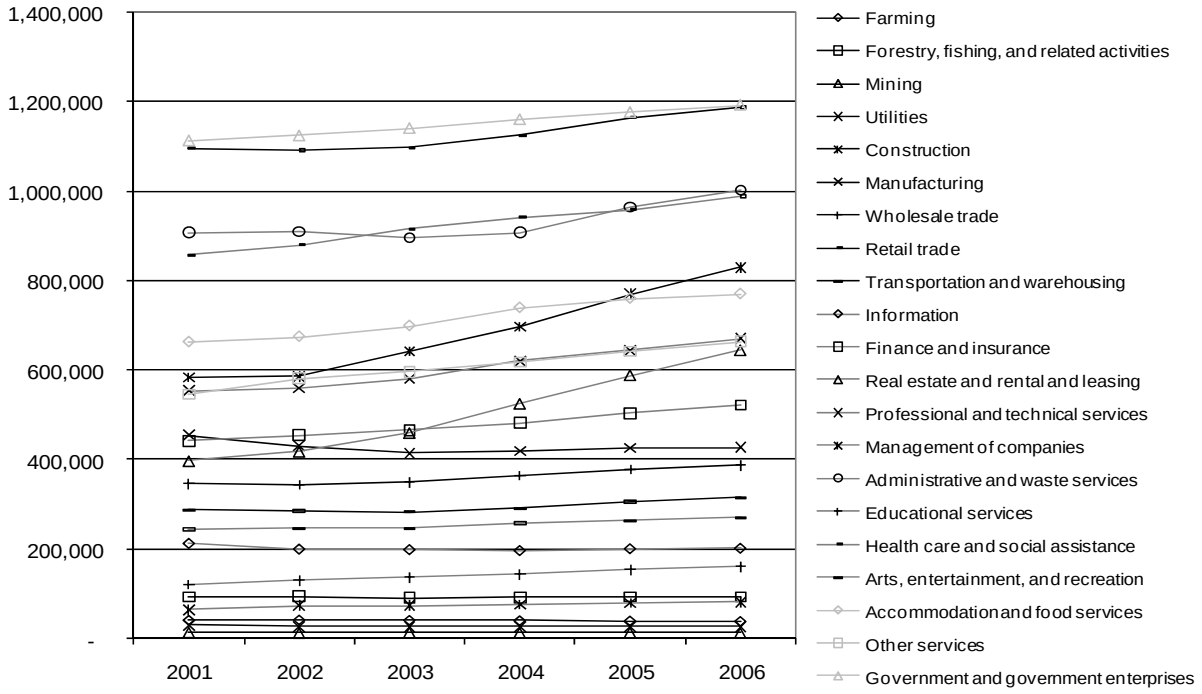
Table 3-124. Employment, 2001 to 2006

Area	2001	2002	2003	2004	2005	2006	Percentage Change 2001 to 2006
Hillsborough County	11,834	11,449	11,979	12,258	13,016	13,641	15%
Manatee County	746,420	755,628	747,606	776,198	803,421	829,757	11%
Hardee County	164,099	166,012	155,621	161,796	173,612	184,390	12%
Polk County	235,315	237,694	242,649	253,985	268,181	276,891	18%
Study Area	1,157,668	1,170,783	1,157,855	1,204,237	1,258,230	1,304,679	13%
Florida	9,112,069	9,204,768	9,411,404	9,774,569	10,185,203	10,521,966	16%

Source: BEA REIS.

The primary employing industries in the state in 2006 were (listed in decreasing importance) government and government enterprises; retail trade; administrative and waste services; healthcare and social assistance; accommodations and food services; and professional and technical services. Between 2001 and 2006, employment in these industries grew by seven, eight, 11, 15, 16, and 21 percent, respectively. Other notable industry employment growth percentage changes over this period include a 42-percent increase in the construction industry, a 62-percent increase in real estate and leasing services, and a 34-percent increase in private educational services. Employment in the mining and utility sectors decreased during this period, nine and 11 percent, respectively. Figure 3-7 summarizes the state's employment by industry from 2000 to 2006.

Figure 3-7. Florida Employment by Industry, 2000 to 2006



Employment by industry figures for the study area shows that the top employing industries in 2006 were (listed in decreasing importance) administrative and waste services, retail trade, government and government services, healthcare and social assistance, and construction. However, because of proprietary data disclosure issues, employment data between 2001 and 2006 are not available for forestry and related activities, mining, utilities, and transportation and warehousing industries. Partial information is available for management of companies, administration and waste services, private educational services, arts and recreation, and accommodations and food industries. Of those industries with data available, the highest rates of employment growth between 2001 and 2006 were in construction (40 percent) and real estate (61 percent), which represent average annual growth rates of eight and 12 percent respectively. With the recent economic downturn, these industries are likely not experiencing these rates of growth. The construction and real estate sectors are typically highly cyclical industries, fluctuating with the local, regional, and national economic cycles.

To better understand the mining employment situation across the study area, data are provided for this sector for the four-county area in Table 3-125, for 2001 through 2006. Where data were not available, a (D) is denoted. The Polk County mining industry employment was higher than mining employment in

Manatee and Hillsborough counties. However, during this time period, employment dropped by 60 percent in Polk County, while it more than doubled in Hillsborough County. Manatee County shows indications that mining employment increased slightly between 2001 and 2004. There was no available information on mining in Hardee County.

Table 3-125. Mining Employment in the Study Area, 2001 to 2006

Area	2001	2002	2003	2004	2005	2006
Hillsborough County	371	322	385	330	383	780
Manatee County	160	170	(D)	190	(D)	(D)
Hardee County	(D)	(D)	(D)	(D)	(D)	(D)
Polk County	2,477	1,988	(D)	(D)	(D)	996
(D): Data not available – not disclosed by BEA in order to protect confidentiality.						

Source: BEA REIS.

In central Florida, Mosaic and CF Industries are the major producers of phosphate, controlling more than 300,000 acres of the state. In 2005, Mosaic indicated that the company employed 3,000 people in the central Florida counties of Hardee, Hillsborough, Manatee, and Polk, with a combined total payroll of nearly $270 million (Phosphate Florida Website 2005), indicating average earnings of $90,000.

Employment in phosphate mining also creates jobs through the ripple or multiplier effect on other supporting and downstream industry sectors, such as phosphate fertilizer manufacturing and the transportation and shipping industries. One source estimates that for every one job created in phosphate mining, five downstream jobs are created (Florida Institute of Phosphate Research 2004).

The phosphate industry provides an important export for the Port of Tampa. According to Enterprise Florida, Inc., fertilizer was one of the state's leading export commodities, with a 2005 value of $1.7 billion. The Port of Tampa attributed approximately 67,000 jobs and approximately $5.8 billion in total economic contributions to phosphate and related chemical industries in 2005 (www.phosphateflorida.com). "Phosphates were, by far, the most important outbound commodity, accounting for 90 percent of the port's outbound tonnage. More than 10.7 million tons of phosphate products were exported through the Port of Tampa in 2001," according to *The Contribution of the Port of Tampa to the Tampa Bay and Florida Economies in 2001,* a report prepared for the Tampa Port Authority by the Pennsylvania-based Business Research and Economic Advisors, November 2002 (as reported in the Florida Institute of Phosphate Research 2004).

Earnings

In Florida, real earnings by industry have been generally increasing. Leading industries include government, healthcare and social assistance, professional and technical services, retail trade, finance and insurance, administrative and waste services, and manufacturing.

Within the study area, there are no federal data for forestry, mining, utilities, and transportation and warehousing because of data disclosure issues stemming from the limited number of companies in these industries. The most important industries in terms of total real labor earnings paid to workers in these areas include (in decreasing importance) government, professional and technical services, administrative and waste services, finance and insurance, and manufacturing.

Personal income is composed of earnings, investment income, and transfer payments. To understand the relative importance of these components, they were compared from 2001 to 2006 (Table 3-126). Earnings composed between 79 to 81 percent of total personal income over this time period, while investment income generally made up the difference—from 18 to 20 percent. Since 2002, sources indicate that investment income reported as real 2006 dollars grew in importance (from 18 percent to 20 percent), while earnings decreased slightly (from 81 to 79 percent) between 2001 and 2006. However, with the recent economic downturn, it is likely that these figures in general are less than those in 2006, although their relative importance is difficult to evaluate.

Table 3-126. Real Components of Personal Income in Study Area (2006$), 2001 to 2006

Area	2001	2002	2003	2004	2005	2006	Percentage Change 2001 to 2006
Earnings	$46,189,333	$48,087,596	$48,594,281	$51,182,665	$53,793,556	$55,991,199	21%
Investment Income	$11,793,073	$10,674,509	$10,663,653	$11,786,365	$13,423,575	$14,279,993	21%
Transfer Payments	$546,131	$700,896	$1,100,320	$1,426,832	$948,485	$545,108	0%
Total Personal Income	$58,528,537	$59,463,001	$60,358,254	$64,395,862	$68,165,617	$70,816,300	21%
Percentage Earnings of PI	79%	81%	81%	79%	79%	79%	0%
Percentage Investment Income of PI	20%	18%	18%	18%	20%	20%	0%
PI=Personal Income							

Source: BEA REIS.

On average across the study area, the highest paying jobs were management of companies and enterprises followed by professional and technical services and manufacturing, which includes some chemical manufacturing. The lowest paying jobs were in accommodation and food services, and real estate and private educational services.

No earnings data for the mining sector between 2001 and 2006 were available. However, this industry typically has higher average wages compared with other industries and would likely be comparable to the manufacturing sector. For example, in 2006, average earnings for the mining sector in Florida were $62,000, comparable with the wholesale trade industry in the study area. The mining industry has indicated that its average earnings are as much as $90,000 (www.floridaphosphate.com).

Demographic Characteristics

Age

Manatee County has shown slight increases in the percentages of younger people over time, while Hardee County has shown slight decreases in this younger population. In Hardee County, a larger portion of its population was below 18 (28 percent), and Manatee had a lower proportion of the younger population (21 percent). In Manatee County, the percentage of people 65 years and older has decreased since 1990. However, Manatee County had the highest proportion of older residents, 22 percent, compared with 12 percent in Hillsborough County. The state's average was 17 percent.

Ethnicity and Race

Hispanic populations across the study area and in Florida increased between 2000 and 2006 as a percentage of total population. (Data for 1990 could not be compared with 2000 data because the types of reporting are inconsistent.) Overall, in both 2000 and 2006, Hardee County had the largest proportion of Hispanic population and the fewest white residents (Table 3-127). Hardee County's Hispanic population was 36 and 41 percent respectively, for 2000 and 2006, compared with the state's average of 15 and 20 percent for the same years. Polk and Manatee counties' Hispanic populations were lower than the state's average for both years, and Hillsborough County's Hispanic population was slightly higher than the state's average.

Table 3-127. Race by Study Area and State 2000 and 2006

	White (percentage)	Black (percentage)	Hispanic, Non-White (percentage)
Hillsborough			
2000	63%	16%	18%
2006	58%	17%	22%
Manatee			
2000	81%	9%	9%
2006	77%	9%	12%
Hardee			
2000	55%	8%	36%
2006	49%	9%	41%
Polk			
2000	76%	14%	10%
2006	69%	14%	14%
Florida			
2000	65%	16%	15%
2006	61%	18%	20%

Source: U.S. Census Bureau 2000.

Poverty

Rates of poverty have been fairly stable across the study area and across Florida. The exception has been Hardee County, where poverty rates increased between 1990 and 2000 and decreased between 2000 and 2004. Hardee County also had the highest rates of poverty over this time period: in 2000, 12 percent

above the state's poverty level, and in 2006, eight percent above the state's poverty level. These poverty figures are depicted in Table 3-128.

Table 3-128. Poverty Level in the Study Area and in the State (Percentage of Population Below the Poverty Level)

	1990	2000	2004
Hillsborough	13%	13%	12%
Manatee	10%	10%	10%
Hardee	23%	25%	20%
Polk	13%	13%	13%
Florida	12%	13%	12%

Source: U.S. Census Bureau 1990, U.S. Census Bureau 2000.

Household Income

Median household income varied across the study area, with the highest levels being in Hillsborough County and the lowest levels in Hardee County. As of 2004, Hardee and Polk counties' household income levels were less than those of the state. These figures are summarized in Table 3-129.

Table 3-129. Median Household Income in the Study Area and in the State (2006$)

	1990	2000	2004	Percentage Change 1990 to 2006
Hillsborough	$43,350	$47,351	$48,032	11%
Manatee	$39,505	$45,034	$44,358	12%
Hardee	$33,589	$35,147	$31,774	-5%
Polk	$38,386	$41,963	$38,918	1%
Florida	$41,837	$45,204	$43,802	5%

Source: U.S. Census Bureau 1990, U.S. Census Bureau 2000.

Housing Values

Real housing values have been highest in Manatee County, followed by Hillsborough, Polk, and Hardee. Between 1990 and 2000, values increased the most in Manatee and Hardee counties, while Hillsborough and Polk experienced no increase to a slight increases. Between 1990 and 2006, values increased the most in Manatee County, followed by Hillsborough. Data were not available for Hardee County for 2006. These figures are depicted in Table 3-130.

Table 3-130. Real Median Housing Values in the Study Area and in the State (2006$)

	1990	2000	2006	Percentage Change 1990 to 2000	Percentage Change 1990 to 2006
Hillsborough	$111,279	$111,176	$216,200	0%	94%

	1990	2000	2006	Percentage Change 1990 to 2000	Percentage Change 1990 to 2006
Manatee	$120,869	$135,869	$244,000	12%	102%
Hardee	$61,348	$67,821	N/A	11%	N/A
Polk	$92,859	$94,790	$141,000	2%	52%
Florida	$117,368	$120,052	$230,600	2%	96%
N/A: Not available					

Source: U.S. Census Bureau 1990, U.S. Census Bureau 2000.

Phosphate Mining in the Study Area

Florida provides 75 percent of the phosphorous used by U.S. farmers and about 25 percent of world production (Tampa Bay Soundings 2002). Phosphorous is critical for root and flower development in all plants. Starting in the late 1880s, phosphate miners began working southward through the heart of Bone Valley. As they dug around the cities of Lakeland, Mulberry, Bartow, and Plant City, mining became the third-largest industry in the state, behind only tourism and agriculture, for much of the 20th century. During this period, more than 100 companies were involved in mining phosphate in Florida. Today, only three companies remain—Mosaic, CF Industries, and Potash—and none is based in the state.

Mosaic obtains all of its phosphate from Florida, nearly 10 million tons a year (Barnett 2008). That volume of production amounts to more than half the phosphate sold in the United States, and 16 percent of the global market, more than double any competitor's share.

World phosphate stocks are low, while the rate of growth in demand has doubled every year for the past three years, according to the International Fertilizer Association (Barnett 2008). Dammonium phosphate (the most common fertilizer manufactured in Florida) has sold for as much as $1,000 a metric ton, up from $255 at the start of 2007. Although 2007 and 2008 were boom times for phosphate mining because of high prices, lower prices from 1999 through 2006 caused seven large-scale phosphate plants to close in the United States, six of them in Florida (Barnett 2008).

With the recent economic downturn and in response to a lower stock value and a dip in phosphate's price, Mosaic has indicated that it plans to cut production by as much as 20 percent. The company planned to produce up to 10 million tons of refined phosphate this fiscal year (FY). Now, according to one industry representative, the company plans to produce eight million to nine million tons. (Spinner 2008a).

The phosphate companies want to continue the industry's traditional progression southward into Hardee County, expanding the South Fort Meade Mine by 10,885 acres. Other tracts called Altman in Manatee County and Ona in Hardee County are scheduled for development soon. A court recently denied a challenge by Lee and Sarasota counties and concluded that state regulators should issue a permit for the expanding the South Fort Meade Mine. The administrative law judge's recommendation went to the FDEP, which announced its intent to issue the permit in September 2009 (Spinner 2008b).

BLM has estimated that the South Fort Meade Mine expansion encompasses 10,885 acres, of which 602 acres or five percent are owned by BLM (BLM 2008b). Typically, 6,000 tons of phosphate are recovered per acre of the mining operation (BLM 1995), equating to 65 million tons of phosphate for this mine expansion in Hardee County. BLM's mineral ownership of 602 acres will yield approximately 3.6 million tons of phosphate during the mining operations (likely within the BLM planning horizon).

Attitudes and Beliefs

BLM has control over a number of issues and decisions that could be important to stakeholders and their beliefs, including federal land disposal and mineral development, such as phosphate and oil and gas. Although federal mineral leases compose only from one to five percent of the private phosphate mining operations, these federal lands and minerals do contribute to mining operations, and thus can be related to the jobs, income, fiscal receipts, and potential environmental impacts for these areas. This section briefly describes stakeholders' attitudes and beliefs related to phosphate mining to provide a social context for these decisions.

Public lands are important in providing a natural resource base for economic activities. Where federal tracts are involved, these resources and opportunities to develop them may proceed or may be bypassed in perpetuity. Phosphate development and production will be supported by some stakeholders and not by others. Stakeholders who support mineral development and production believe domestic production of resources provides products on which the public relies heavily, generating economic and social benefits, including local and regional jobs, income, and Gross State Product. Without the availability and access for development of these resources, these stakeholders often believe that many adverse impacts could occur, including worsening trade gaps, increasing prices, and potentially strategic vulnerabilities. In addition, the mineral industries have contributed to the tax base of counties and the state, providing funds for local, regional, and state governments, infrastructure, schools, and other community services. Many people believe that this funding is important to the economy of Florida counties and the state. Some stakeholders support these mining activities because of the economic benefits (both from the direct industries and downstream supporting industries) in terms of income, jobs, and government revenues, while others are concerned that the economic benefit may not offset the risks to environmental and water resources from the activity.

Conservation-focused stakeholders may not support mineral development or might support conditions and stipulations on development and production to reduce negative impacts on the surface and subsurface. These environmental stakeholders are concerned about erosion and water quality impacts associated with mining operations and reclamation. Some stakeholders believe that the potential long-term environmental risks of development are considerable compared with the short-term benefit of the resource extracted. In addition, these stakeholders believe that mineral development impacts, such as increased road building, associated road traffic, dust, and noise, worsen the negative impacts associated with this type of development.

Lee and Sarasota counties have opposed expanding phosphate operations in Hardee County and toward the southwest, arguing that the mine would harm the Peace River, a regional drinking water source. The Peace River also flows into Charlotte Harbor, one of the state's most productive estuaries for fish and shellfish (Spinner 2008b).

Local and state government representatives and environmental stakeholders may also be concerned about the volatility of the phosphate industry and the financial risks inherent in such an operation. In the past, this has led to bankruptcy and the abandonment of mines and plants, which could then be left to the state to maintain and clean up the sites. These cleanup efforts can drain considerable state funds to reclaim the phosphate lands.

Public Finance

According to industry statistics as reported in the Florida Phosphate Council's "Phosphate Facts," the phosphate mining industry paid more than $85.9 million in severance, property, sales, and other taxes and fees in 2003. In 2005, the industry indicated that it had paid approximately $70 million in severance,

property, sales, and other taxes and fees (www.floridaphosphate.com). In addition, when the industry leases federal minerals, a royalty is paid to the Federal Government associated with production of those minerals, of which half are returned to the state.

Federal Mineral Royalties

The BOEMRE (formerly MMS) collects federal royalties from mining of federal minerals, amounting to approximately five percent of the value of production. About half of these funds are deposited into the U.S. Treasury and half are returned to the state in which the production occurs (MMS 2009b). In 2008, the MMS reports show that $1,614 in FMR were paid from phosphate mining in the state. However, these royalty receipts vary considerably by year depending on both the price of phosphate and the location of the BLM parcel of land and where it resides within the planned mining operations and production cycle. For example, in 2005, phosphate FMR were $844,557, while subsequent years have been much less. These figures are summarized in Table 3-131.

Table 3-131. Florida Federal Mineral Royalties, 2005 to 2008

Year	FMR Receipts
2008	$1,614
2007	$884
2006	$32,996
2005	$844,557
Average	**$220,013**

Source: MMS.

According to BLM officials and the Solid Minerals RFD, the 2005 production on 46 acres of BLM-managed resources in Manatee County yielded 551,500 tons beneficiated phosphate, with an average phosphate recovery of 11,900 tons per acre. The federal royalty was collected at five percent of the $31 per ton phosphate value at that time, yielding approximately $850,000. Typically, the recovery yield of phosphate has been estimated to be 6,000 tons per acre (BLM 1995).

Over the four-year period noted above, the average annual royalty received was $220,000. If BLM owns from one to five percent of the federal mineral estate and approximately 10,000,000 tons of phosphate are produced annually, this equates to from $155,000 to $775,000 in annual federal royalty payments (provided the price is approximately $31 per ton) on average, of which the State of Florida receives approximately half.

Severance and Ad Valorem Taxes

Mineral production is also subject to severance and ad valorem taxes, as well as sales taxes on mining services, although these sales taxes are difficult to estimate. The mining industry is responsible for paying these taxes on the value of production. However, because BLM owns from one to five percent of the mineral estate in the study area, this portion of the fiscal revenue can be attributed to BLM. Severance taxes are used for reclamation and rehabilitation activities, schools, recreation, conservation, phosphate research, and other state and local government activities. Property taxes fund local government expenditures, such as police, fire stations, hospitals, garbage disposal, sewers, road and sidewalk maintenance, parks, and libraries.

The industry must pay $1.945 per ton of phosphate rock severed, and an additional $1.38 per ton surcharge (Florida Department of Revenue [DOR] 2008). The proceeds of the severance surtax are used for rehabilitation, management and closure of the Piney Point and Mulberry sites of severance, as well as other approved land reclamation (Florida DOR 2008). The first $10 million in severance tax revenues are deposited into the Conservation and Recreation Lands (CARL) Trust Fund. The remaining revenues are distributed from the State Treasury to the General Revenue Fund, the Phosphate Research Trust Fund, counties where phosphate production occurs, and the Minerals Trust Fund (Florida House of Representatives 2000).

