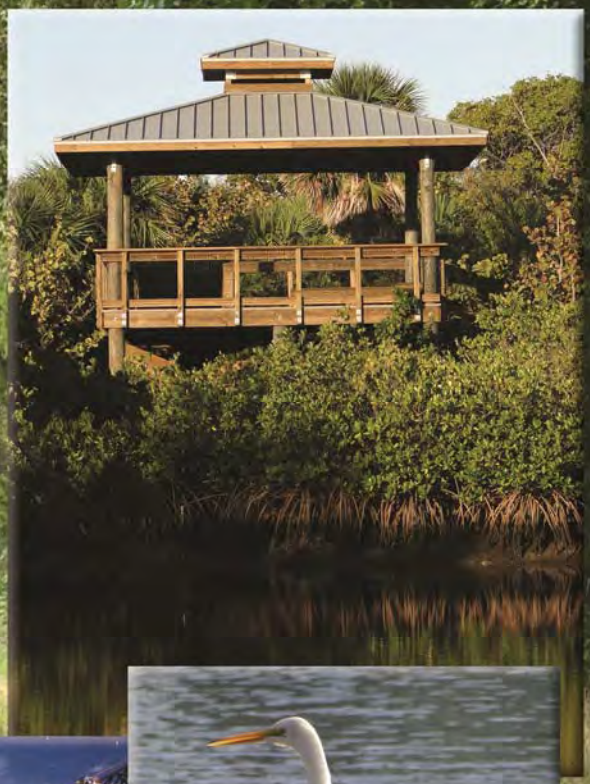
September 2014

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 2 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 2 of 3

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

September 2014

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CHAPTER 4—ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

The purpose of this chapter is to determine the potential impacts of the "federal action" on the "human environment" in compliance with the National Environmental Policy Act (NEPA). For this Draft Resource Management Plan (RMP) and Environmental Impact Statement (EIS), the "federal action" is the selection of an alternative, which will serve as a framework for future land use and resource management decisions on Bureau of Land Management (BLM) administered surface tracts and federal mineral ownership (FMO). The Council on Environmental Quality (CEQ) regulations for implementing NEPA states that the "human environment" shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment (40 Code of Federal Regulations [CFR] §1508.14). Many future land use and resource management decisions will require further NEPA analyses to assess site-specific impacts.

4.1.1 Approach to the Analysis

This analysis is organized by resource program and discloses the potential impacts of implementing each of the proposed alternatives discussed in Chapter 2. Resources are discussed in the same order as presented in Chapter 2 and Chapter 3. The information presented in this chapter provides the analytical basis for the summary table of impacts found at the end of Chapter 2.

The analysis of the alternatives identifies the types of impacts anticipated and estimates their intensity. The analysis addresses impacts from resource management actions proposed on BLM-administered surface tracts, as well as minerals-related actions on FMO. Potential impacts from