Property or ad valorem taxes are assessed on the taxable valuation of solid minerals, typically determined by the millage rate, production volume, and current price of the minerals. The local millage rate is applied to the taxable value of the phosphate produced. These rates vary across the four counties. Hardee County has the highest rate (7.7926) and Hillsborough County has the lowest rate (5.7446). The average millage rate across the four counties is 6.6 (Florida DOR 2008). At a production level ranging from eight to 10 million tons per year and a price of $31 per ton, the valuation of these minerals ranges from $248 to $310 million. Table 3-132 summarizes the tax receipts associated with phosphate mineral production in central Florida. Historically, BLM's FMO composes between one and five percent of these operations.

Table 3-132. Annual Florida Severance and Property Taxes

	Production = 10M tons	Production = 8M tons
Severance Tax	$19,450,000	$15,560,000
Severance Surcharge	$13,800,000	$11,040,000
Ad Valorem Tax	$2,069,444	$1,655,555
Total	$35,319,444	$28,255,555
BLM 1%	$353,194	$282,556
BLM 5%	$1,765,972	$1,412,778

Assumes a price of $31/ton; an average millage rate of 6.676; ad valorem tax is taxable value multiplied by millage rate divided by 1,000.

Projected BLM-Attributed Economic Activity

As described in the previous sections, Mosaic employed 3,000 people in the central Florida counties of Hardee, Hillsborough, Manatee, and Polk, with a combined total payroll of nearly $270 million (www.phosphateflorida.com). Because little federal data (BLS or BEA) is disclosed for these industries, it is necessary to use the general industry estimates. If BLM federal mineral estate accounts for between one and five percent of these operations, 30 to 150 jobs can be attributed to these BLM lands. This does not include the multiplier impact of these jobs within the study area, which could be as high as five indirect jobs for every one mining job. These percentages can also be applied to earnings or payroll, with $2.7 to $13.5 million in earnings associated with BLM FMO.

With 65 million tons of phosphate expected to be produced from the South Fort Meade Mine expansion in Hardee County (see Mining in Study Area above), and 3.6 million tons from BLM-administered FMO

within that operation, Table 3-133 shows the expected total fiscal receipts associated with production from these federal minerals over the entire mining operation.

Table 3-133. BLM-Attributed Total Fiscal Receipts

Type of Payment	Total Fiscal Receipts	Percentage of Total
FMR	$5,270,000	31%
Severance Tax	$6,613,000	38%
Severance Surcharge	$4,692,000	27%
Ad Valorem Tax	$703,610	4%
Total	**$17,278,610**	**100%**

Assumes $31/ton price, 3.4 million tons produced over planning horizon.

Environmental Justice

EJ is a goal to be achieved for all communities so that all people will be treated fairly with respect to the development and enforcement of protective environmental laws, regulations, and policies; and potentially affected community residents are meaningfully involved in the decisions that will affect their environment and/or their health. Conversely, allegations of environmental injustice describe the situations in which communities believe that the goal has not been achieved because there is disproportionate exposure to environmental harms and risks. These environmental harms and risks include air pollution, water quality concerns, and the cumulative impacts associated with living in some urban and rural areas.

The concept of EJ first became an expressed consideration with the publication of EO 12898 on February 11, 1994. The EO requires each federal agency to make the achievement of EJ part of its mission by "identifying and addressing…disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority and low-income populations in the United States" (EO 12898, §59 Fed.Reg.7629, 1994). The broad goal of EO 12898 was then tempered in §6-609 by the caution that "this order is intended only to improve the internal management of the executive branch and is not intended to create any right enforceable against the United States."

The EPA defines a community with potential EJ populations of concern as one that has a greater percentage of minority or low income population than an identified reference community. EPA has provided two approaches for identifying EJ populations with regard to minority status: 50 percent minority population in the affected area (EPA 1998); or whether the affected area has a significantly greater minority population than the reference area. No specific thresholds are provided for low-income or poverty populations. Because there is no consistent guidance for these indicators, some assumptions were developed specifically for this analysis. This analysis assumed that populations residing within a study area constitute an EJ community if the percentage of population in minority and/or poverty status is at least 10 percentage points higher than for the reference community. This threshold was chosen based on past experience evaluating EJ indicators and the belief that this threshold defines a percentage that would represent a significant population difference from the reference community. In addition, poverty threshold levels determined by the U.S. Census were used as a proxy for low income populations in the affected area and reference community.

Hardee County, one of the counties within the study area, is identified as an EJ population of concern. This is based primarily on the minority population in this county. The reference population is the State of Florida. Table 3-134 demonstrates that in 2006, the Hispanic non-white population was 21 percent higher in Hardee County than in the State of Florida. Hardee County also had a larger percentage of its population living in poverty—20 percent in Hardee and 12 percent in the state. Median household income was also 38 percent higher in the state than in Hardee County. For these reasons, Hardee County is considered an EJ population.

Table 3-134. Environmental Justice Indicators for Hardee County and Florida

	Percentage Below Poverty (2004)	Median Household Income (2004 in 2006$)	Percentage of the Population That Is Hispanic (Non-White) (2006)
Hardee County	20%	$31,777	41%
Florida	12 %	$43,802	20%

Source: U.S. Census Bureau.

3.18.4 Florida Tract Specific Socioeconomics

Jupiter Inlet Lighthouse ONA

Jupiter Inlet Lighthouse ONA is different from most eastern BLM lands in that it used for conservation and educational purposes as opposed to energy and mineral development. It is also unique in that it exists in one of the more populous coastal metropolitan areas in the country, where useable open space and sensitive habitats are often limited resources and in high demand. Jupiter Inlet Lighthouse ONA is an important natural resource for Palm Beach County as well as for the national and international communities, providing a number of social and economic values. These values include recreation, education, habitat, water filtration, and coastal protection. Although these values are often difficult to monetize or even quantify, their importance to these communities can be considerable.

Jupiter Inlet Lighthouse ONA provides valuable habitat for many common, sensitive and federally listed species. The site has four federally listed species (four-petal pawpaw, perforate lichen, Florida Scrub Jay, and West Indian manatee). Efforts to study and preserve the endangered species include genetic sampling and successful hand pollination of the endangered four-petal pawpaw, and monitoring to assess the steep declines in federally threatened Florida Scrub Jay. In addition to these habitat values, Jupiter Inlet Lighthouse ONA offers hydrological services, including water filtration and waste assimilation, and coastal protection services, for example, from hurricane disturbances and from beach erosion.

Jupiter Inlet Lighthouse ONA has 65,000 visitors annually from the local population and from all over the world. As was noted in the manager's annual report, guided tours of the Jupiter Inlet Lighthouse are popular with local residents as well as national and international travelers. From July 2007 to June 2008, public tours and programs reached 57,394 visitors. To build on interest in the environmental and historical assets on the site, Jupiter Inlet Lighthouse ONA is working to create a comprehensive interpretative program.

The local community has not only supported Jupiter Inlet Lighthouse ONA by visiting the site, but local organizations have also spent thousands of volunteer hours helping to maintain and preserve this important natural asset. As part of the Hands on the Land program, Jupiter Inlet Lighthouse ONA serves

as an outdoor classroom for Jupiter High School Environmental Research and Field Studies Academy. Students and local volunteers spend time in exotic plant removal, clean-up, and native planting projects. In fact, the school was recognized in 2004 by BLM's Director after logging more than 3,000 hours in seven years. In addition to volunteer support, the Loxahatchee River Historical Society cost-shared in 2007 on native landscaping and trails to interpret the historic Tyndall house, one of Jupiter's oldest buildings, which was moved to Jupiter Inlet Lighthouse ONA in 2007. Other community partners of Jupiter Inlet Lighthouse ONA include the U.S. Coast Guard, Palm Beach County, town of Jupiter, and the village of Tequesta. Virtually all of the project work funded by BLM at Jupiter Inlet Lighthouse ONA has been cost-shared with these and other local partners. This group of local stakeholders has received the Legacy of the Land Award, 4 C's Award, Departmental Environmental Achievement Award, and Cooperative Conservation Award for collaborative work at Jupiter Inlet.

3.18.5 Kentucky Socioeconomics

Social and Economic Features

The social and economic analysis for BLM FMO in Kentucky focuses on coal production and oil and gas development and production. These are important industries in Kentucky, and these activities on BLM-administered resources contribute to the national, commonwealth, and local economies. Important social values also are connected with these activities regarding the livelihoods provided and the concerns that some stakeholders have about the environmental and other impacts of these activities.

According to the EIA, the Commonwealth of Kentucky has 3.5 percent of the nation's share of oil producing wells and 3.7 percent of the nation's share of gas producing wells. However, Kentucky accounts for only 0.2 percent of the nation's crude production and 0.5 percent of the nation's gas production. In 2008, commonwealth-wide oil production was 10 percent of the oil production high in 1959.

The revised Oil and Gas RFD (BLM 2012) forecasts oil and gas drilling activity over the next 10 years. For oil, 60 new wells are projected to be drilled in eastern Kentucky, 830 new wells in central Kentucky, and 40 new wells in western Kentucky. For gas, 3,210 new wells are projected to be drilled in eastern Kentucky, 90 new wells in central Kentucky, and 60 new wells in western Kentucky. Within these totals, only 29 wells (oil and gas combined) are projected for BLM-administered FMO over the next 10 years: 16 in eastern Kentucky, 10 in central Kentucky, and three in western Kentucky. These 29 wells are scattered across 22 counties, only five of which are forecasted for more than one well. Because of the low density and wide geographic distribution of oil and gas activity on BLM-administered resources, the socioeconomic study area for oil and gas is defined as the entire Commonwealth of Kentucky.

Kentucky accounts for 10 percent of coal production in the United States. In 2007, 115 million short tons were produced in Kentucky. Coal production in Kentucky has largely been on the decline since its 1990 high of 173 million tons. However, since 2003, economic pressures related to the price of oil and the strategic concern over imported energy resources have led to an increase in coal production.

BLM has indicated that there are currently two LBAs in process for coal mining under USACE lands in the Dewey Lake area of Floyd County in eastern Kentucky. It is estimated that these two leases on BLM-administered FMO will generate between 2,180,000 and 2,300,000 tons of coal for the first four years and between 480,000 and 600,000 tons of coal for the remaining years of the lease. This is the only coal development on BLM-administered FMO projected during the study period. The Dewey Lake region of Floyd County is located in the northern part of the county, within relatively close proximity to three other counties: Johnson, Martin, and Pike. Mining employment statistics also indicate that these three counties may have businesses that, and employees who, would support the new coal mining operations in Floyd

County. Therefore, the socioeconomic study area for coal is defined as Floyd, Johnson, Martin, and Pike counties. Together, these counties account for 27 percent of the coal production in the Commonwealth of Kentucky.

In the material that follows, statistics and discussions are presented for the "coal study area" as defined above, and for the Commonwealth of Kentucky. The commonwealth serves as a comparative reference for the coal study area and is the defined study area for oil and gas, as discussed earlier.

Socioeconomic Conditions

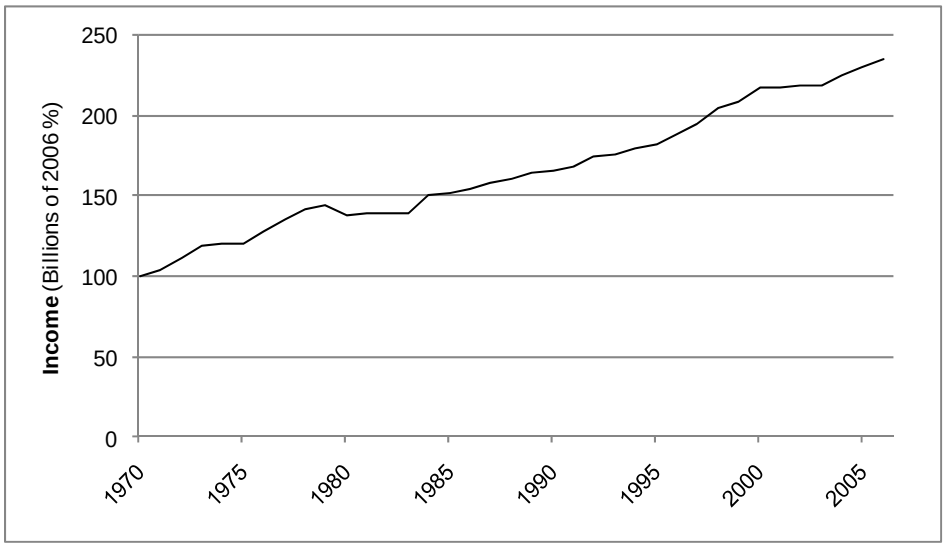
Population in the Commonwealth of Kentucky grew by 973,857 people between 1970 and 2006 to 4,204,444 in 2006, representing an annual increase of 0.7 percent. The population in the Commonwealth of Kentucky was ranked 26th compared with other U.S. states. The population of the four-county coal study area grew by 18,449 people between 1970 and 2006 to a total of 143,314 in 2006. This growth represents an annual increase of 0.4 percent. The growth rate is somewhat misleading because more recently the population of the coal study area has been in decline from its peak in 1985. The population of the coal study area is about four percent of the commonwealth's population.

The coal study area is located in a mountainous and somewhat remote portion of eastern Kentucky. Within the study area, there are a few population centers. These communities all had populations under 7,000 in 2000, which speaks to the extremely rural nature of the study area. Among them, Pikeville was the largest, with a population of 6,295.

Employment and Income

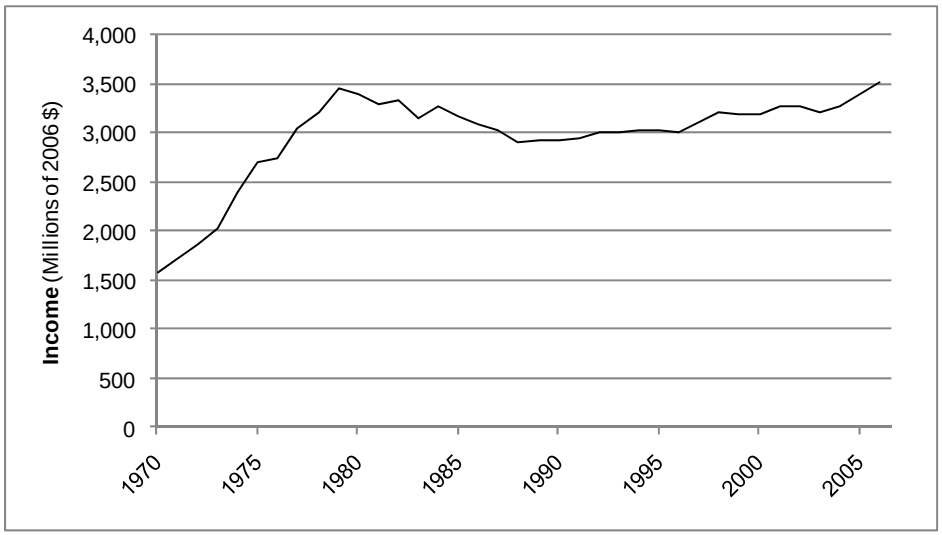
Real personal income, composed of labor earnings, investment income, and transfer payments, has grown at an annualized rate of 2.4 percent in recent years in the commonwealth. This is 0.2 percent less than the annualized personal income growth rate for the nation (2.6 percent). Figure 3-8 shows that Kentucky maintained relatively constant personal income growth from 1970 to 2006. In 2006, total personal income in Kentucky was $124,993 million, of which the coal study area's total personal income of $3,516 million comprised three percent of the commonwealth total.

Figure 3-8. Kentucky Real Personal Income, 1970 to 2006



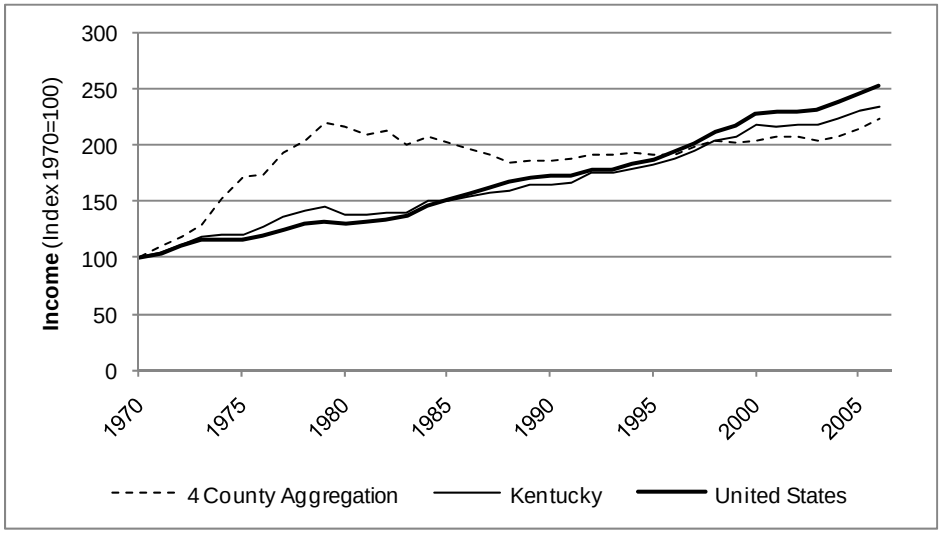
Real personal income in the coal study area increased between 1970 and 2006, with an annualized growth rate of 2.3 percent. As shown in Figure 3-9, personal income increased rapidly in the 1970s, similar to population growth, but total income growth stagnated as the population declined during the 1980s. Figure 3-10 shows that the coal study area's income growth dramatically outpaced that of Kentucky and the nation in the 1970s. However, since then, personal income for Kentucky and the nation has increased substantially, whereas personal income in the study area has stagnated.

Figure 3-9. Coal Study Area Real Personal Income, 1970 to 2006



Source: BEA REIS.

Figure 3-10. Income Growth in the Coal Study Area, Kentucky, and the United States



Source: BEA REIS.

In the Commonwealth of Kentucky, non-labor personal income, as a proportion of total income, grew from 22 to 35 percent between 1970 and 2006. New income from 1970 to 2006 was composed of 44

percent non-labor sources and 56 percent labor sources compared with 37 percent non-labor sources and 63 percent labor sources in the nation. Table 3-135 summarizes these figures.

Table 3-135. Real Labor and Non-Labor Personal Income in Kentucky

	1970	1970 Percent of Total	1995	1995 Percent of Total	2006	2006 Percent of Total	New Income 2070 -to 2006	Percent of New Income	Percent Chage. Annual Rate 2070 to 2006	Percent Chage. Annual Rate 2005 to 2006
Total Personal Income	53,148	100%	97,082	100%	124,993	100%	71,845	100.0%	2.4%	2.3%
Labor Sources	41,547	78%	63,132	65%	81,812	65%	40,265	56.0%	1.9%	2.4%
Non-Labor Sources	11,601	22%	33,950	35%	43,182	35%	31,580	44.0%	3.7%	2.2%
Dividends, Interest, and Rent	5,864	11%	16,642	17%	18,535	15%	12,672	17.6%	3.2%	1.0%
Personal Current Transfer Receipts	5,738	11%	17,308	18%	24,647	20%	18,909	26.3%	4.1%	3.3%

Notes:
1. All income in millions of 2006 dollars.
Source: BEA REIS.

In the coal study area, non-labor personal income, as a proportion of total income, grew between 1970 and 2006, from 24 to 43 percent. The new income from 1970 to 2006 was composed of 59 percent non-labor sources and 41 percent labor sources. Table 3-136 summarizes these figures.

Table 3-136. Real Labor and Non-Labor Personal Income in the Coal Study Area

	1970	1970 Percent of Total	1995	1995 Percent of Total	2006	2006 Percent of Total	New Income 2070 -to 2006	Percent of New Income	Percent Chage. Annual Rate 2070 to 2006	Percent Chage. Annual Rate 2005 to 2006
Total Personal Income	1,572	100%	3,026	100%	3,518	100%	1,946	100.0%	2.3%	1.4%
Labor Sources	1,197	76%	1,733	57%	1,996	57%	799	41.0%	1.4%	1.3%

	1970	1970 Percent of Total	1995	1995 Percent of Total	2006	2006 Percent of Total	New Income 2070 -to 2006	Percent of New Income	Percent Chage. Annual Rate 2070 to 2006	Percent Chage. Annual Rate 2005 to 2006
Non-Labor Sources	374	24%	1,293	43%	1,522	43%	1,148	59.0%	4.0%	1.5%
Dividends, Interest, and Rent	104	7%	400	13%	344	10%	239	12.3%	3.4%	-1.4%
Personal Current Transfer Receipts	270	17%	893	30%	1,178	33%	908	46.7%	4.2%	2.6%

Notes:
1. All income in millions of 2006 dollars.
2. Percentages do not add to 100 because of adjustments made by BEA, such as residence, social security, and others.

Source: BEA REIS.

Employment increased across Kentucky and in the coal study area between 1970 and 2000 (Table 3-137). The number of jobs in the coal study area grew at an average rate of 808 jobs per year, whereas the commonwealth added 33,000 jobs annually. The coal study area employment as a percentage of total commonwealth employment increased between 1970 and 1980; after 1980, the coal study area's share decreased from 3.2 percent to 2.5 percent in 2000.

Table 3-137. Employment in the Coal Study Area and Commonwealth, 1970 to 2000

Area	1970	1980	1990	2000
Study Area	33,529	53,459	54,394	57,754
Kentucky	1,336,200	1,645,891	1,918,471	2,332,023
Study Area as a Percentage of Kentucky	2.5%	3.2%	2.8%	2.5%

Source: BEA REIS, SIC Employment

From 2001 to 2006, employment grew modestly in the coal study area and in the commonwealth, two percent and six percent, respectively (see Table 3-138). The study area's share of the commonwealth's employment remained relatively constant during this period, ranging from 2.5 to 2.4 percent.

Table 3-138. Employment in the Coal Study Area and Commonwealth, 2001 to 2006

Area	2001	2002	2003	2004	2005	2006	Percentage Change 2001 to 2006
Study Area	58,424	58,124	56,948	57,127	58,794	59,586	2%
Kentucky	2,305,386	2,292,119	2,301,328	2,340,169	2,388,324	2,432,901	6%

Area	2001	2002	2003	2004	2005	2006	Percentage Change 2001 to 2006
Study Area as a Percentage of Kentucky	2.5%	2.5%	2.5%	2.4%	2.5%	2.4%	-0.1%

Source: BEA REIS, SIC Employment

Employment and Income by Industry

In Kentucky, employment for the years between 1970 and 2000 showed an increase across numerous sectors. Services and professional industries, which consists of transportation and public utilities; wholesale trade; retail trade; finance, insurance, and real estate; and health, legal, and business services, showed the greatest number of jobs and the rapidest increase in jobs. Government and manufacturing employment were second and third, respectively. Employment figures for mining (e.g., coal, oil and gas, and other minerals) declined significantly after their peak in the early 1980s. Mining accounted for 2.3 percent of total employment in the Commonwealth of Kentucky in 1970, but only one percent of the total in 2000. Construction, manufacturing, and farming and agricultural services had much lower levels of employment than the sectors mentioned above.

In the coal study area, employment between years 1970 and 2000 showed an increase across numerous sectors. Services and professional industries (e.g., transportation and public utilities, wholesale trade, retail trade, finance, insurance and real estate, and health, legal, and business services) showed the greatest number of jobs and the rapidest increase in jobs in the 1970s, 1980s, and most of the 1990s. Government and mining employment were second and third, with government jobs overtaking mining in 1995 as the second largest employee sector. Mining employment figures declined significantly after their peak in the early 1980s. Mining in 2000 accounted for 11.6 percent of employment in the study area. Construction, manufacturing, and farming and agricultural services had much lower levels of employment than the sectors mentioned above.

Census data, as summarized in Table 3-139, show more detailed information on employment by sector in 1999. The Commonwealth of Kentucky largely mirrored the nation in employment share per industry; however, a few key industries had differences. Manufacturing employment had a larger share of employment in the Commonwealth of Kentucky than in the nation, but industries (e.g., professional, scientific, and technical services) requiring advanced degrees had a larger share of employment for the nation than the Commonwealth of Kentucky.

Top employing industries in 1999 in the coal study area, as shown in Table 3-139, were healthcare, retail trade, mining, and educational services. The coal study area had a much higher percentage of employment share in mining than the Commonwealth of Kentucky or the nation, whereas the percentage share of employment for manufacturing was significantly lower in the coal study area than the Commonwealth of Kentucky or the nation. The percentage of employment related to professional, scientific, and technical services also was lower in the coal study area than in the Commonwealth of Kentucky or the nation.

Table 3-139. 1999 Employment Sector Analysis, Share of Total Employment—Coal Study Area, Commonwealth, and Nation

Industry	United States	Kentucky	Coal Study Area
Agriculture, Forestry, Fishing, and Hunting	1%	2%	1%
Mining	<1%	1%	12%
Construction	7%	7%	6%
Manufacturing	14%	18%	5%
Wholesale Trade	4%	3%	3%
Retail Trade	12%	12%	15%
Transportation and Warehousing	4%	5%	5%
Utilities	1%	1%	2%
Information	3%	2%	2%
Finance and Insurance	5%	4%	4%
Real Estate and Rental and Leasing	2%	1%	1%
Professional, Scientific, and Technical Services	6%	4%	2%
Management of Companies and Enterprises	<1%	<1%	<1%
Administrative and Support and Waste Management Services	3%	3%	2%
Educational Services	9%	9%	11%
Healthcare and Social Assistance	11%	11%	12%
Arts, Entertainment, and Recreation	2%	1%	1%
Accommodation and Food Services	6%	6%	5%
Other Services (except public administration)	5%	5%	5%
Public Administration	5%	4%	5%

Source: U.S. Census Bureau 2000.

Employment by industry since 2000 cannot be readily compared with prior years. In 2001, the BEA switched from the SIC to the NAICS to better capture new industries that did not exist when the SIC classifications were created. The employment and earnings trends by industry are separated in this analysis to avoid mixing the SIC and NAICS classifications. The trends for 1990 to 2000 use SIC, and trends from 2001 to 2006 use NAICS. Note also that although BEA estimates annual employment and earnings for counties nationwide, BEA will not show some information (e.g., total employment for an industry sector that has few companies within a particular geography) to ensure that it does not violate confidentiality for those companies.

At the commonwealth level, disclosure restrictions are not an issue. Table 3-140 provides BEA REIS data from 2001 to 2006 for the commonwealth. These data show that in 2006, Federal Government and commonwealth and local employment had the largest share in the commonwealth (15 percent), followed by (listed in decreasing importance): manufacturing, retail trade, health care and social assistance, accommodation and food services, construction, and transportation and warehousing. Kentucky mining employment comprised about one percent of commonwealth employment in 2006, although mining jobs increased by 14 percent, or 3,187 jobs, from 2001 to 2006.

Table 3-140. Kentucky Employment by Industry, 2001 and 2006

Industry	2001	2006	2006 Share of Total	Percentage Change 2001 to 2006
Farm Employment	94,626	89,897	4%	-5%
Private Employment	1,845,278	1,969,536	80%	7%
Forestry, Fishing, Related Activities	17,529	16,936	1%	-3%
Mining	23,283	26,470	1%	14%
Utilities	7,333	6,883	<1%	-6%
Construction	137,491	149,163	6%	8%
Manufacturing	299,516	268,616	13%	-10%
Wholesale Trade	78,547	83,103	3%	6%
Retail Trade	265,399	268,252	12%	1%
Transportation and Warehousing	99,143	105,720	4%	7%
Information	37,305	34,416	2%	-8%
Finance and Insurance	79,808	91,805	3%	15%
Real Estate and Rental and Leasing	56,171	72,208	2%	29%
Professional and Technical Services	91,311	101,175	4%	11%
Management of Companies and Enterprises	14,440	17,241	1%	19%
Administrative and Waste Services	106,053	131,060	5%	24%
Educational Services	30,756	35,301	1%	15%
Healthcare and Social Assistance	210,763	234,413	9%	11%
Arts, Entertainment, and Recreation	30,031	34,344	1%	14%
Accommodation and Food Services	142,582	158,909	6%	11%
Other Services, except Public Administration	117,817	133,521	5%	13%
Government and Government Enterprises	348,761	358,361	15%	3%
Federal, Civilian	36,242	37,810	2%	4%
Military	49,797	50,333	2%	1%
Commonwealth and Local	262,722	270,218	11%	3%

Industry	2001	2006	2006 Share of Total	Percentage Change 2001 to 2006
Total Employment	**2,305,386**	**2,432,901**	**100%**	**6%**

Source: BEA REIS.

Within the coal study area, BEA REIS data from 2001 to 2006 indicates undisclosed data for many industry sectors. Table 3-141 shows these data. Between 2001 and 2006, there is no information for any of the six years for forestry, fishing, mining, manufacturing, management of companies, education services, healthcare and social assistance, arts, entertainment and recreational, or accommodation and food services.

Table 3-141. Employment in the Coal Study Area, 2001 to 2006

Industry	2001	2002	2003	2004	2005	2006
Farm Employment	323	324	316	309	309	308
Private Employment	48,942	48,538	47,278	47,222	48,906	49,808
Forestry, Fishing, Related Activities	(D)	(D)	(D)	(D)	(D)	(D)
Mining	(D)	(D)	(D)	(D)	(D)	(D)
Utilities	(D)	(D)	(D)	(D)	(D)	(D)
Construction	3,555	3,481	2,702	2,940	(D)	(D)
Manufacturing	(D)	(D)	(D)	(D)	(D)	(D)
Wholesale Trade	(D)	(D)	(D)	(D)	1,753	(D)
Retail Trade	9,109	9,085	9,150	9,219	9,684	9,385
Transportation and Warehousing	(D)	(D)	2,079	2,183	2,218	2,271
Information	775	(D)	(D)	(D)	(D)	(D)
Finance and Insurance	(D)	1,799	1,835	1,653	1,704	1,763
Real estate and Rental and Leasing	(D)	(D)	(D)	1,085	1,171	1,237
Professional and Technical Services	(D)	(D)	(D)	2,096	2,232	2,249
Management of Companies and Enterprises	(D)	(D)	(D)	(D)	(D)	(D)
Administrative and Waste Services	(D)	(D)	(D)	1,961	2,218	2,526
Educational Services	(D)	(D)	(D)	(D)	(D)	(D)
Healthcare and Social Assistance	(D)	(D)	(D)	(D)	(D)	(D)
Arts, Entertainment, and Recreation	(D)	(D)	(D)	(D)	(D)	(D)
Accommodation and Food Services	(D)	(D)	(D)	(D)	(D)	(D)

Industry	2001	2002	2003	2004	2005	2006
Other Services, Except Public Administration	(D)	(D)	3,923	3,817	3,799	3,882
Government and Government Enterprises	9,095	9,199	9,275	9,520	9,519	9,410
Federal, Civilian	551	547	747	891	860	843
Military	475	479	472	448	449	455
Commonwealth and Local	7,289	7,397	7,309	7,449	7,425	7,314
Total Employment	**58,424**	**58,124**	**56,948**	**57,127**	**58,794**	**59,586**
(D): Data not available—not disclosed by BEA to protect confidentiality.						

Source: BEA REIS.

In Kentucky, real income by industry generally increased from 1970 to 2000, as summarized in Table 3-142. Leading industries over this period included services and professional sectors, non-labor sources, manufacturing government, construction, and farming and agriculture.

Table 3-142. Kentucky Personal Income by Industry and Type, 1970 and 2000

Industry	1970	Percen-tage of Total	2000	Percen-tage of Total	New Income 1970 to 2000	Percen-tage of New Income
Total Personal Income*	**58,148**	**100%**	**115,721**	**100%**	**62,573**	**100%**
Farm and Agricultural Services	2,141	4.0%	2,310	2.0%	169	0%
Farm	2,015	3.8%	1,688	1.5%	(327)	N.A.
Agricultural Services	126	0.2%	622	0.5%	496	1%
Mining	1,709	3.2%	1,668	1.4%	(41)	N.A.
Manufacturing (including forest products)	10,934	20.6%	18,156	15.7%	7,222	12%
Services and Professional	17,543	33.0%	43,856	37.9%	26,313	42%
Transportation and Public Utilities	3,225	6.1%	6,649	5.7%	3,424	5%
Wholesale Trade	2,061	3.9%	4,958	4.3%	2,897	5%
Retail Trade	4,969	9.3%	8,387	7.2%	3,418	5%
Finance, Insurance, and Real Estate	1,626	3.1%	4,851	4.2%	3,225	5%
Services (Health, Legal, Business, Other)	5,663	10.7%	19,011	16.4%	13,348	21%
Construction	3,087	5.8%	5,324	4.6%	2,237	4%

Industry	1970	Percen-tage of Total	2000	Percen-tage of Total	New Income 1970 to 2000	Percen-tage of New Income
Government	8,131	15.3%	15,170	13.1%	7,039	11%
Non-Labor Income	11,601	21.8%	39,667	34.3%	28,056	45%
Dividends, Interest, and Rent	5,864	11.0%	20,063	17.3%	14,200	23%
Transfer Payments	5,738	10.8%	19,594	16.9%	13,856	22%

Note: All income in millions of 2005 dollars
*The sum of the above categories does not add to total because of adjustments made for place of residence and personal contributions for social insurance made by the U.S. Department of Commerce.
N.A.: Not applicable

Source: BEA REIS 2006 CD Table CA05

Between 2001 and 2006, real personal income increased across the commonwealth by 13 percent (Table 3-143). Earnings in the mining sector increased by $524 million across the commonwealth, accounting for two percent of the share of personal income in the commonwealth in 2006.

Table 3-143. Personal Income in Kentucky by Industry, 2001 and 2006 (New Income in Millions of Dollars)

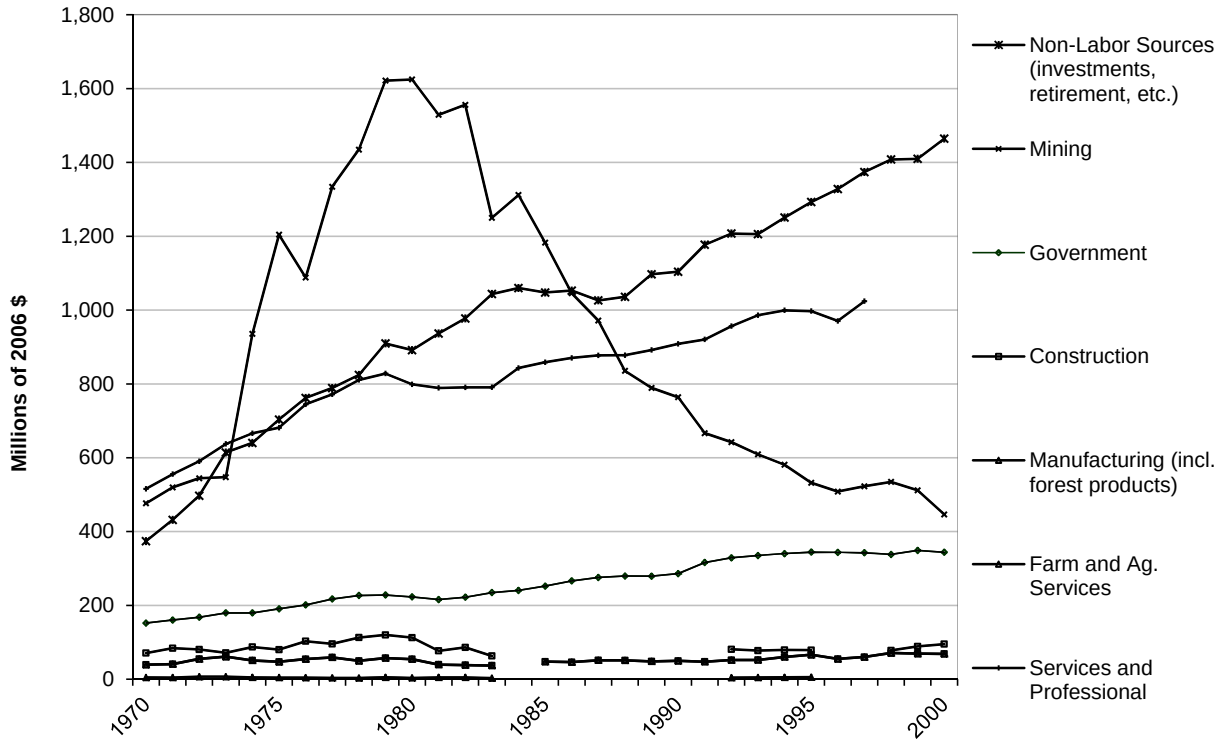
Industry	2001	2006	2006 Share of Total	New Income
Personal Income	**115,367**	**124,993**	**100%**	**9,627**
Wage and Salary Disbursements	63,537	67,929	54%	4,392
Proprietors' Income	8,326	8,875	7%	549
Farm Proprietor	797	740	1%	(57)
Nonfarm Proprietor	7,529	8,135	7%	606
Farm Earnings	1,085	1,023	1%	(62)
Nonfarm Earnings	84,810	93,604	75%	8,794
Private Earnings	69,263	74,656	60%	5,393
Forestry, Fishing, Related Activities, and Other	437	390	0%	(47)
Mining	1,626	2,150	2%	524
Utilities	643	625	0%	(19)
Construction	5,179	5,089	4%	(90)
Manufacturing	16,588	16,653	13%	64
Wholesale Trade	4,238	4,863	4%	625
Retail Trade	6,281	6,312	5%	31

Industry	2001	2006	2006 Share of Total	New Income
Transportation and Warehousing	4,896	5,208	4%	312
Information	1,704	1,550	1%	(154)
Finance and Insurance	3,723	4,834	4%	1,111
Real Estate and Rental and Leasing	1,115	1,098	1%	(17)
Professional and Technical Services	4,990	5,012	4%	21
Management of Companies and Enterprises	1,196	1,637	1%	441
Administrative and Waste Services	2,218	2,785	2%	567
Educational Services	645	736	1%	91
Healthcare and Social Assistance	8,596	9,997	8%	1,401
Arts, Entertainment, and Recreation	531	556	0%	25
Accommodation and Food Services	2,304	2,547	2%	243
Other Services, Except Public Administration	2,351	2,613	2%	262
Government and Government Enterprise	15,547	18,949	15%	3,401
Federal, Civilian	2,585	3,061	2%	476
Military	2,426	4,017	3%	1,591
Commonwealth and Local	10,536	11,871	9%	1,334
Commonwealth Government	3,884	4,335	3%	451
Local Government	6,652	7,536	6%	883

Source: BEA REIS 2006 CD Table CA05N

Within the coal study area, personal income by type in 2000 was led by non-labor sources of income, followed by services and professional sectors, mining, government, construction, manufacturing, and farming and agricultural services (Figure 3-11). In the mid-1970s to mid-1980s, mining was the most important industry for personal income in the study area; however, from the early 1980s to 2000, personal income from mining decreased substantially. Personal income by type since 2001 cannot be meaningfully portrayed for the coal study area because of data disclosure restrictions.

Figure 3-11. Coal Study Area Personal Income by Type, 1970 to 2000



Mining Employment

Table 3-144 shows an increase in mining employment in Kentucky of 15 percent between 2001 and 2007. The mining (except oil and gas) subsector accounted for 70 percent of this employment, driven by coal mining in the commonwealth. Employment in this subsector was fairly constant over this time period. Industries in the support activities for mining sector, which are likely in both oil and gas and coal mining support services, experienced employment gains of 170 percent between 2001 to 2007. In 2007, mining employment comprised slightly more than one percent of total employment in the commonwealth. The census data provided above (Table 3-139) indicate that mining employment in coal study area was much higher, employing 12 percent of workers.

Table 3-144. Mining Employment in Kentucky, 2001 to 2007

	2001	2002	2003	2004	2005	2006	2007
Total Mining	23,283	22,867	22,941	23,053	25,104	27,366	26,761
Annual Percentage Change in Employment	N.A.	-2%	0%	0%	9%	9%	-2%
Oil and Gas Extraction	3,378	3,082	3,813	3,540	3,940	4,573	4,743
Annual Percentage Change in Employment	N.A.	-9%	24%	-7%	11%	16%	4%
Mining (Except Oil and Gas)	18,689	18,204	17,282	17,422	18,615	19,891	18,731

	2001	2002	2003	2004	2005	2006	2007
Annual Percentage Change in Employment	N.A.	-3%	-5%	1%	7%	7%	-6%
Support Activities for Mining	1,216	1,581	1,846	2,091	2,549	2,902	3,287
Annual Percentage Change in Employment	N.A.	30%	17%	13%	22%	14%	13%
N.A.: Not applicable							

Source: BEA, Regional Economic Accounts, NAICS Employment

Employment in mining also creates jobs through the ripple or multiplier effect on other supporting and downstream industry sectors, such as construction, trucking and transportation, wholesale trade, processing, manufacturing, and geological engineering services. Employment also creates ripple effects from coal mining workers spending their money in the local economies, creating induced jobs in sectors such as accommodations and food services, auto dealerships, real estate, and healthcare.

In 2006, one study estimated that the Kentucky coal industry employed 17,669 miners earning more than $1 billion in wages. The industry generated $634 million in commonwealth tax revenues and created an economic impact throughout the Commonwealth of Kentucky of $10.85 billion (Kentucky Office of Energy Policy Division of Fossil Fuels and Utility Services, and the Kentucky Coal Association, Kentucky Coal Facts). It is estimated that in 2006, the economic impact of the Kentucky coal industry led to the creation of 72,960 jobs across multiple sectors of the economy, indicating a mining employment multiplier of more than four (i.e., four total jobs created for each mining job).

Average Earnings

On average across the commonwealth, the most recent highest paying job sectors are mining, Federal Government, financial activities, and manufacturing. The mining sector in 2006 accounted for 1.3 percent of employment in Kentucky and paid an average wage of $55,690. The Federal Government sector accounted for 2.1 percent of the commonwealth's employment, paying an annual average wage of $52,210. In 2006, goods-producing employees were paid an average of $43,906, whereas service-providing employees were paid an average of $31,891 annually. In general, U.S. average earnings are higher than those in Kentucky for the same occupations. Table 3-145[3] summarizes BLS commonwealth figures. Average earnings were unavailable for the study area.

Table 3-145. Kentucky Employment and Average Earning by Industry (2006$)

Industry	Employment	Percentage of Total	Average Annual Wages
Total Private and Public	**1,779,202**	**100%**	**35,201**
Total Private	**1,483,314**	**83%**	**34,922**
Goods-Producing	374,154	21%	43,906

[3] *Employment figures are inconsistent between BEA and BLS for numerous reasons. BEA employment includes all full-time and part-time employment. If one person holds multiple jobs, the number of jobs is counted. BEA employment (27,366 in mining in 2006; Table [103]) counts the number of employed (e.g., occupied) persons and not number of jobs. BLS employment (22,451 in mining in 2006; Table [105]) excludes sole proprietors or self-employed jobs.*

Industry	Employment	Percentage of Total	Average Annual Wages
Natural Resources and Mining	30,094	2%	48,789
Agriculture, Forestry, Fishing, and Hunting	7,643	0%	28,521
Mining	22,451	1%	55,690
Construction	83,184	5%	37,313
Manufacturing (Incl. Forest Products)	260,876	15%	45,445
Service Providing	1,109,161	62%	31,891
Trade, Transportation, and Utilities	375,694	21%	32,383
Information	29,707	2%	40,467
Financial Activities	89,973	5%	45,710
Professional and Business Services	178,880	10%	36,788
Education and Health Services	218,722	12%	35,838
Leisure and Hospitality	168,410	9%	(3,242)
Other Services	45,202	3%	25,051
Unclassified	2,573	0.14%	42,542
Total Public	295,888	17%	36,602
Federal Government	37,712	2%	52,210
Commonwealth Government	84,265	5%	38,931
Local Government	173,911	10%	32,089

Source: BLS, Quarterly Census of Employment and Wages

Demographic Characteristics

Age and Gender

Table 3-146 summarizes age and gender demographic statistics for Kentucky. In the Commonwealth of Kentucky, from 1990 to 2000, the median age rose from 33 to 35.9. The share of the population over 65 decreased one percent over this time period, and the Baby Boom generation (40 to 54 years) share increased from 17 percent in 1990 to 22 percent in 2000.

The coal study area age and gender profile is very similar to that of the commonwealth (Table 3-147). From 1990 to 2000, the overall population of the coal study area grew older. In 1990, the median age was 32.2, and in 2000, it was 36.8. The share of the population that was more than 65 increased one percent during this time period, and the Baby Boom generation (40 to 54 years) share increased from 18 percent in 1990 to 23 percent in 2000. For both the commonwealth and the coal study area, the 2000 male/female split was 49 percent male, 51 percent female.

Table 3-146. Kentucky Age and Gender Demographics

	Total Number	Under 20 Years		40–54 (Baby Boom in 2000)		65 Years and Over		Median Age	Density (Pop./ mi.^{2})
		Number	Share	Number	Share	Number	Share		
Total Population									
2000	4,041,769	1,113,644	28%	877,666	22%	504,793	12%	35.9	102
1990	3,685,296	1,076,776	29%	642,820	17%	466,845	13%	33.0	93
10-Year Change	356,473	36,868	-2%	234,846	4%	37,948	0%	2.9	9
10-Year Percentage Change	10%	3%		37%		8%		9%	10%
2000 Sex Breakout									
Male	1,975,368	571,598	29%	432,135	22%	203,981	10%	34.6	N.A.
Female	2,066,401	542,046	26%	445,531	22%	300,812	15%	37.1	N.A.
Male/ Female Split	49%/51%	51%/49%		49%/51%		40%/60%		N.A.	N.A.

Notes: 2000 Table SF1-P12 and 1990 SF1-P05 and P12
N.A.: Not applicable

Source: U.S. Census Bureau 1990, U.S. Census Bureau 2000.

Table 3-147. Coal Study Area Age and Gender Demographics

	Total Number	Under 20 Years		40–54 (Baby Boom in 2000)		65 Years and Over		Median Age	Density (Pop./ mi.^{2})
		Number	Share	Number	Share	Number	Share		
Total Population									
2000	147,200	39,494	27%	34,182	23%	17,796	12%	36.8	87.9
1990	151,943	48,104	32%	26,868	18%	16,575	11%	32.2	90.7
10-Year Change	(4.743)	(8,610)	-5%	7,314	6%	1,221	1%	4.6	(2.8)
10-Year Percentage Change	-3%	-18%		27%		7%		14%	-3%
2000 Sex Breakout									
Male	71,956	20,403	28%	16,883	23%	7,269	10%	35.6	N.A.

	Total Number	Under 20 Years		40–54 (Baby Boom in 2000)		65 Years and Over		Median Age	Density (Pop./
Female	75,237	19,091	25%	17,299	23%	10,527	14%	37.9	N.A.
Male/ Female Split	49%/ 51%	52%/48%		49%/51%		41%/59%		N.A.	N.A.

Notes: 2000 Table SF1-P12 and 1990 SF1-P05 and P12
N.A.: Not applicable

Source: U.S. Census Bureau 1990, U.S. Census Bureau 2000.

Ethnicity and Race

Race and ethnicity percentages in the Commonwealth of Kentucky and the coal study area were very similar. Race and ethnicity demographic information is provided in Table 3-148 for 2000. As in the commonwealth, the coal study area population was generally white (78 percent) and African American (17 percent). This compares with U.S. estimates of 66 percent white non-Hispanic, 15 percent Hispanic, and 12.8 percent African American.

Table 3-148. Population by Race in the Coal Study Area and Commonwealth, 2000

Population	Study Area	Percentage of Total	Kentucky	Percentage of Total
White	143,980	98%	3,608,013	89%
Hispanic or Latino	931	1%	59,939	1%
Black or African American	913	1%	293,639	7%
American Indian and Alaska Native	140	0%	7,939	0%
Asian	435	0%	29,368	1%
Native Hawaiian and Other Pacific Islander	57	0%	1,275	0%
Some other race	38	0%	3,846	0%
Two or more races	706	0%	37,750	1%

Source: U.S. Census Bureau

Poverty

The percentage of the population in poverty in Kentucky increased between 2000 and 2007 by nearly two percent. In 2007, Kentucky's poverty levels were 4.3 percent higher than those of the nation. Overall, the

coal study area poverty levels were significantly higher than those of the commonwealth and nation. These figures are summarized in Table 3-149. A figure for the coal study area for 2007 is unavailable.

Table 3-149. Poverty Level in the Coal Study Area, Commonwealth, and Nation

(Percentage of Population Below the Poverty Level)

	2000	2007
Kentucky	15.8%	17.3%
United States	12.4%	13.0%
Study Area	27.1%	N/A
N/A: Not available		

Source: U.S. Census Bureau.

To better understand poverty levels across the coal study area, statistics were gathered for the four-county study area in 2000. Poverty levels ranged considerably across the study area, but all counties within the coal study area had poverty levels significantly above the commonwealth and national averages. Floyd and Martin counties had more than 30 percent of residents living below the poverty line. These figures are summarized in Table 3-150.

Table 3-150. Population Below the Poverty Level, Coal Study Area Counties, 2000

Area	Percentage of Population in Poverty (2000)
Floyd	30.3%
Johnson	26.6%
Martin	37.0%
Pike	23.4%
Kentucky	15.8%
United States	12.4%

Source: U.S. Census Bureau 2000.

Household Income

Median household income decreased in Kentucky and the United States between 1999 and 2007. Kentucky figures indicate a drop of one percent over this time period, adjusted for inflation. U.S. median household income dropped at a greater rate of four percent during this time period. In 1999, the coal study area experienced a significantly lower median household income when compared with the commonwealth. No data are available for the coal study area for 2007. These figures are summarized in Table 3-151.

Table 3-151. Median Household Income in the Coal Study Area and the Commonwealth

Area	1999 (1999$)	1999 (2007$)	2007 (2007$)	Percentage Change 1999 to 2007 (2007$)
Study Area	$22,807	$27,550	N/A	N/A
Kentucky	$33,672	$40,676	$40,267	-1%
United States	$41,994	$51,938	$50,007	-4%

Source: U.S. Census Bureau; deflated with BLS, South Region Consumer Price Index

Attitudes and Beliefs

In Kentucky, BLM has control over numerous issues and decisions that could be important to stakeholders and their beliefs, including federal land disposal and mineral development (e.g., coal, oil, gas). This section describes briefly stakeholders' attitudes and beliefs related to these specific issues to provide a social context for these decisions.

Public lands are important in providing a natural resource base for economic activities. Some stakeholders (but not others) will support oil and gas as well as coal mining. Stakeholders who support mineral development believe domestic production of resources provides products on which the public relies heavily, generating economic and social benefits. Without the availability and access for developing these resources, these stakeholders believe that many adverse impacts could occur, including trade gaps, increasing prices, and strategic vulnerabilities. The mineral industries also have contributed to the tax base of counties and the commonwealth, providing funds for local, regional, and commonwealth governments, infrastructure, schools, and other community services. Many people believe that this funding is vital to the economy of Kentucky counties and the commonwealth. Some stakeholders will support these mining activities because of the economic benefits in income, jobs, and government revenues; however, others will be concerned that the economic benefit may not offset the risks to environmental and water resources resulting from the activity.

Conservation-focused stakeholders might not support mineral development or might support conditions and stipulations on development and production to reduce negative impacts on the surface and subsurface. These environmental stakeholders are concerned about wildlife habitat destruction, erosion and water quality impacts associated with road construction, and the disposal of mining overburden in the production process. Some stakeholders believe that the potential long-term environmental risks of development are considerable compared with the short-term benefit of the resource extracted. These types of stakeholders also believe that mineral development impacts (e.g., increased road building, associated road traffic, dust, and noise) add to the negative impacts associated with this type of development.

A particular source of contention is the process of coal production called mountain top removal (MTR). According to the EPA, MTR is a surface mining practice concentrated in Appalachia that involves removing mountaintops to expose coal seams and then disposing of the associated mining overburden in adjacent valleys, called "valley fills." Concerns about the impacts of MTR range from water and air pollution, to destruction of scenic landscapes, impacts on socio-economically disadvantaged communities, and loss of wildlife habitat.

Public Finance

In the Commonwealth of Kentucky, the oil and gas industry and the coal industry pay taxes on payroll, sales taxes on mining equipment and services, taxes on corporate profits, severance taxes, and property taxes on the value of the unmined minerals. According to the Kentucky Coal Association, the coal industry in Kentucky paid $221.4 million in severance taxes during FY 2006 to 2007 (FY06 to FY07) and generated total commonwealth tax revenues of $634 million. During the same FY, the Kentucky DOR collected $38.8 million in severance taxes and $19.6 million in property taxes related to oil and gas resources. When extracting resources from federal minerals, industry pays an additional mineral royalty to the Federal Government. These government revenue sources and amounts are discussed further here.

Federal Mineral Royalties

Leasable mineral production taking place on BLM-administered public lands is assessed an FMR. Underground mined coal production is assessed at eight percent of value after allowable deductions, whereas oil, gas, and surface mined coal is assessed at 12.5 percent. The Federal Government returns about 50 percent of the total royalties collected to the commonwealth in which the mineral production occurred (MMS 2009b).

As shown in Table 3-152, FMRs associated with coal production from federal lands increased almost three-fold between 2006 and 2007, and then fell 47 percent between 2007 and 2008. The commonwealth receives about half of these royalties in disbursement from the BOEMRE (formerly MMS). In 2008, this amount would have been approximately $713,074.

Table 3-152. Kentucky Federal Mineral Royalties for Coal, 2006 to 2008

	2006	2007	2008
Sales Volume (Ton)	207,197	880,324	412,897
Sales Value (Ton)	$8,450,232.28	$37,181,339.90	$20,006,957.50
Royalties from Coal	$676,018.58	$2,670,376.25	$1,426,148.50

Source: MMS includes royalties for coal, tonnage mined, and value of coal mined

Coal production does not occur currently on BLM-administered land in the coal study area or in the commonwealth. Future FMR revenues on coal projected to be mined on BLM-administered land in the coal study area are estimated in the BLM-Attributed Economic Activity Section.

As shown in Table 3-153, FMR associated with oil and gas production from federal minerals increased significantly for oil between 2006 and 2008 but fell for gas in the same period. For oil, the 2008 FMR total is $265,409 or more than 3,000 percent higher than the 2006 amount. For gas, the amount of royalties collected fell by $25,703 or 10 percent. The commonwealth receives about half of these royalties in disbursement from the BOEMRE (formerly MMS). In 2008, this amount would have been approximately $253,093 for oil and gas combined.

Table 3-153. Kentucky Federal Mineral Royalties for Oil and Gas, 2006 to 2008

	2006	2007	2008
Oil Sales Volume (Barrel)	10,904	12,151	13,860
Gas Sales Volume (mcf)	338,633	202,176	400,594

	2006	2007	2008
Oil Sales Revenue	$640,547	$650,202	$1,349,160
Gas Sales Revenue	$2,580,347	$1,419,695	$3,167,694
Oil Royalties	$7,333	$6,910	$272,742
Gas Royalties	$259,146	$111,139	$233,443

Severance and Ad Valorem Taxes

Mineral production is also subject to severance and ad valorem taxes. These taxes are paid by the industry to the commonwealth and local governments. These funds are used for schools, roads and highway improvement, and other commonwealth and local government activities.

For coal, the severance and processing tax rate in the Commonwealth of Kentucky is 4.5 percent of gross value, often with a minimum tax of 50 cents per ton. The minimum tax does not apply in the case of taxpayers who only process coal. For coal used for burning solid waste, the tax is limited to the lesser of four percent of the selling price or 50 cents per ton. Thus, the effective tax rate can vary somewhat from 4.5 percent.

Of the severance tax revenues, 50 percent is mandated to be returned to the counties where the coal was extracted. However, as of 1992, only 7.2 percent of the estimated $2.7 billion collected had been returned to counties where it was extracted, which led to changes in public sentiment regarding how severance taxes were being spent. Recently, significant public pressure has encouraged the legislature in Kentucky to develop a phased plan to bring the severance taxes returned to the counties up to the appropriate 50 percent levels (Kentuckians for the Commonwealth, www.kftc.org).

In addition to the production severance tax, an additional 4.5-percent tax is levied on the gross value of processing coal. For this tax, the processor is taxed on the final sales price, or market value in the case of consumption, reduced by the amount paid for the coal and transportation expense. According to the Kentucky Revenue Cabinet, the coal study area accumulated $70.4 million in severance and processing taxes for FY06 to FY07.

The Commonwealth of Kentucky also administers a severance or processing tax of 4.5 percent of the market value of natural gas and 4.5 percent of the market value for all other natural resources severed or processed in the commonwealth (Kentucky Legislative Code 143A.020). This tax is applicable to all taxpayers severing and/or processing natural resources in the Commonwealth of Kentucky. For oil, the processing tax is referred to as a production tax and is 4.5 percent of the market value of the oil produced. The oil production tax is imposed and attached when the crude petroleum is first transported from the tanks or other receptacle located at the place of production (Kentucky Legislative Code 137.120). From FY03–04 to FY07–08, the Commonwealth of Kentucky collected severance and processing/production taxes commonwealth-wide of more than $30.5 million for oil and $147.9 million for natural gas. Over this period, the commonwealth saw increases in severance and production taxes collected of 190 percent for oil and 47 percent for natural gas.

Property or ad valorem taxes are assessed on the taxable valuation or market value of minerals (including coal, oil and gas, and other minerals), typically determined by the millage rate, production volume, and current price of the minerals. In Kentucky, however, property taxes are collected on unmined minerals, as a result of a 1988 commonwealth supreme court ruling allowing minerals to be taxed at the same commonwealth and local tax rates as other real estate (www.coaleducation.org). The Kentucky DOR is

responsible for valuing all mineral resources. The unmined minerals tax receipts associated with coal production in the coal study area are difficult to determine at the county level and are excluded from this analysis. However, coal-based property taxes collected commonwealth-wide from FY03–04 to FY07–08 totaled $50.7 million. With respect to the commonwealth-wide socioeconomic study area for oil and gas, property taxes collected for these resources commonwealth-wide from FY03–04 to FY07–08 totaled $73.7 million.

Projected BLM-Attributed Economic Activity

With respect to coal development, BLM is projecting that beginning in 2010, two parcels of BLM-administered minerals will be leased for coal development in the Dewey Lake area of Floyd County. BLM has preliminary information that the coal production will range from 2,180,000 to 2,300,00 tons of coal annually for the first four years (beginning in 2010), and between 480,000 and 600,000 tons of coal for the remaining eight years. It is assumed that all this coal is from federal minerals; in reality, it is likely to be a mix of federal and private minerals. These figures are only preliminary because the minerals have not yet been leased.

To determine the number of jobs that can be attributed to the anticipated coal production associated with BLM-administered minerals, additional data are required, and numerous additional assumptions need to be made. In 2006, more than 37 million tons of coal were produced in the coal study area (Kentucky Office of Energy Policy Division of Fossil Fuels and Utility Services, and the Kentucky Coal Association, Kentucky Coal Facts). This amounts to roughly 29 percent of the coal produced in the Commonwealth of Kentucky. During this time period, coal mining employed 6,094 in the coal study area (Kentucky Coal Association). Thus, the current production rate per job is estimated to be 5,374 tons of coal per mining employee.

Using the current rate of 5,374 tons of coal produced per job in the study area, it can be assumed that coal production on BLM-administered minerals will generate between 426 and 428 jobs in the first 4 years of production and between 89 and 112 jobs for the remaining years of the lease. Table 3-154 below shows the projected production and employment generated from coal mining on BLM-administered minerals in the four-county study area.

Table 3-154. Estimated Annual BLM-Attributed Coal Production and Employment, 2010 to 2017

	2010	2011	2012	2013	2014	2015	2016	2017
BLM Production Low Estimate	2,180,000	2,180,000	2,180,000	2,180,000	480,000	480,000	480,000	480,000
BLM Production High Estimate	2,300,000	2,300,000	2,300,000	2,300,000	600,000	600,000	600,000	600,000
Attributed Employment Low Estimate	406	406	406	406	89	89	89	89
Attributed Employment High Estimate	428	428	428	428	112	112	112	112

	2010	2011	2012	2013	2014	2015	2016	2017

Assumes that one job is generated in coal mining employment for every 5,374 tons of coal produced

The increase in coal production related to mining BLM-administered coal also will generate additional revenue receipts for Floyd County, the commonwealth, and the U.S. Treasury. Severance taxes to be collected from the new BLM-administered production can be estimated by multiplying high and low production estimates for the BLM-administered production by the 2006 coal price of 46.68 per ton, and then multiplying the resulting gross value by the severance tax rate. As noted earlier, the nominal severance tax rate is 4.5 percent; however, the effective rate may vary because of certain minimum payment provisions and reduced tax rates. In Floyd County from FY06 to FY07, the effective rate based on gross value and actual severance taxes collected was 4.41 percent. This rate is applied here to the gross values calculated as noted above, to yield the estimates of severance taxes in Table 3-155 and Table 3-156 below.

If it is assumed that existing coal study area production levels and coal prices will remain constant at FY06 to FY07 levels, severance taxes on that production would also remain constant, at $62.4 million. (This does not include processing taxes.) Adding the new severance tax revenues to the assumed constant severance tax revenues for current study area coal production results in an estimated 7.2-percent increase in total study area severance tax receipts for the low production estimate for years 2010 to 2013, and a 7.6-percent increase for the high production estimate for the same period. For years 2014 to 2017, total severance tax collected in the study area would decline compared with the 2010 to 2013 period but would remain above 2006/2007 levels by 1.6 percent in the low estimate scenario and 2.0 percent in the high estimate scenario.

FMRs to be collected from the new BLM-administered production can be estimated by multiplying the high and the low production gross values (calculated as noted above) by the eight-percent royalty rate for coal. Between 2010 and 2013, FMRs attributed to coal production from BLM minerals would range from $8.1 million to $8.6 million depending on the amount of coal extracted. This amount would decrease to a range of $1.8 million to $2.2 million for 2014 to 2017. The Commonwealth of Kentucky would receive about 50 percent of these FMR totals. Table 3-155 and Table 3-156 provide the estimated BLM-attributed revenue receipts for the state government for these two time periods.

Table 3-155. BLM-Attributed Coal Production Commonwealth Fiscal Receipts Per Year, 2010 to 2013

Type of Payment	BLM Low Estimate	Percentage of Total	BLM High Estimate	Percentage of Total
FMR (Commonwealth's Share)	$4,070,496	48%	$4,294,560	48%
Severance Tax	$4,491,867	52%	$4,739,126	52%
Total	**$8,562,363**	**100%**	**$9,033,686**	**100%**

Assumes 2006 coal prices (Kentucky Office of Energy Policy Division of Fossil Fuels and Utility Services, and the Kentucky Coal Association, Kentucky Coal Facts) of $46.68 a ton

Table 3-156. BLM-Attributed Coal Production Commonwealth Fiscal Receipts Per Year, 2014 to 2017

Type of Payment	BLM Low Estimate	Percentage of Total	BLM High Estimate	Percentage of Total
FMR (Commonwealth's Share)	$896,256	48%	$1,120,320	48%
Severance Tax	$989,035	52%	$1,236,294	52%
Total	**$1,885,291**	**100%**	**$2,356,614**	**100%**

Assumes 2006 coal prices of $46.68 a ton (Kentucky Office of Energy Policy Division of Fossil Fuels and Utility Services, and the Kentucky Coal Association, Kentucky Coal Facts)

With respect to oil and gas development, BLM is projecting that beginning in 2010, 28 wells (nine oil and 19 gas) will be developed on BLM-administered minerals. These wells will be developed over a 10-year period. According to production and well totals from the Kentucky Geological Survey, there were 17,264 producing oil wells and 15,529 producing gas wells in the Commonwealth of Kentucky in 2007. In 2007, oil production in Kentucky was 2.6 million barrels, whereas gas production was 95.2 billion cubic feet (bcf). Based on these totals, in 2007, each oil well on average produced 149 barrels of oil (2.6 million barrels/17,264 wells), and each gas well produced 6.1 mcf (95.2 bcf/15,529 wells). Assuming that 2007 production rates per well remain constant, once 28 BLM wells are in production, they will produce on average 1,341 barrels of oil (nine wells x 149 barrels) and 117 mcf of gas (6.1 mcf x 19 wells) annually.

In 2007, total oil and gas extraction employment in Kentucky was approximately 4,743 jobs. To estimate oil and gas extraction employment related to BLM-administered wells, it must be assumed that the number of wells in production and the total oil and gas extraction employment are directly linked. Having made this assumption, the number of oil and gas jobs per well in the Commonwealth of Kentucky is calculated by dividing the total number of wells in 2007 (33,153), by the total oil and gas extraction employment in the Commonwealth of Kentucky (4,743). This calculation gives a total of 0.14 jobs in oil and gas extraction per well. Assuming that the relationship (0.14 jobs per well) between wells and oil and gas employment in 2007 remains constant, the 28 forecasted BLM-administered wells will generate an estimated four jobs in oil and gas extraction.

The rise in oil and gas production related to BLM-administered wells will generate additional revenue for the commonwealth. The market value for oil and gas produced in the Commonwealth of Kentucky from FY06 to FY07 was $137 million for oil and $726 million for gas. Severance taxes were $6.2 million for oil and $32.7 million for gas. When analyzed on a per-well basis, the severance tax collected from FY06 to FY07 amounts to $351 ($6.2 million/17,264 wells) per oil well and $2,103 ($37.2 million/15,529 wells) per gas well. Future severance tax receipts will depend on production and prices, which can be highly variable. Assuming that the severance tax collected per well in future years remains at the FY06 to FY07 level, the 28 forecasted BLM-administered wells would generate $3,156 ($351 x 9 wells) in oil severance taxes annually and $39,963 ($2,103 x 19 wells) in gas severance taxes annually.

The additional BLM wells would add to the FMRs collected in the Commonwealth of Kentucky. In FY08, the 225 federally administered wells generated $506,185 in FMRs. This total is likely to increase with the addition of 50 federally administered wells during the next 10 years. Of these 50, BLM will manage 28. If the royalties collected per well remain constant at their FY08 levels of $2,249 of FMRs collected per well ($506,185 in FMR/225 wells), FMRs collected from BLM wells would total an estimated $63,000. Of this total, 50 percent, or $31,500, would go back to the Commonwealth of

Kentucky. Table 3-157 summarizes the total revenues from oil and gas that could accrue to the commonwealth from BLM-administered wells, based on the forecasted 28 wells and the data and assumptions above.

Table 3-157. BLM-Attributed Oil and Gas Production Fiscal Receipts Per Year, for 28 Forecasted Wells

Type of Payment	BLM Estimate
FMR on Oil and Gas (Commonwealth's Share)	$31,500
Severance Tax Oil Per Year	$3,156
Severance Tax Gas Per Year	$39,963
Total	**$74,618**

Environmental Justice

EJ is a goal to be achieved for all communities so that all people will be treated fairly with respect to the development and enforcement of protective environmental laws, regulations, and policies, and potentially affected community residents are meaningfully involved in the decisions that will affect their environment and/or their health. Conversely, allegations of EJ describe situations in which communities believe that the goal has not been achieved because that there is disproportionate exposure to environmental harms and risks. These environmental harms and risks include, for example, air pollution and water quality concerns, as well as the cumulative impacts associated with living in some urban and rural areas.

The concept of EJ first became an expressed consideration with the publication of EO 12898 on February 11, 1994. This EO requires each federal agency to make achieving EJ part of its mission by "identifying and addressing…disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority and low-income populations in the United States" (EO 12898, §59 *Federal Register* 7629, 1994). The broad goal of EO 12898 is then tempered in §6-609 by the caution that "this order is intended only to improve the internal management of the executive branch and is not intended to create any right enforceable against the United States."

The EPA defines a community with potential EJ populations of concern as one that has a greater percentage of minority or low income population than an identified reference community. EPA has provided two approaches for identifying EJ populations with regard to minority status: 50-percent minority population in the affected area (EPA 1998), or whether the affected area has a significantly greater minority population than the reference area. No specific thresholds are provided for low-income or poverty populations. Because there is no consistent guidance for these indicators, some assumptions were developed specifically for this analysis. This analysis assumed that populations residing within a study area constitute an EJ community if the percentage of population in minority and/or poverty status is at least 10 percentage points higher than for the reference community. This threshold was chosen based on past experience evaluating EJ indicators and the feeling that this threshold defines a percentage that would represent a significant population difference from the reference community. Poverty threshold levels determined by the U.S. Census also were used as a proxy for low income populations in the affected area and reference community.

All four counties in the coal study area have poverty percentages exceeding 10 percent above the commonwealth's average percentages. In Martin County, more than one-third of the population lives below the poverty line. Table 3-158 shows poverty levels of all counties within the coal study area. The figures speak to the extreme poverty in eastern Kentucky. The reference population is the Commonwealth of Kentucky. Consequently, these four counties are identified as potential EJ populations of concern.

The percentage of the population in poverty for the oil and gas study area, which is the entire commonwealth, is above that for the United States. However, the percentage difference is significantly less than 10 percent. Therefore, the commonwealth-wide oil and gas study area is not identified as an EJ population of concern.

Table 3-158. EJ Indicators for the Counties Within the Coal Study Area, Kentucky, and United States

Area	Percentage of Population in Poverty (2000)
Floyd	30.3%
Johnson	26.6%
Martin	37.0%
Pike	23.4%
Kentucky	15.8%
United States	**12.4%**

Source: U.S. Census Bureau 2000.

3.18.6 Louisiana Socioeconomics

Social and Economic Features

The social and economic analysis for BLM FMO in Louisiana focuses on oil and gas development and production. These are important industries in Louisiana, and these activities on BLM-administered resources contribute to the local, state, and national economies. There are also important social values connected with these activities, in terms of both the livelihoods they provide and the concerns some stakeholders have about their environmental and other impacts.

As described below, oil and gas development is expected to be distributed across the northern and southern portions of the state; therefore, a statewide socioeconomic study area is adopted. The following material describes economic and social conditions in the study area, attitudes and beliefs of stakeholders, and the economic contributions of these activities—including tax revenues and royalty payments—that are attributable to BLM-administered resources. This section also evaluates the study area for EJ concerns.

In 2008, Louisiana ranked fourth among the states in crude oil production, behind Texas, Alaska, and California (excluding federal offshore areas, which produce more than any single state). Louisiana accounted for 4.0 percent of crude oil production in 2008 in the United States, and approximately 6.8 percent of natural gas production in the United States in 2007 (EIA 2009). In 2007, 1,363 billion cubic feet of natural gas were produced in Louisiana.

Louisiana's production in the federal outer continental shelf (OCS) continued to expand into the 21st century as new offshore technologies allowed companies to access reserves in deeper, more remote areas of the Gulf. Louisiana's OCS production reached a peak in 2002, but experts believe that large new oil deposits remain to be discovered in deepwater areas, and future exploration and production is promising. Louisiana's offshore petroleum industry was dealt a serious blow in 2005 when Hurricanes Katrina and Rita damaged offshore oil platforms and curbed production for several months.

According to the EIA, there were 20,747 producing crude oil wells in Louisiana in 2008 and 18,145 producing gas wells in 2007. These include state onshore wells and wells within three miles of the Louisiana coast (all state minerals). These state onshore and offshore oil wells accounted for 15 percent of total crude oil production in 2008 and 40 percent of total gas production in 2007, as summarized in Table 3-159.

The EIA reports that the Gulf of Mexico Federal Offshore Region produced 446,112 thousand barrels of oil; Louisiana federal offshore crude oil production accounts for about 92 percent of Gulf of Mexico production. Similarly, Gulf of Mexico gas production in 2007 was reported to be 2,813,197 mcf for gross withdrawals, of which 72 percent was associated with Louisiana federal offshore production.

Table 3-159. Louisiana Oil and Gas Production by Region

Commodity	State Onshore	State Offshore	Federal Offshore	Total Production	Percentage State
Crude Oil 2007 (BBL)	69,245,933	8,145,387	427,033,166	504,424,481	15%
Crude Oil 2008 (BBL)	64,045,366	7,998,592	325,619,550	397,663,508	18%
Natural Gas 2007 (MMcf)	1,268,006	85,912	2,022,059	3,375,977	40%
Natural Gas 2008 (MMcf)	1,260,902	88,045	1,411,700	2,760,606	49%

Source: Louisiana Department of Natural Resources.

Drilling activity on BLM-administered fluid minerals deposits is expected to occur in 22 parishes, 13 in the north and nine in the south. These parishes are listed in Table 3-160. BLM's wells represent two percent of the total number of expected wells in both the north and south. The number of current BLM-administered wells and their locations are not available. However, if it is assumed that the wells in the north are primarily gas wells and that the wells in the south are oil wells, the well development percentages can be applied to the current number of producing wells (20,747 oil wells in 2008; 18,145 gas wells in 2007) to estimate the number of producing BLM wells: 415 oil wells and 181 gas wells. These 596 BLM wells would account for approximately 1.5 percent of total producing wells in the state. In reality, there are likely fewer BLM-administered producing wells because operators avoid developing wells located on federal lands for a variety of reasons (e.g., permitting delays, additional federal royalties).

Table 3-160. Parishes With BLM-Administered Oil and Gas Well Development

Parish	10-Year Well Development
North	
Bienville	5

Parish	10-Year Well Development
Bossier	59
Caddo	30
Caldwell	10
DeSoto	10
East Carroll	20
La Salle	1
Natchitoches	10
Rapides	9
Red River	5
Richland	10
Webster	30
West Carroll	1
South	
Cameron	20
East Feliciana	4
Lafourche	25
Plaquemines	48
Saint Charles	2
Saint Helena	3
Tangipahoa	2
Washington	15
West Feliciana	1
Total	**320**

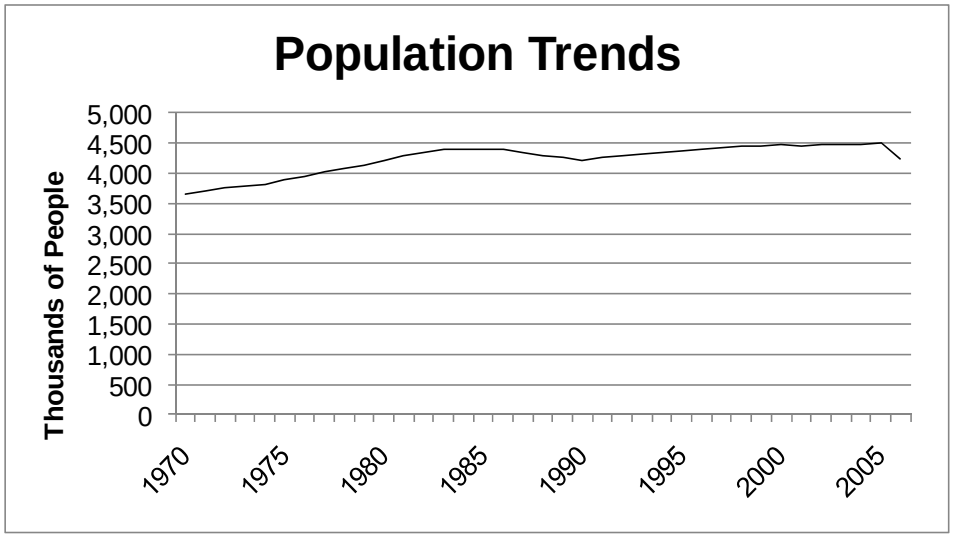
Source: BLM 2012

Because well development and BLM-administered minerals lie in the northwestern, north-central, and southwestern parishes in the state, the socioeconomic baseline discussion focuses on a state-level socioeconomic analysis.

Socioeconomic Conditions

The population in Louisiana increased by 593,079 between 1970 and 2006 to a total of 4,243,288 in 2006, an annual increase of 0.4 percent. The drastic decrease in population in 2005 was a result of Hurricane Katrina. Figure 3-12 shows the rate of growth.

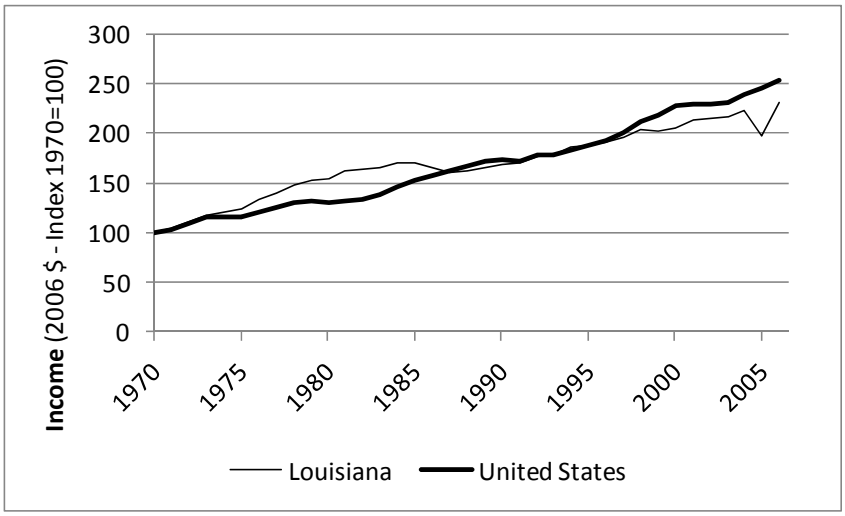
Figure 3-12. Population Trends in Louisiana



Employment and Income

Real personal income, which includes labor earnings, investment income, and transfer payments, generally increased across Louisiana between 1970 and 2006, with an annualized average growth rate of 3.5 percent, as shown in Figure 3-13. In 2006, total personal income in the state was $135,026 million in 2006 dollars, up from $58,613 million in 1970. Personal income increased at rates greater than that of the nation until the 1990s, when the state's income growth slowed relative to that of the nation. Income growth declined sharply in 2005 as a result of Hurricane Katrina.

Figure 3-13. Real Personal Income, 1970 to 2006



Non-labor sources of personal income, including transfer payments and investment income, increased between 1970 and 2007, from 22 to 33 percent, as shown in Table 3-161. In the past 36 years, non-labor sources increased at an annual average rate of 3.6 percent, outpacing labor sources, which increased at a

rate of 1.9 percent. The new income from 1970 to 2006 is composed of 42.5 percent non-labor sources and 57.5 percent labor sources.

Table 3-161. Real Labor and Non-Labor Personal Income

Type of Income	1970	1970 Percentage of Total	1995	1995 Percentage of Total	2006	2006 Percentage of Total
Total Personal Income	58,613	100%	110,503	100%	135,026	100%
Labor Sources	45,995	78%	71,783	65%	89,903	67%
Non-Labor Sources	12,618	22%	38,720	35%	45,124	33%
Dividends, Interest, and Rent	6,624	11%	17,897	16%	18,690	14%
Transfer Receipts	5,994	10%	20,822	19%	26,434	20%

Note: All income in millions of 2006 dollars.
Source: BEA REIS.

Employment has been increasing across Louisiana since 1970 (Table 3-162), although the state's job growth rate has generally been slower than that of the nation. In Louisiana, the number of jobs increased at an annual rate of 28,000 jobs, of which 72 percent were wage and salary jobs. In 1970, proprietors represented 13 percent of total employment; in 2006, they represented 19 percent. Proprietors include sole proprietorships, partnerships, and tax-exempt cooperatives.

Table 3-162. Employment in Study Area and State, 1970 to 2006

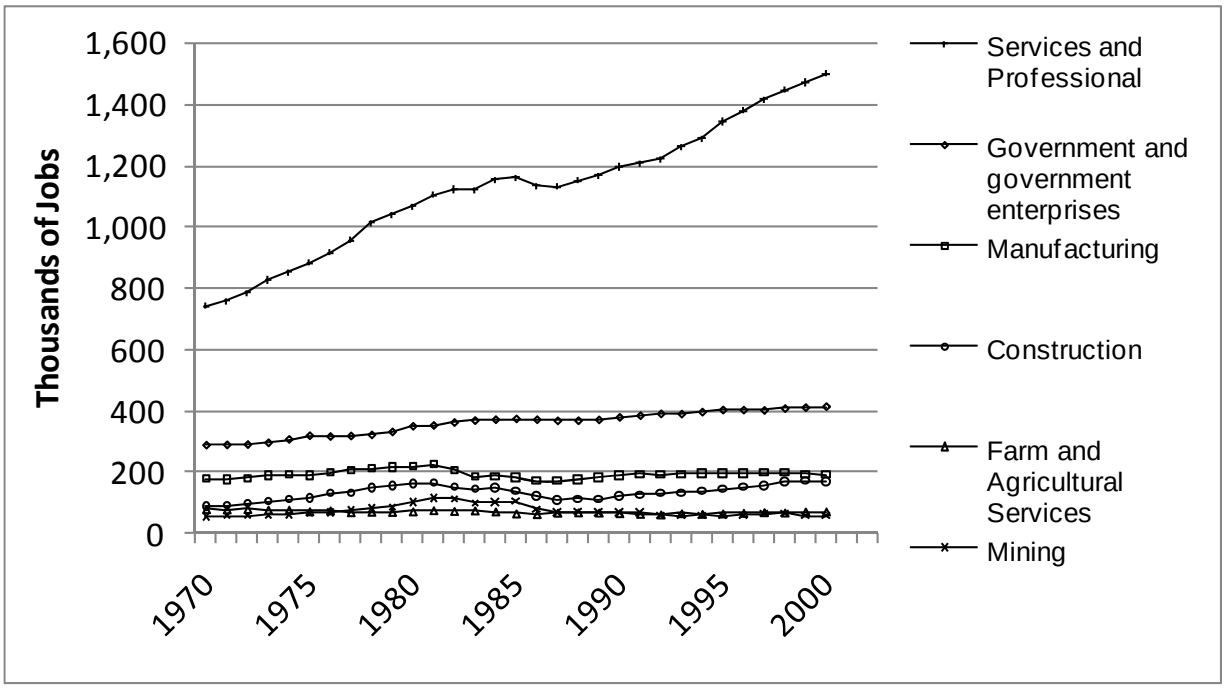
Area	1970	1995	2006	New Employment	Annual Average Rate of Job Growth
Total Employment	1,429,472	2,209,120	2,439,028	1,009,556	28,043
Wage and Salary Jobs	1,243,978	1,890,347	1,967,129	723,151	20,088
Proprietor Employment	185,494	318,773	471,899	286,405	7,956

Source: BEA, Regional Economic Accounts, SIC Employment.

Employment and Income by Industry

Employment by industry for the years between 1970 and 2000 shows increases across a number of industry sectors in the study area. Services and professional industries—which includes transportation and public utilities; wholesale trade; retail trade; finance, insurance, and real estate; and health, legal, and business services—accounted for both the largest number of jobs and the most rapid increase in jobs between 1970 and 2000. Government, manufacturing, and construction employment were the second, third, and fourth largest industries, respectively, in Louisiana. In 2000, farming/agriculture and mining (including oil and gas) employment made up 3.0 and 2.4 percent of the employment, respectively, in the state. These figures are depicted in Figure 3-14.

Figure 3-14. Employment by Industry in Louisiana, 1970 to 2000



In terms of job growth in Louisiana over this time period, there was considerable growth in agricultural services, health, legal, and business services, retail trade, and construction; job decreases occurred in farming. These employment figures are summarized in Table 3-163.

Table 3-163. Employment by Sector in Louisiana, 1970 and 2000

Employment	1970	2000	Share in 2000	Percentage Change 1970 to 2000
Total Employment	1,429,472	2,404,237	100%	68%
(Wage and Salary Employment)	1,243,978	2,033,118	84.6%	63%
(Proprietors' Employment)	185,494	371,119	15.4%	100%
Farm and Agricultural Services	78,471	71,219	3.0%	-9%
Farm	69,082	39,649	1.6%	-43%
Agricultural Services	9,389	31,570	1.3%	236%
Mining	55,659	57,441	2.4%	3%
Manufacturing (including forest products)	177,651	190,078	7.9%	7%
Services and Professional	742,405	1,501,743	62.5%	102%
Transportation and Public Utilities	100,712	135,424	5.6%	34%
Wholesale Trade	70,811	102,421	4.3%	45%
Retail Trade	211,164	407,384	16.9%	93%

Employment	1970	2000	Share in 2000	Percentage Change 1970 to 2000
Finance, Insurance, and Real Estate	70,218	148,287	6.2%	111%
Services (Health, Legal, Business, Others)	289,500	708,227	29.5%	145%
Construction	88,740	169,775	7.1%	91%
Government	286,546	413,981	17.2%	44%

Source: BEA, Regional Economic Accounts, SIC Employment.

Table 3-164 shows employment by industry in 2001 and 2006.[4] In 2006, state and local government employment had the largest share in the state (13%), followed by (listed in decreasing importance): retail trade, healthcare and social assistance, construction, manufacturing, and accommodation and food services. In 2006, Louisiana mining employment comprised more than two percent of state employment, although mining job growth decreased by five percent, or 3,000 jobs, from 2001 to 2006.

Table 3-164. Louisiana Employment by Industry, 2000 to 2006

Employment Type	2001	2006	2006 Share of Total	Percentage Change, 2001 to 2006
Farm Employment	37,436	35,706	1%	-5%
Private Employment	1,963,544	2,024,181	83%	3%
Forestry, Fishing, Related Activities	22,574	21,967	1%	-3%
Mining	58,655	55,582	2%	-5%
Utilities	10,211	9,865	0%	-3%
Construction	170,565	193,754	8%	14%
Manufacturing	178,444	159,021	7%	-11%
Wholesale Trade	83,188	80,457	3%	-3%
Retail Trade	272,071	269,734	11%	-1%
Transportation and Warehousing	91,750	93,794	4%	2%
Information	34,619	33,543	1%	-3%
Finance and Insurance	86,297	85,875	4%	0%
Real Estate and Rental and Leasing	73,859	83,179	3%	13%

4 In 2001, the BEA switched from the SIC to the NAICS to better capture new industries that did not exist when the SIC classifications were created. The employment and earnings trends by industry have been separated to avoid mixing the SIC and NAICS classifications. The trends for 1990 to 2000 use the SIC industry classification; trends from 2001 to 2006 use the NAICS classification. BEA estimates annual employment and earnings for counties and parishes nationwide.

Employment Type	2001	2006	2006 Share of Total	Percentage Change, 2001 to 2006
Professional and Technical Services	114,990	128,059	5%	11%
Management of Companies and Enterprises	23,325	22,793	1%	-2%
Administrative and Waste Services	118,110	138,065	6%	17%
Educational Services	39,689	41,742	2%	5%
Healthcare and Social Assistance	225,106	241,977	10%	7%
Arts, Entertainment, and Recreation	55,347	49,204	2%	-11%
Accommodation and Food Services	167,281	166,571	7%	0%
Other Services	137,463	148,999	6%	8%
Government and Government Enterprises	408,318	379,141	16%	-7%
Federal, Civilian	34,594	32,413	1%	-6%
Military	42,023	36,303	1%	-14%
State and Local	331,701	310,425	13%	-6%
State Government	113,097	103,816	4%	-8%
Local Government	218,604	206,609	8%	-5%
Total Employment	**2,409,298**	**2,439,028**	**100%**	**1%**

Source: BEA REIS.

In Louisiana, real income by industry increased more than 100 percent between 1970 and 2000, as summarized in Table 3-165 and depicted in Figure 3-15. The leading industries as of 2000 included health, legal, and business services (19 percent), government (13.7 percent), manufacturing (9.4 percent), and retail trade (6.7 percent).

Table 3-165. Louisiana Real Personal Income by Industry and Type, 1970 to 2000 (2005$)

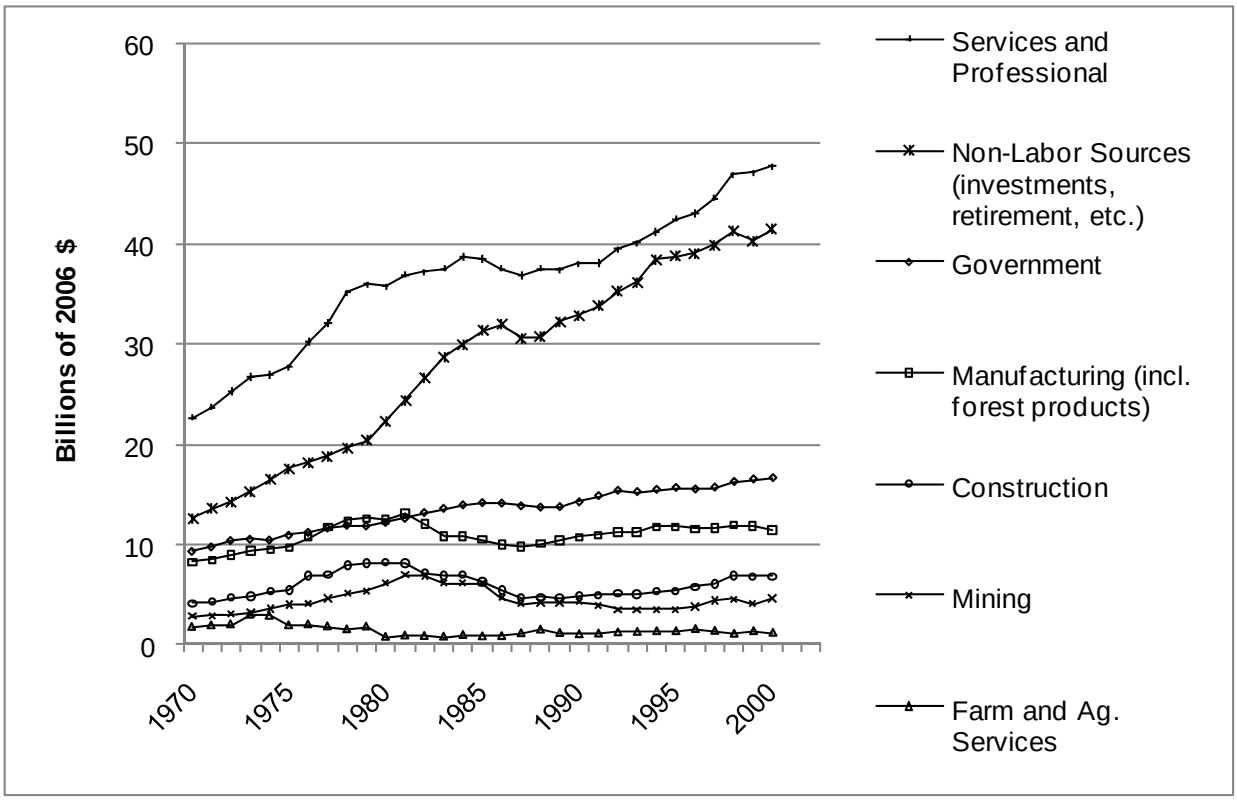
Industry	1970	Percen-tage of Total	2000	Percent-age of Total	New Income 1970 to 2000	Percent-age of New Income
Total Personal Income*	**58,613**	**100%**	**120,762**	**100%**	**62,148**	**100%**
Farm and Agricultural Services	1,748	3.0%	1,154	1.0%	(593)	N.A.
Farm	1,457	2.5%	587	0.5%	(870)	N.A.

Industry	1970	Percen-tage of Total	2000	Percent-age of Total	New Income 1970 to 2000	Percent-age of New Income
Agricultural Services	291	0.5%	567	0.5%	276	0%
Mining	2,839	4.8%	4,587	3.8%	1,748	3%
Manufacturing (including forest products)	8,275	14.1%	11,410	9.4%	3,134	5%
Services and Professional	22,663	38.7%	47,721	39.5%	25,058	40%
Transportation and Public Utilities	4,644	7.9%	7,034	5.8%	2,390	4%
Wholesale Trade	3,207	5.5%	4,809	4.0%	1,602	3%
Retail Trade	5,478	9.3%	8,109	6.7%	2,631	4%
Finance, Insurance, and Real Estate	2,147	3.7%	4,833	4.0%	2,686	4%
Services (Health, Legal, Business, Other)	7,187	12.3%	22,935	19.0%	15,748	25%
Construction	4,155	7.1%	6,843	5.7%	2,689	4%
Government	9,372	16.0%	16,575	13.7%	7,203	12%
Non-Labor Income	12,618	21.5%	41,416	34.3%	28,797	46%
Dividends, Interest, and Rent	6,624	11.3%	20,722	17.2%	14,098	23%
Transfer Payments	5,994	10.2%	20,694	17.1%	14,700	24%

Note: All figures in millions of 2005 dollars
*The sum of the above categories does not add to total because of adjustments made for place of residence and personal contributions for social insurance made by the U.S. Department of Commerce.
N.A.: Not applicable

Source: BEA REIS 2006 CD Table CA05

Figure 3-15. Louisiana Real Personal Income by Industry (2006$)



Between 2001 and 2006, real personal income increased across the state by eight percent, as shown in Table 3-166. Earnings in the mining sector increased by $655 million (13 percent) during this time period, accounting for four percent of the share of personal income in the state in 2006. Leading industries in 2006 included state and local government, manufacturing, healthcare and social assistance, construction, and professional and technical services.

Table 3-166. Personal Income in Louisiana by Industry, 2001 to 2006

Industry	2001	2006	2006 Share of Total	New Income
Personal Income	**125,509**	**135,026**	**100%**	**9,517**
Wage and Salary Disbursements	66,093	70,740	52%	4,647
Proprietors' Income	11,546	11,796	9%	250
Farm Proprietor	290	293	0%	3
Nonfarm Proprietor	11,256	11,503	9%	247
Farm Earnings	532	464	0%	(68)
Nonfarm Earnings	90,981	99,430	74%	8,448
Private Earnings	74,136	80,741	60%	6,605
Forestry, Fishing, Related Activities, and Other	614	490	0%	(124)

Industry	2001	2006	2006 Share of Total	New Income
Mining	5,020	5,675	4%	655
Utilities	931	1,078	1%	147
Construction	6,669	8,130	6%	1,461
Manufacturing	10,612	11,335	8%	723
Wholesale Trade	4,127	4,695	3%	568
Retail Trade	6,515	6,977	5%	461
Transportation and Warehousing	4,604	4,913	4%	309
Information	1,964	1,844	1%	(120)
Finance and Insurance	3,577	4,126	3%	549
Real Estate and Rental and Leasing	2,225	2,165	2%	(60)
Professional and Technical Services	6,328	6,603	5%	275
Management of Companies and Enterprises	1,401	1,436	1%	35
Administrative and Waste Services	2,608	3,648	3%	1,040
Educational Services	1,062	1,026	1%	(36)
Healthcare and Social Assistance	8,772	9,414	7%	642
Arts, Entertainment, and Recreation	1,428	1,237	1%	(190)
Accommodation and Food Services	2,762	2,937	2%	175
Other Services, Except Public Administration	2,918	3,014	2%	96
Government and Government Enterprises	16,845	18,688	14%	1,843
Federal, Civilian	2,710	2,907	2%	197
Military	1,645	2,237	2%	593
State and Local	12,490	13,544	10%	1,054
State Government	4,602	5,029	4%	427
Local Government	7,889	8,515	6%	626

Source: BEA REIS 2006 CD Table CA05N

Oil and Gas Employment

BEA REIS state data for Louisiana indicate total mining employment of 61,370, up five percent from 2001 (Table 3-167). Over the past eight years, approximately 86 to 97 percent of this mining employment has been associated with oil and gas activity. Support activities for mining, which typically comprise well development activities such as drilling, perforating, stimulating, casing wells, and others, has been responsible for about 65 to 67 percent of oil and gas employment. In 2007, mining employment comprised 2.4 percent of total employment in the state.

Table 3-167. Mining Employment in Louisiana, 2001 to 2007

	2001	2002	2003	2004	2005	2006	2007
Total Mining	58,655	54,329	55,455	51,433	52,740	57,939	61,370
Annual Percentage Change in Employment	N.A.	-7%	2%	-7%	3%	10%	6%
Oil and Gas Extraction	19,610	17,851	18,929	16,645	17,268	18,239	19,531
Annual Percentage Change in Employment	N.A.	-9%	6%	-12%	4%	6%	7%
Mining (Except Oil and Gas)	2,082	2,005	2,042	1,929	1,625	1,614	1,585
Annual Percentage Change in Employment	N.A.	-4%	2%	-6%	-16%	-1%	-2%
Support Activities for Mining	36,963	34,473	34,484	32,859	33,847	38,086	40,254
Annual Percentage Change in Employment	N.A.	-7%	0%	-5%	3%	13%	6%
Total Oil and Gas Employment (Extraction+Support)	56,573	52,324	53,413	49,504	51,115	56,325	59,785
Percentage of Oil and Gas to Total	96%	96%	96%	96%	97%	97%	97%
N.A.: Not applicable							

Source: BEA, Regional Economic Accounts, NAICS Employment.

A report by Centaur Associates (1986) estimated the economic impacts of oil and gas development in the Gulf of Mexico and found that 91 percent of the Gulf offshore employment associated with these activities reported to companies located in Louisiana. That indicates that there is considerable oil and gas employment in Louisiana associated with federal offshore production and development activities as well as with onshore oil and gas activities.

Employment in the sectors of oil and gas extraction, drilling, and support activities for mining also creates jobs through the ripple or multiplier effect on other supporting and downstream industry sectors, such as construction, trucking and transportation, wholesale trade, pipelines, refining, chemical manufacturing, geological engineering services, and others. Employment also produces ripple effects from oil and gas workers spending their money in the local economies, creating induced jobs in sectors such as accommodations and food services, auto dealerships, real estate, healthcare, and others.

Because of Louisiana's location and its involvement in both onshore and offshore oil and gas activities, there are considerable shipping and port-related businesses located in the state. Louisiana is also the

second largest refiner of petroleum, with 19 refineries. The EIA (2009, State Energy Profiles) notes a number of oil and gas related activities in Louisiana, including the following:

- The Louisiana Offshore Oil Port (LOOP) is the only port in the United States capable of accommodating deep draft tankers.
- Two of the U.S. Strategic Petroleum Reserve's four storage facilities are located in Louisiana.
- The Henry Hub is the largest centralized point for natural gas spot and futures trading in the United States, providing access to major markets throughout the country.
- The liquefied natural gas (LNG) import terminal at Lake Charles is the largest of the five existing LNG import sites in the United States.
- The Excelerate Energy Gulf Gateway Deepwater Port/Energy Bridge, which came online in 2006, is the only offshore LNG terminal in the United States and the first new LNG import facility constructed in more than 20 years.

Demographic Characteristics

Age and Gender

Since 1990, the median age of the population in Louisiana has increased. In 1990, the median age was 31.0; in 2000, it was 34.0. The portion of the population older than 65 remained relatively constant over this time period, although the Baby Boom generation (40 to 54 years old in 2000) share increased from 16 percent in 1990 to 21 percent in 2000. Interestingly, a large portion (60 percent) of the state's female population is older than 65 years. Table 3-168 summarizes the age and gender demographic information.

Table 3-168. Louisiana Age and Gender Demographics

	Total Number	Under 20 Years		40–54 (Baby Boom in 2000)		65 Years and Over		Median Age	Density (Pop./ mi.^{2})
		Number	Share	Number	Share	Number	Share		
Total Population									
2000	4,468,976	1,368,029	31%	935,109	21%	516,929	12%	34.0	102.6
1990	4,219,973	1,367,610	32%	685,589	16%	468,991	11%	31.0	96.9
10-Year Change	249,003	419	-2%	249,520	5%	47,938	0%	3.0	5.7
10-Year Percentage Change	6%	0%		36%		10%		10%	6%
2000 Sex Breakout									
Male	2,162,903	696,637	32%	455,971	21%	208,288	10%	32.6	N.A.
Female	2,306,073	671,392	29%	479,138	21%	306,641	13%	35.3	N.A.
Male/Female Split	48%/52%	51%/49%		49%/51%		40%/60%		N.A.	N.A.

Notes: 2000 Table SF1-P12 and 1990 SF1-P05 and P12
N.A.: Not applicable

Source: U.S. Census Bureau 1990, U.S. Census Bureau 2000.

Ethnicity and Race

Race and ethnicity percentages in Louisiana for 2007 are summarized in Table 3-169. In 2007, the percentage of African-Americans in Louisiana was higher than that in the nation and the percentage of Hispanics was lower than that in the nation.

Table 3-169. Population by Race in Louisiana, 2007

Population	Percentage of LA Population	Percentage of U.S. Total
White, not Hispanic	62.3%	66.0%
Black or African-American	31.9%	12.8%
American Indian and Alaska Native	0.6%	1.0%
Asian	1.4%	4.4%
Hispanic	0.9%	15.1%

Source: U.S. Census Bureau.

Poverty

The percentage of the population in poverty in Louisiana decreased from 19.6 percent in 2000 to 18.8 percent in 2007 (Table 3-170). In 2007, Louisiana's poverty levels were 5.8 percent higher than those of the nation.

Table 3-170. Poverty Level in the State and Nation

(Percentage of Population Below the Poverty Level)

	2000	2007
Louisiana	19.6%	18.8%
United States	12.4%	13.0%

Source: U.S. Census Bureau 2000.

Household Income

Real median household income, adjusted for inflation, increased only slightly in Louisiana between 1999 and 2007. During the same period, the United States experienced a decrease of four percent in household income levels. These figures are summarized in Table 3-171.

Table 3-171. Median Household Income in the State Compared With United States (2007$)

Area	1999 (1999$)	1999 (2007$)	2007 (2007$)	Percentage Change 1999 to 2007 (2007$)
Louisiana	$32,566	$40,278	$40,866	1%

Area	1999 (1999$)	1999 (2007$)	2007 (2007$)	Percentage Change 1999 to 2007 (2007$)
United States	$41,994	$51,938	$50,007	-4%

Source: U.S. Census Bureau; deflated with BLS, South Region Consumer Price Index.

Attitudes and Beliefs

BLM has control over a number of issues and decisions that could be important to stakeholders and their beliefs, including federal land disposal and mineral development, such as coal, phosphate, and oil and gas. Although BLM federal well development comprises only two percent of the projected wells in the south region and one percent in the north, these federal lands and minerals do contribute to local oil and gas operations; thus jobs, income, fiscal receipts, and potential environmental degradation of these areas can be attributed to them. This section briefly describes stakeholders' attitudes and beliefs related to oil and gas development and extraction to provide a social context for these decisions.

Public lands are important because they provide a natural resource base for economic activities. Crude oil and gas development and production will be supported by some stakeholders and not by others. Stakeholders who support oil and gas development and production believe domestic production of resources provides products on which the public relies heavily, generating economic and social benefits, including local and regional jobs, income, and gross state product. Without availability and access to develop these resources, stakeholders often feel that adverse impacts could occur, including worsening trade gaps, increasing prices, and potentially strategic vulnerabilities. In addition, the mineral industries contribute to the tax base of parishes and the state, providing funds for local, regional, and state governments, infrastructure, schools, and other community services. Many people believe that this funding is important to the economy of Louisiana parishes and the state. Some stakeholders will support these oil and gas activities based on the economic benefits (from both the direct industries and downstream supporting industries) they provide in income, jobs, and government revenues. Other stakeholders, however, will be concerned that the economic benefits may not offset the risks to environmental and water resources from those activities.

Conservation-focused stakeholders may not support oil and gas development or may support development delays and conditions and stipulations on development and production to reduce negative impacts on the surface and subsurface. These environmental stakeholders are concerned about erosion and water quality impacts associated with mining operations and reclamation. Some stakeholders believe that the potential long-term environmental risks of development are considerable compared with the short-term benefit of the resource extracted. In addition, these types of stakeholders believe that mineral development impacts such as increased road building, associated road traffic, dust and noise, add to the negative impacts associated with this type of development.

Local and state government representatives and environmental stakeholders also may be concerned about the volatility of the oil and gas industry (often driven by volatile prices) and the financial and economic sustainability risks inherent in such operations. This type of boom and bust industry is difficult to predict and makes it difficult to plan, creating challenges for local and state governments in budgeting, forecasting revenues, and planning for government expenditures for infrastructure and other social services. The boom and bust phenomenon also can exacerbate economic cycles, contributing to unemployment rates during economic downturns or recessions.

Public Finance

The oil and gas industry pays severance taxes on the value of the oil and gas extracted. When extracting the resources from federal minerals, the industry pays an additional mineral royalty to the Federal Government, which returns a portion of the money to the state. The industry also pays sales and use taxes on some services and tangible goods and property taxes on surface and subsurface equipment. These property and sales and use taxes are difficult to estimate and, therefore, are not assessed in this report. FMR and state severance tax receipts are addressed in the following sections.

Federal Mineral Royalties

Leasable mineral production on FMO is assessed an FMR. Oil and gas and surface-mined coal production is assessed at 12.5 percent of value after allowable deductions. Other mineral production is assessed at lower rates. For example, production of underground mined–coal is assessed at eight percent, and federal royalties for trona production vary from five to eight percent. The Federal Government returns approximately 50 percent of the total royalties collected to the state in which the mineral production occurred (MMS 2009b).

As shown in Table 3-172, FMRs associated with oil and gas production from FMO increased 68 percent between 2005 and 2008. This increase likely resulted from the increased gas production in the northern portion of the state.

Table 3-172 also summarizes the onshore federal oil and gas production as reported by the MMS and the total onshore production reported by the Louisiana Department of Natural Resources. Federal gas production accounted for approximately two percent of total onshore production, although in 2008 it increased to four percent of production. Federal oil production remained constant at one percent of the total onshore production. These numbers are consistent with the development figures projected in the Revised RFD: two percent of projected drilled wells are associated with federal minerals. Of those projected federal wells, 62 percent are BLM wells.

Table 3-172. Onshore Louisiana Federal Mineral Royalties, 2005 to 2008

Onshore Data	2005	2006	2007	2008	Percentage Change 2005 to 2008
Total Federal Royalties	$32,755,629	$46,767,664	$34,527,948	$55,154,866	68%
Federal Gas Production Volume (BBL)[a]	25,940,273	29,599,204	27,380,995	44,304,854	71%
Federal Oil Production Volume (BBL)[a]	494,099	414,628	428,046	445,809	-10%
Total Onshore Gas Production (MCF)[b]	1,179,323,679	1,254,331,588	1,268,005,713	1,260,901,667	7%
Total Onshore Oil Production (MCF)[b]	68,356,458	66,317,466	69,245,933	64,045,366	-6%
Federal Percent—Gas	2%	2%	2%	4%	2%

Onshore Data	2005	2006	2007	2008	Percentage Change 2005 to 2008
Federal Percent—Oil	1%	1%	1%	1%	0%

a. Source: MMS.
b. Source: Louisiana Department of National Resources.

If it is assumed that 62 percent of the FMR is attributable to BLM-administered wells; this equates to $34.2 million in 2008, approximately half of which (i.e., $21.2 million) was returned to the State of Louisiana.

Severance and Ad Valorem Taxes

Mineral production also is subject to severance taxes. In Louisiana, severance tax is levied on production of natural resources taken from land or water bottoms within the territorial boundaries of the state. The state collects no severance tax from production in federal waters in the Gulf; federal waters start three miles from the Louisiana coastline. Oil and gas severance tax collections account for almost 92 percent of all severance tax collections. Severance taxes help to fund education, healthcare, and other services. Approximately one-fifth of the severance tax, not to exceed $500,000, is remitted to the parish in which production occurs.

The mining industry is responsible for paying severance taxes on the value of production. However, because BLM owns and manages approximately 62 percent of the FMO in Louisiana, this portion of the fiscal revenue from federal resources can be attributed to BLM.

The tax rate for oil and condensate is 12.5 percent of value and accounts for more than 85 percent of the oil and condensate tax collections. There is also an incapable rate and a stripper rate for low-producing oil wells. The rate for gas for FY 2008–2009 was 28.8 cents per mcf and accounted for more than 91 percent of total gas tax collections. There are also reduced tax rates for low-pressure oil-well gas and incapable gas-well gas.

To determine the proportion of severance taxes associated with BLM-administered oil and gas production, it is assumed that BLM production is approximately 62 percent of the reported federal mineral production summarized in Table 3-172. BLM production, as shown in Table 3-173, accounted for approximately 2.2 percent of gas production and 0.4 percent of oil production in 2008. These percentages are applied to the oil and gas severance tax receipts to show the amount of severance taxes associated with BLM-administered wells. In 2008, there were $3.64 million in oil severance tax and $6.4 million in gas severance tax, a total of $10.4 million in BLM-attributed severance taxes in 2008.

Table 3-173. Onshore Louisiana Severance Taxes, 2005 to 2008

Onshore Data	2005	2006	2007	2008	Percentage Change 2005 to 2008
Oil Severance Taxes[a] (in Millions of $)	$439.0	$506.3	$529.8	$842.9	92%
Gas Severance Taxes[a] (in Millions of $)	$243.6	$331.4	$354.1	$293.7	21%

Onshore Data	2005	2006	2007	2008	Percentage Change 2005 to 2008
BLM production—Oil (BBL)	306,341	257,069	265,389	276,402	-10%
BLM production—Gas (MCF)	16,082,969	18,351,506	16,976,217	27,469,009	71%
Percentage of BLM Production—Oil	0.4%	0.4%	0.4%	0.4%	-4%
Percentage of BLM Production—Gas	1.4%	1.5%	1.3%	2.2%	60%
BLM Oil Severance Tax (in Millions of $)	$1.97	$1.96	$2.03	$3.64	85%
BLM Gas Severance Tax (in Millions of $)	$3.32	$4.85	$4.74	$6.40	93%

a. Source: Louisiana Department of National Resources.

Property or ad valorem taxes are assessed on the market value of surface and downhole equipment, but not on the assessed valuation of oil and gas production. Because of the difficulties in estimating the value of this equipment, estimates of these taxes are not presented in this report.

Projected BLM-Attributed Economic Activity

In 2007, employment related to oil and gas activities in Louisiana included approximately 59,785 jobs, comprising extraction (19,531 jobs) and support activity (40,254 jobs) sectors (BEA REIS). It is assumed that the mining support sector in Louisiana consists primarily of support services for drilling and completing oil and gas wells. The number of oil and gas workers has varied over the past five decades, although since the 1990s and 2000s, the numbers have ranged around 50,000 to 60,000 workers. Typically, changes in the level of employment mimic changes in the amount of development of wells, which is more labor-intensive than extraction of the resource. Well development often is driven by higher oil and gas prices. Between 2000 and 2007, extraction sector employment has been constant; support sector employment (i.e., development activities) increased by nine percent. Gulf of Mexico production appears to have peaked in 2002, although with new deepwater technologies emerging, there has been more development activity. In 2007, there were 15 rigs in ultra-deep water and 94 exploratory and 48 development wells.

To determine what portion of employment can be attributed to BLM-administered wells requires additional assumptions. Oil and gas employment statistics do not differentiate between offshore and onshore oil and gas activities, and there is considerable production from, and likely employment associated with, offshore operations. Louisiana accounts for the majority of Gulf offshore workers; one study estimated that in 1984, 91 percent of Gulf of Mexico offshore oil and gas workers were associated with businesses located in Louisiana (Centaur Associates 1986).

Table 3-174 summarizes the percentage of production associated with onshore oil and gas activities. For gas production, the onshore percentage increased between 2007 and 2008, from 38 to 46 percent. The increase likely was associated with the gas boom in the northern portion of the state. Oil production is dominated by federal offshore activity. To determine a total percentage of onshore production, barrels

were converted to thousands of cubic feet equivalent (MCFE) by applying a factor of six. In general, 32 percent of oil and gas production operations were associated with onshore activities.

Table 3-174. Percentage of Oil and Gas Production Associated With Onshore Louisiana Production

	2007	2008
Oil	14%	16%
Gas	38%	46%
Total Oil and Gas (MCFE)	**26%**	**32%**

Source: Louisiana Department of Natural Resources.

BLM-attributed employment calculations are shown in Table 3-175. Extraction sector and support sector employment is assumed to increase four percent annually, driven by the well projections from the revised RFD and the increased growth in these figures over the past few years. Onshore employment is estimated to be approximately 32 percent of this oil and gas employment in the state. There is uncertainty surrounding this number because there is little known about the breakdown of onshore and offshore oil and gas employment. The 32 percent figure is based on the relative percentage of onshore production compared with total onshore and offshore Louisiana production (see Table 3-174). BLM employment is driven by the projected BLM well development as a percentage of the total projected well development in the state in 2008 (BLM 2012), which is 1.5 percent. The analysis suggests that a total of 287 and 427 jobs can be attributed to BLM oil and gas activities in 2007 and 2017, respectively.

Table 3-175. Estimated Annual BLM-Attributed Oil and Gas Jobs, 2007 to 2017

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
State Extraction	19,531	20,291	21,080	21,900	22,752	23,637	24,557	25,512	26,505	27,536	28,607
State Support	40,254	41,916	43,646	45,447	47,323	49,277	51,311	53,429	55,634	57,930	60,322
Onshore Extraction (32%)	6,250	6,493	6,746	7,008	7,281	7,564	7,858	8,164	8,482	8,811	9,154
Onshore Support (32%)	12,881	13,413	13,967	14,543	15,143	15,769	16,419	17,097	17,803	18,538	19,303
Total Onshore Jobs	19,131	19,906	20,712	21,551	22,424	23,332	24,278	25,261	26,284	27,349	28,457
BLM Percentage (1.5%)	287	299	311	323	336	350	364	379	394	410	427
Producing Wells	38,892	40,405	41,918	43,431	44,944	46,457	47,970	49,483	50,996	52,509	54,022
Total Well Development Projection	-	1,513	1,513	1,513	1,513	1,513	1,513	1,513	1,513	1,513	1,513
BLM Developed Wells	596 (Prod)	21	21	21	21	21	21	21	21	21	21

Assumes 4 percent annual increase in jobs in the extraction sector and mining support sector. Assumes BLM wells are 1.5 percent of operating or producing wells in the state.

Over the next 10 years, it is assumed that both the severance taxes and the FMR will increase at a rate of four percent annually based on development figures (BLM 2012). Over the past few years, the rate of increase in these revenues has been much higher than that, driven by higher prices and increasing production. Actual values were used for 2007 and 2008.

Table 3-176 summarizes these calculations for the period 2007 to 2017. FMR accounts for approximately 77 percent of revenue receipts. Approximately one-half of the FMR funds will be returned to Louisiana. Over this 10-year period, these revenue receipts are estimated to be $560 million associated with federal non–USFS production.

Ad valorem and sales and use taxes attributable to BLM-administered minerals were not estimated for this analysis.

Table 3-176. Project Tax Receipts Association with BLM Oil and Gas Production in Louisiana (Millions)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Totals
BLM-Attributed Severance Tax	$6.77	$10.04	$10.44	$10.85	$11.29	$11.74	$12.21	$12.70	$13.21	$13.74	$14.28	$127.26
BLM-Attributed FMR	$21.41	$34.20	$35.56	$36.99	$38.47	$40.00	$41.60	$43.27	$45.00	$46.80	$48.67	$431.97
Total Severance Tax and FMR	$28.18	$44.23	$46.00	$47.84	$49.76	$51.75	$53.82	$55.97	$58.21	$60.53	$62.96	$559.24

Environmental Justice

EJ is a goal to be achieved for all communities so that all people are treated fairly with respect to the development and enforcement of protective environmental laws, regulations, and policies and potentially affected community residents are meaningfully involved in the decisions that will affect their environment and/or their health. Conversely, allegations of environmental injustice describe the situations where communities believe that the goal has not been achieved because there is disproportionate exposure to environmental harms and risks. These environmental harms and risks include, for example, air pollution, water quality concerns, and the cumulative impacts associated with living in some urban and rural areas.

The concept of EJ first became an expressed consideration with the publication of EO 12898 on February 11, 1994. EO 12898 requires each federal agency to make achieving EJ part of its mission by "identifying and addressing…disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority and low-income populations in the United States" (EO 12898, §59 *Federal Register* 7629, 1994). The broad goal of EO 12898 is then tempered in §6-609 by the caution that "this order is intended only to improve the internal management of the executive branch and is not intended to create any right enforceable against the United States."

The EPA defines a community with potential EJ populations of concern as one that has a greater percentage of minority or low-income populations than an identified reference community. EPA provides two approaches for identifying EJ populations with regard to minority status: 50 percent minority population in the affected area (EPA 1998) or whether the affected area has a significantly greater minority population than the reference area. There are no specific thresholds provided for low-income or poverty populations. Because there is no consistent guidance for these indicators, some assumptions were developed specifically for this analysis. This analysis assumed that populations residing within a study area constitute an EJ community if the percentage of the population in minority and/or poverty status is at least 10 percentage points higher than for the reference community. This threshold was chosen based on experience evaluating EJ indicators and the feeling that this threshold defines a percentage that would represent a significant population difference from the reference community. In addition, poverty threshold levels determined by the U.S. Census were used as a proxy for low-income populations in the affected area and in the reference community.

There are three parishes in which BLM well development is anticipated over the next 10 years that also have minority race percentages that are 10 percent or more above the state's average percentages (Table 3-177). There are no parishes with BLM-anticipated well development that have poverty rates more than 10 percent above the state's average. However, Bienville, Caddo, and Red River parishes have higher percentages of African-American populations, respectively, 42.8, 47.8, and 42.4 percent, compared with the state average of 31.9 percent. For these reasons, these three parishes are identified as potential EJ populations of concern.

Table 3-177. Environmental Justice Indicators for Selected Parishes Within Louisiana With BLM Well Development Anticipated

	Percentage Below Poverty (2000)	Percentage of African-American Population (2000)
Bienville	25.5%	42.8%
Caddo	22.8%	47.2%

	Percentage Below Poverty (2000)	Percentage of African-American Population (2000)
Red River	23.2%	42.4%
Louisiana	**19.6%**	**31.0%**

Source: U.S. Census Bureau 2000.

3.18.7 Tennessee Socioeconomics

According to the Tennessee Oil and Gas RFD scenario, two new oil and gas wells are projected in the state over the 10-year planning period. The social and economic impacts associated with this small amount of development are negligible compared with the state social and economic situation. Therefore, a social and economic analysis was not prepared for Tennessee FMO.

3.18.8 Virginia Socioeconomics

Social and Economic Features

The social and economic analysis for BLM FMO in the Commonwealth of Virginia focuses on oil and gas development and production. These are important industries in Virginia, and these activities on BLM-administered resources contribute to the local, commonwealth, and national economies. Important social values are also connected with these activities in terms of both the livelihoods provided and the concerns some stakeholders have about the environmental and other impacts of these activities.

The Commonwealth of Virginia ranked 16th among states for natural gas production and provided less than one percent of U.S. gas production in 2008 (EIA 2008). Virginia's natural gas production is minor but enough to supply a substantial share of commonwealth demand (EIA 2009b). Virginia produces both conventional natural gas and CBNG in the Central Appalachian Basin, which covers the commonwealth's western panhandle. Most of Virginia's natural gas production comes from CBNG fields, two of which are among the 100 largest natural gas fields in the United States.

Gas production in the commonwealth has shown an upward trend since 1980, increasing 277 percent between 1993 and 2006. The increase was related to growth in CBNG production, which reached a record yearly total of 81.4 bcf in 2006, while conventional gas production rate has remained relatively flat in the past 11 years. The productive areas of conventional and CBNG overlap in the Appalachian Plateau Province of the commonwealth. The vast majority (94 percent) of the gas production in the Commonwealth of Virginia occurs in Buchanan, Dickenson, Russell, and Wise counties. As in gas extraction, oil extraction in Virginia also occurs largely on the southwestern region of the commonwealth. Oil production is very limited in Virginia, and only three wells are currently operating.

Table 3-178 shows projected gas well development over the next 10 years according to BLM (2012). BLM-administered gas wells are projected to increase over the next 10 years, with activity in two counties in southwestern Virginia. The revised RFD projects 2.1 BLM-administered wells developed annually (21 over 10 years), or one percent of the study area well development. The actual rate of development is uncertain and is driven by a number of factors that BLM does not control (e.g., natural gas prices, drilling technologies, industry locational preference, and avoidance of accessing federal minerals and surface).

Table 3-178. Counties With Occurrence of BLM Estimated Oil and Gas Development and Associated Well Development Projections Over 10 Years

County	Total Forecast Wells	Forecast USFS Wells	Forecast Other Federal Wells
Wise	112	20	0
Tazewell	438	0	0
Russell	488	0	0
Montgomery	1	0	1
Lee	10	1	0
Dickenson	1,263	40	20
Buchanan	1,818	0	0
Commonwealth Total	**4,130**	**61**	**21**

Source: BLM 2012.

Projected BLM 10-year well development is located in two counties. The 20 wells in Dickenson County are included in this BLM socioeconomic study area, along with three additional counties. These three additional counties were included because of their proximity to BLM well development and their relatively high mining employment figures. The figures indicate that these counties likely house workers that will support BLM oil and gas development and operations. Together Buchanan, Dickenson, Russell, and Wise counties account for 94 percent of the gas production in the Commonwealth of Virginia.

Socioeconomic Conditions

Population

On average, all of the counties in the study area are less densely populated than the Commonwealth of Virginia. Dickenson County is the smallest by land area and has the fewest persons per square mile. Wise County has the largest population at 43,820 and highest population density at 106.6 persons per square mile. Included in the Wise County population totals is Norton, Virginia, which is an independent city within the borders of Wise County. Table 3-179 summarizes the population and land area data.

Table 3-179. Population and Land Area

Area	Land Area (Square Miles)	Population 2008 Estimate	Population per Square Mile
Buchanan	504	31,333	62.2
Dickenson	332	16,405	49.4
Russell	475	28,667	60.4
Wise	411	43,820	106.6

Area	Land Area (Square Miles)	Population 2008 Estimate	Population per Square Mile
Study Area	**1,722**	**122,233**	**71.0**
Virginia	**39,594**	**7,769,089**	**196.2**

Source: U.S. Census Bureau 2000.

The population in the study area experienced a small increase (two percent) between 2000 and 2008, which is significantly lower than the commonwealth's average. During this same time period, Buchanan County experienced the highest rate of population growth, with an increase of 16 percent, while Russell County experienced a population decrease of five percent. Population growth in the study area from 1990 to 2008 was constant at two percent, but it varied significantly among counties.

Employment and Income

Nominal personal income, comprising labor earnings, investment income, and transfer payments, increased across the study area between 2000 and 2006 at a slower rate than the Commonwealth of Virginia, as Table 3-180 shows. However, if inflation or cost of living increases are removed from these personal income figures, the real person income growth was much less (Table 3-181). If fact, Buchanan County experienced negative personal income growth of 0.2 percent over this time period. The other counties and the study area ranged from three percent to 16 percent real income growth between 2001 and 2006. The Commonwealth of Virginia experienced real personal income growth of 17 percent during this time period.

Table 3-180. Nominal Personal Income, 2001–2006

	2001	2002	2003	2004	2005	2006	Percentage Change 2001 to 2006
Buchanan	$541,382	$543,575	$554,076	$548,068	$555,302	$594,273	10%
Dickenson	$290,364	$296,046	$301,733	$311,681	$335,154	$352,283	21%
Russell	$571,557	$574,851	$590,256	$594,331	$626,471	$648,089	13%
Wise	$898,114	$928,735	$972,482	$1,034,560	$1,086,218	$1,149,432	28%
Study Area	**$2,301,417**	**$2,343,207**	**$2,418,547**	**$2,488,640**	**$2,603,145**	**$2,744,077**	**19%**
Virginia	**$233,770,486**	**$240,533,600**	**$250,605,455**	**$267,520,630**	**$286,946,610**	**$302,098,188**	**29%**

Source: BEA REIS.

Table 3-181. Real Personal Income, 2001–2006 (2006$)

	2001	2002	2003	2004	2005	2006	Percentage Change 2001 to 2006
Buchanan	$595,580	$587,077	$587,879	$570,132	$566,173	$594,273	-0.2%

	2001	2002	2003	2004	2005	2006	Percentage Change 2001 to 2006
Dickenso n	$319,432	$319,739	$320,141	$324,229	$341,715	$352,283	10%
Russell	$628,776	$620,856	$626,266	$618,258	$638,735	$648,089	3%
Wise	$988,024	$1,003,062	$1,031,811	$1,076,209	$1,107,482	$1,149,432	16%
Study Area	**$2,531,812**	**$2,530,734**	**$2,566,098**	**$2,588,828**	**$2,654,104**	**$2,744,077**	**8%**
Virginia	**$257,173,252**	**$259,783,562**	**$265,894,382**	**$278,290,471**	**$292,563,836**	**$302,098,188**	**17%**

Source: BEA REIS, Inflated with 2006 DOD Greenbook Gross Domestic Product (GDP) Index.

Personal income comprises earnings, investment income, and transfer payments. To understand the relative importance of these components, they were compared from 2001 to 2006. In the study area, earnings comprised between 61 to 66 percent of total personal income over this time period. It is important to note the significant portion of income that comprised transfer payments. Transfer payments are government payments to individuals for retirement and disability insurance benefits, medical payments (mainly Medicare and Medicaid), income maintenance benefits, unemployment insurance benefits, veterans' benefits, and federal grants and loans to students. Investment income decreased dramatically during this time period, while earnings increased as a portion of total personal income. Table 3-182 summarizes these income figures.

Table 3-182. Components of Personal Income in Study Area (in Thousands of 2006$)

Area	2001	2002	2003	2004	2005	2006	Percentage Change 2001 to 2006
Earnings	$1,554,041	$1,570,044	$1,595,938	$1,696,134	$1,774,085	$1,809,853	16%
Investment Income	$400,608	$367,566	$353,935	$287,367	$243,169	$248,462	-38%
Transfer Payments	$838,547	$853,554	$877,343	$884,229	$931,719	$984,365	17%
Total Personal Income	$2,531,812	$2,530,734	$2,566,098	$2,588,828	$2,654,104	$2,744,077	8%
Percentage Earnings of Personal Income	61%	62%	62%	66%	67%	66%	5%
Percentage Investment Income of Personal Income	16%	15%	14%	11%	9%	9%	-7%

Source: BEA REIS.

Employment has been increasing across Virginia and in the study area generally since 2001 (Table 3-183). Dickenson County experienced the largest increases in employment during this time period (10 %); however, Buchanan County experienced a one percent decline in employment during this time period. Across the study area, employment has been growing at slightly lower rates (5 %) than those of the commonwealth (9 %). Since 1980, employment in the study area has decreased by three percent, while the Commonwealth of Virginia's employment has grown by 73 percent.

Table 3-183. Employment, 2001 to 2006

	2001	2002	2003	2004	2005	2006	Percentage Change 2001 to 2006
Buchanan	10,510	10,075	9,948	10,112	10,268	10,450	-1%
Dickenson	4,601	4,751	4,584	4,607	4,847	5,075	10%
Russell	11,830	11,476	11,891	11,942	12,245	12,107	2%
Wise	20,599	21,637	21,778	21,984	22,153	22,230	8%
Study Area	**47,540**	**47,939**	**48,201**	**48,645**	**49,513**	**49,862**	**5%**
Virginia	**4,439,053**	**4,440,021**	**4,497,878**	**4,633,650**	**4,754,318**	**4,859,015**	**9%**

Source: BEA REIS.

Employment and Earnings by Industry

The primary employing industries in the commonwealth are (listed in decreasing importance): government and government enterprises; retail trade; professional, scientific, and technical services; healthcare and social assistance; construction; and accommodations and food services. Between 2001 and 2006, employment in these industries grew by 18, 7, 21, 15, 22, and 14 percent, respectively. Other notable industry employment growth percentage changes over this period include a 47-percent increase in real estate and leasing services, and a 25-percent increase in private educational services. Manufacturing and information sectors' employment decreased during this period—15 and 19 percent, respectively.

Analyzing study area employment by industry is difficult because of the number of industries for which employment data are not released because of propriety disclosure issues. This speaks to the small aggregate population of the study area as well as the limited number of firms providing services in most industries. Of the industries where employment data was disclosed for 2001 and 2006, construction experienced the largest increase (18%), while manufacturing experienced the largest decrease (22%).

Real earnings by industry have been generally increasing in Virginia. Leading industries include government, professional and technical services, manufacturing, healthcare and social assistance, retail trade, and construction.

In the study area, limited federal data exists for the majority of industries because a limited number of companies provide this information. From pieces of earnings data, the leading industries in terms of total labor earnings paid to workers in these areas include (in decreasing importance) government, mining, retail trade, manufacturing, and construction (BEA REIS).

Mining Employment

To better understand the mining employment (includes oil and gas) situation across the study area, data are provided in this sector for the four county areas, as Table 3-184 shows. Where data was not available, a (D) is listed. Mining employment fluctuated significantly throughout the study area from 2001 to 2006. All counties in the study area experienced a decrease in mining employment in 2002 and 2003, followed by an increase in mining employment in 2004. Wise County contains the largest amount of mining employment, but Dickenson and Russell counties experienced the highest percentage growth from 2001 to 2006 at 48 percent and 33 percent, respectively.

Table 3-184. Mining Employment in the Study Area, 2001 to 2006

	2001	2002	2003	2004	2005	2006
Buchanan	1,985	1,784	1,605	1,608	1,793	1,918
Dickenson	511	463	403	380	610	756
Russell	384	361	312	386	436	512
Wise	2,816	2,542	2,424	2,537	(D)	(D)
Study Area	**5,696**	**5,150**	**4,744**	**4,911**	**(D)**	**(D)**
Virginia	**11,927**	**11,124**	**11,157**	**10,967**	**11,651**	**12,225**
(D): Data not available—not disclosed by BEA in order to protect confidentiality.						

Source: BEA REIS.

Demographic Characteristics

Age

Between 1990 and 2000, the Commonwealth of Virginia experienced a decrease in the percentage of the population under 18. This decrease is even more pronounced in the study area, where the percentage of the population under 18 dropped from 34 percent to 22 percent. All of the counties in the study area experienced a decrease in the percentage of residents under 18, but Buchannan and Dickenson counties experienced the largest decrease.

In the Commonwealth of Virginia, as well as the study area, the percentage of residents over the age of 65 years decreased since 1990. As a whole, the study area had a higher percentage of residents over 65 in 2000, at 13 percent of the total population.

Ethnicity and Race

The populations in the study area are less racially diverse than those in the Commonwealth of Virginia (Table 3-185). Between 1990 and 2000, small amounts of growth in minority populations in the study area occurred, but white residents still comprise the vast majority of the population in the study area.

Table 3-185. Race by Study Area and Commonwealth 1990 and 2000

	White	African-American	Hispanic, Non-White
Buchanan			
1990	99%	0%	1%
2000	96%	3%	0%
Dickenson			
1990	99%	0%	0%
2000	99%	0%	0%
Russell			
1990	99%	1%	0%
2000	96%	3%	1%
Wise			
1990	98%	2%	0%
2000	96%	2%	1%
Virginia			
1990	76%	19%	3%
2000	70%	19%	5%

Source: U.S. Census Bureau 1990, U.S. Census Bureau 2000.

Poverty

The rates of poverty have generally increased across the study area and across Virginia as well. The exception has been Russell County, where poverty rates actually decreased between 1990 and 2000 by two percent. All of the counties in the study area had poverty levels significantly higher than those in the Commonwealth of Virginia. Buchanan County had the highest percentage of residents living below the poverty level, at 30 percent. Table 3-186 depicts these poverty figures.

Table 3-186. Poverty Levels in the Study Area and in the Commonwealth

	1990	2000
Buchanan	22%	30%
Dickenson	26%	27%
Russell	22%	20%
Wise	22%	25%
Virginia	10%	11%
Percentage of Population Below the Poverty Level.		

Source: U.S. Census Bureau.

Household Income

Median household income varies across the study area, with the highest levels in Russell County and the lowest levels in Buchanan County. All of the counties in the study area have household income levels that are less than those of the Commonwealth of Virginia. Buchanan County is the only county that experienced a decrease in household income from 1990 to 2000. Table 3-187 summarizes these figures.

Table 3-187. Median Household Income in the Study Area and in the Commonwealth (2006$)

	1990	2000	Percentage Change 1990 to 2006
Buchanan	$28,534	$25,520	-11%
Dickenson	$23,418	$26,920	15%
Russell	$25,662	$30,830	20%
Wise	$28,164	$30,043	7%
Virginia	$47,906	$53,627	12%

Source: U.S. Census Bureau.

Housing Values

Real housing values have been highest in Russell County, followed by Wise, Dickenson, and Buchanan counties. Between 1990 and 2000, values increased the most in Russell and Wise counties, while Buchanan County experienced only a slight increase. Table 3-188 summarizes these figures,

Table 3-188. Real Median Housing Values in the Study Area and in the Commonwealth (2006$)

	1990	2000	Percentage Change 1990–2000
Buchanan	$60,946	$63,649	4%
Dickenson	$57,065	$64,223	13%
Russell	$66,120	$80,193	21%
Wise	$62,671	$75,483	20%
Virginia	$129,941	$144,072	11%

Source: U.S. Census Bureau.

Attitudes and Beliefs

BLM has control over a number of issues and decisions that could be important to stakeholders and their beliefs, including federal land disposal and mineral development, such as coal, phosphate, and oil and gas. Although BLM federal mineral leases comprise less than one percent of the projected gas wells in this region, these federal lands and minerals do contribute to local oil and gas operations and thus jobs,

income, fiscal receipts, and potential environmental degradation of these areas can be attributed to them. This section briefly describes stakeholders' attitudes and beliefs related to oil and gas development and extraction to provide a social context for these decisions.

Public lands are important in providing a natural resource base for economic activities. Some stakeholders will support gas development and production and some will not. Stakeholders who support gas development and production believe domestic production of resources provides products on which the public relies heavily, generating economic and social benefits, including local and regional jobs, income, and gross state product. Without the availability and development access of these resources, stakeholders often feel that many adverse impacts could occur, including worsening trade gaps, increasing prices, and potentially strategic vulnerabilities. In addition, the mineral industries have contributed to the tax base of counties and the commonwealth, providing funds for local, regional, and commonwealth governments; infrastructure; schools; and other community services. Many people believe this funding is important to the economy of Virginia counties and the commonwealth. Some stakeholders will support these oil and gas activities because of the economic benefits (from both the direct industries and downstream supporting industries) to income, jobs, and government revenues; others will be concerned that the economic benefit may not offset the risks to environmental and water resources from the activity.

Conservation-focused stakeholders may not support oil and gas development or may support development delays and conditions, as well as stipulations on development and production, to reduce negative impacts on the surface and subsurface. These environmental stakeholders are concerned about erosion and water quality impacts associated with mining operations and reclamation. Some stakeholders believe that the potential long-term environmental risks of development are considerable compared with the short-term benefit of the resource extracted. In addition, these types of stakeholders believe mineral development impacts, such as increased road building, associated road traffic, dust, and noise, add to the negative impacts associated with this type of development.

Local and commonwealth government representatives and environmental stakeholders may also be concerned about the volatility of the oil and gas industry (often driven by volatile prices) and the financial and economic sustainability risks inherent in such operations. This type of boom and bust industry is often difficult to predict and plan for, creating challenges for local and commonwealth governments in budgeting, forecasting revenues, and planning for government expenditures for infrastructure and other social services. The boom and bust phenomenon can also exacerbate economic cycles, contributing to unemployment rates during economic downturns or recessions.

Public Finance

In the Commonwealth of Virginia, the oil and gas industry pays taxes on payroll, sales taxes on mining equipment, taxes on corporate profits, and severance and property taxes on the value of the oil and gas extracted. The industry pays severance and ad valorem taxes to the commonwealth and local governments. These funds are used for schools, roads, highway improvement, and other commonwealth and local government activities. When extracting the resources from federal minerals, the industry pays an additional mineral royalty to the Federal Government. The industry pays FMRs associated with production from federal minerals to the BOEMRE (formerly MMS).

Federal Mineral Royalties

Leasable mineral production taking place on BLM-administered public lands is assessed an FMR. Oil and gas and surface-mined coal production are assessed at 12.5 percent of value after allowable deductions. Other mineral production is assessed at lower rates. The Federal Government returns approximately 50 percent of the total royalties collected to the commonwealth in which the mineral production occurred

(MMS 2009b). As Table 3-189 shows, FMR associated with oil and gas production from federal minerals in Virginia decreased by 24 percent between 2006 and 2008. This change in FMR collected was the result of both a decrease in production and a decrease in the price per mcf of gas during this period.

Table 3-189 separates the FMR into production-based royalties, which are typically ongoing taxes based on production levels, and bonuses or bonus bids, which are lump sum payments to the Federal Government for the private leasing of federal minerals. In 2006 and 2007, Virginia did not receive any FMRs related to bonus payments. In 2008, the commonwealth received $136,015 in FMR bonuses, which was 40 percent of the FMR collected during this time period.

The states typically receive approximately half of these royalties in disbursement from the BOEMRE (formerly MMS). In 2008, this total would have amounted to approximately $236,112. The volume of gas production from federal minerals in Virginia in 2008 was 538,499.26 mcf (MMS 2009a).

Table 3-189. Virginia FMR for Gas, 2006 to 2008

	2006	2007	2008	Percentage Change 2006 to 2008
Production-Based Royalties	$440,161	$373,082	$336,210	-22%
Bonus FMR	$0	$0	$136,015	N.A.
Total FMR	$440,161	$373,082	$472,225	7%
Bonuses as a Percentage of Total FMR	0%	0%	40%	N.A.
Price of Unprocessed Gas	$6.14	$5.68	$5.28	-14%

N.A.: Not applicable

Source: MMS, State Mineral Revenue Reports.

Based on the percentage of new federal wells projected to be on BLM-administered land in the Virginia Oil and Gas RFD, BLM wells account for 9.7 percent of the forecasted federal wells in the commonwealth. Therefore, it was assumed that BLM wells currently account for 9.7 percent of the wells in the area producing gas. In 2008, the FMR from these wells was approximately $33,000, half of which was returned to the commonwealth.

Severance and Ad Valorem Taxes

Mineral production is also subject to severance and ad valorem taxes. In the Commonwealth of Virginia, severance tax is assessed at three percent of the value of the conventional gas extracted. According to the Virginia Oil and Gas Association, $20.1 million was paid in severance and property taxes in 2006, which includes a 130-percent increase in severance tax collected since 2003.

Typically, property or ad valorem taxes are assessed on the taxable valuation or market value of the minerals, determined by the millage rate, production volume, and current price of the minerals. Local millage rates often differ from county to county. In the Commonwealth of Virginia, the property tax is

determined not by production volumes but by the cost of well development. The "value of the well" is applied to the millage rate to determine the property tax assessed. If the well was created before 2003, the well was assumed to have a taxable value of $200,000 and was depreciated and reassessed after six years. After 2003, the cost to construct the well became its taxable value, after which the well was depreciated and reassessed after six years. Because of unknowns in determining the constructed value of the forecasted wells, the property tax assessed on these future wells was not included in the analysis.

To determine the proportion of severance taxes associated with BLM-administered gas production, it was necessary to estimate the federal gas production as reported by the MMS in its Mineral Revenue Reports (Accounting Year 2008). BLM production was assumed to be approximately 9.7 percent of federal production. The BOEMRE (formerly MMS) also provides the value of production. This value allows a derivation of the applied price for both processed and unprocessed gas. The average price was determined for the past three years. The market value of the current volume of production was determined for two prices: 2008 and an average of 2006 through 2008 (Table 3-190).

Table 3-190. Estimates of Market Value of BLM-Attributed Production

Type of Gas	2008 Federal Production (mcf)	BLM Production Estimate (mcf)	2008 Prices[1]	Average 2006–2008[1]	Value BLM Production 2008 Price	Value BLM Production 2006 to 2008 Average Price
Unprocessed	538,499	52,243	$5.28	$5.68	$275,843	$296,740

The BLM-attributed severance tax receipts associated with the market value of gas can subsequently be estimated, as Table 3-191 shows.

Table 3-191. Estimated Annual BLM-Administered Severance Taxes, 2008

	Total BLM Market Value (2008 Prices)	Total BLM Market Value (Average 2005 to 2008 Prices)
Market Value	$275,615	$296,740
Severance Tax 3%	$8,268	$8,902

The mining industry is responsible for paying these taxes on the value of production. However, because BLM owns and manages approximately 9.7 percent of this FMO in the study area (and commonwealth), this portion of the fiscal revenue can be attributed to BLM.

Projected BLM-Attributed Economic Activity

In 2006, total mining employment in Virginia was approximately 12,478, comprising oil and gas extraction (2,974 jobs), mining except oil and gas (7,485 jobs), and support activities for mining (2,019) (BEA, REIS). It is assumed that half of the support activities for the mining sector are attributed to oil and gas activity. To determine the portion of these employment figures that can be attributed to BLM-administered development and production, a number of additional assumptions need to be made. In 2006,

more than 96,546,768 mcf of gas were extracted in the study area (Virginia Department of Mineral Mines and Energy), which amounts to roughly 94 percent of the gas extracted in the Commonwealth of Virginia. Because 94 percent of production occurred in the study area, it was assumed that 94 percent of employment related to oil and gas extraction and support activity jobs existed in the study area. This amounts to 2,795 jobs for oil and gas extraction and 949 in the support activities for mining sector.

In 2006 in the Commonwealth of Virginia, 102,876,099 mcf of gas was extracted from a total of 5,179 gas wells (Virginia Department of Mineral Mines and Energy). This leads to an average of 19,859 mcf of gas per well in 2006. Assuming production levels at wells remain constant, then as of 2008, roughly 27 wells are in production on federally administered land. This estimate was calculated using the 2008 Virginia gas production totals from the MMS. According to the Virginia RFD, 289 new wells are projected to be in production on federally administered land. Included in 289 new wells are 28 wells projected on BLM-administered minerals. On average, 28.9 federally administered wells are projected to be developed per year, with 2.8 of those wells, or 9.7 percent, from BLM-administered minerals. Applying the production per well of 19,859 mcf, the additional 28 BLM-administered wells over 10 years would equate to 556,054 mcf of gas.

Based on 2006 commonwealth production statistics from the Virginia Department of Mines (102,876,099 mcf) and employment for oil and gas extraction (2,974) and support activities for mining (1,009) from BEA, it was determined that 25,829 mcf of gas produced is associated with one job created in the extraction and support activities for mining sectors. Based on estimated BLM production in 2008, therefore, in 2008 two jobs were attributed to BLM gas extraction. Because of the lack of data separating oil and gas extraction employment and the low quantity of oil extracted (16,881 barrels), it was assumed that all employment in this sector was related to gas development and extraction. When this metric is applied to the estimated extraction totals for BLM-administered wells (556,054 thousand cubic feet), it is estimated that 22 jobs per year will be created in the oil and gas extraction and support for mining activities sectors once all 28 BLM wells come into production. Table 3-192 summarizes these production and employment calculations.

Table 3-192. Estimated BLM-Attributed Employment

	2006	2016
Gas Production per Well	19,859 mcf/well	19,859 mcf/well
BLM Developed Wells	2.8	28
Total BLM Gas Produced	55,605 mcf	556,054 mcf
Production per Job	25,825 mcf/job	25,825 mcf/job
BLM-Attributed Oil and Gas Employment	2	22

The subsequent rise in gas production related to extraction on BLM-administered wells will also generate additional tax receipts for the county, commonwealth, and U.S. Treasury. To project the tax receipts for the next 10 years, it was necessary to estimate the market valuation of the gas, which is determined by multiplying the price of gas by the volume of production. Actual market valuation is used as reported by the MMS for 2007 and 2008. To determine the market valuation of the gas between 2009 and 2017, production was increased at the rate of BLM wells added per year at an average gas production volume of 19,859 mcf per year. Both 2008 prices and the average of 2005 to 2008 prices were applied to the production volumes to determine market valuation.

The federal-assessed tax royalty is 12.5 percent on the value of the gas extracted, which was applied to the estimated BLM-attributed market valuation to determine BLM-attributed FMR. Based on the gas royalties collected from current production from wells on federally administered land, it is assumed that the gas extracted from the new wells will be unprocessed.

The current severance tax rate in the Commonwealth of Virginia is three percent and is expected to remain constant; this three percent rate was applied to the BLM-attributed market valuation to determine the BLM-attributed severance tax receipts. Property taxes are also levied on the cost of developing wells but were not considered in this analysis because of unknowns in determining the costs of the forecasted wells.

Table 3-193 summarizes these annual figures. Table 3-194 provides the estimated aggregate severance and FMR tax receipts for this ten-year period.

Table 3-193. Projected Tax Receipts Association With BLM Gas Production

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Totals
Market Value BLM Production (2008 Prices)	$299,091	$275,615	$569,362	$863,110	$1,156,858	$1,450,605	$1,744,353	$2,038,101	$2,331,848	$2,625,596	$2,919,344	$15,699,178
Market Value BLM Production (Ave Prices 2005–2008)	$299,091	$275,615	$612,977	$929,227	$1,245,477	$1,561,727	$1,877,977	$2,194,226	$2,510,476	$2,826,726	$3,142,976	$16,901,789
Severance Tax (2008 price)	$8,973	$8,268	$17,081	$25,893	$34,706	$43,518	$52,331	$61,143	$69,955	$78,768	$87,580	$470,975
Severance Tax (Ave Price 2005–2008)	$8,973	$8,268	$18,389	$27,877	$37,364	$46,852	$56,339	$65,827	$75,314	$84,802	$94,289	$507,054
FMR Actual	$36,189	$32,612	-	-	-	-	-	-	-	-	-	-
FMR (2008 Prices)	-	-	$71,170	$107,889	$144,607	$181,326	$218,044	$254,763	$291,481	$328,200	$364,918	$1,962,397
FMR (Ave Price 2005–2008)	-	-	$76,622	$116,153	$155,685	$195,216	$234,747	$274,278	$313,810	$353,341	$392,872	$2,112,724
Commonwealth's Distribution of FMR (2008 Prices)	$18,094	$16,306	$35,585	$53,944	$72,304	$90,663	$109,022	$127,381	$145,741	$164,100	$182,459	$981,199
Number of BLM Wells	2	4.8	7.6	10.4	13.2	16	18.8	21.6	24.4	27.2	30	30
Annual Percent Increase in BLM Wells	N.A.	140%	58%	37%	27%	21%	18%	15%	13%	11%	10%	0%

N.A.: Not Applicable

Table 3-194. BLM-Attributed Total Fiscal Receipts, 2007 to 2017

Tax	BLM Attributed Tax Receipts (2008 Prices)	Percentage of Total	BLM Attributed Tax Receipts (2008–2006 Prices)	Percentage of Total
FMR	$1,962,397	81%	$2,112,724	81%
Severance	$ 470,975	19%	$507,054	19%
Total	**$2,433,372**	**100%**	**$2,619,778**	**100%**

Environmental Justice

EJ is a goal to be achieved for all communities so all people will be treated fairly with respect to the development and enforcement of protective environmental laws, regulations, and policies; and potentially affected community residents are meaningfully involved in the decisions that will affect their environment and/or their health. Conversely, allegations of environmental injustice describe the situations where communities believe the goal has not been achieved because there is disproportionate exposure to environmental harms and risks. These environmental harms and risks include, for example, air pollution, water quality concerns, and the cumulative impacts associated with living in some urban and rural areas.

The concept of EJ first became an expressed consideration with the publication of EO 12898 on February 11, 1994. The EO requires each federal agency to make achieving EJ part of its mission by "identifying and addressing…disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority and low-income populations in the United States" (EO 12898, §59 CFR 7629, 1994). The broad goal of EO 12898 is then tempered in §6-609 by the caution that "this order is intended only to improve the internal management of the executive branch and is not intended to create any right enforceable against the United States."

The EPA defines a community with potential EJ populations of concern as one that has a greater percentage of minority or low-income population than an identified reference community. EPA has provided two approaches for this identification of EJ populations with regard to minority status: 50 percent minority population in the affected area (EPA 1998) or whether the affected area has a significantly greater minority population than the reference area. No specific thresholds are provided for low-income or poverty populations. Because there is no consistent guidance for these indicators, some assumptions were developed specifically for this analysis. This analysis assumed that populations residing in a study area constitute an EJ community if the percentage of population in minority and/or poverty status is at least 10 percentage points higher than for the reference community. This threshold was chosen based on experience evaluating EJ indicators and the feeling that this threshold defines a percentage that would represent a significant population difference from the reference community. In addition, poverty threshold levels determined by the U.S. Census were used as a proxy for low-income populations in the affected area and reference community.

Three of the counties in the study area have poverty percentages in excess of 10 percent above the commonwealth's average (the reference population). Table 3-195 shows the poverty levels of these counties in the study area. In Buchanan County, nearly one-third of the population lives below the poverty line. The figures speak to the extreme poverty in western Virginia. Based on these figures, Buchanan, Dickenson, and Wise counties are identified as potential EJ populations of concern. The population in this area is predominantly white, with limited ethnic diversity; therefore, ethnicity does not contribute to the population of concern status.

Table 3-195. EJ Indicators for Counties in the Study Area and Virginia

	Percentage of Population Below the Poverty Level (2000)
Buchanan	30%
Dickenson	27%
Wise	25%
Virginia	**11%**

Source: U.S. Census Bureau 2000.

3.18.9 Virginia Tract-Specific Socioeconomics

Meadowood SRMA

Meadowood SRMA is a BLM-owned and managed recreational site in southeastern Fairfax County, Virginia. In 2001, BLM acquired the original Meadowood Farm, which consisted of 804 acres of wooded area and open pastures, from a private owner. Today, Meadowood SRMA is a recreation area with a network of trails, stables, an indoor arena, and other supporting facilities. Along with the neighboring parks of Mason Neck State Park, Pohick Bay Regional Park, and Occoquan Regional Park, Meadowood provides a valuable green respite in the densely populated Washington, DC/Northern Virginia metropolitan area.

Resource and Use Values

Meadowood SRMA is unique in that it exists in one of the more populous metropolitan areas in the country, where useable open space is a limited resource and in high demand by the public. Although the social and economic value of these resources and amenities to Fairfax County and the region may be hard to quantify, these values to local and regional communities are considerable.

Meadowood SRMA encompasses 804 acres of forests, meadows, hiking trails, and horseback riding trails, along with other natural and manmade features. It contains an approximately 30-year old stable and associated facilities. The primarily users of Meadowood's equestrian facilities are people taking riding lessons, private horse owners who pay to board their horses at the stables, and the customers of a therapeutic riding program.

The trail system is open to the general public free of charge, but BLM has generated revenue through the Federal Lands Recreation Enhancement Act for Special Recreation Permits for activities such as running races, orienteering events, Boy Scout jamborees.

Environmental education opportunities abound at Meadowood SRMA. Several local schools participate in the "Hands on the Land Program," where students participate in programs such as bird identification, pathways to fishing, habitat hikes, tree identification, "Urban Leave No Trace," tracking, invasive weed activity kits, cleanup days, and various other environmental education activities. Although no identified threatened or endangered species reside onsite, the community actively supports the preservation of the pristine natural state that exists on Meadowood SRMA.

Table 3-196 lists the number of visitors per year from 2005 to 2008. Visitation at Meadowood increased from 8,796 in 2005 to 24,648 in 2008—a 180-percent increase.

Table 3-196. Visitors Each Year at Meadowood SRMA

	2005	2006	2007	2008	Percentage Change 2005 to 2008
Meadowood SRMA	8,796	9,850	14,850	24,648	180%

Source: BLM Recreation Management Information System.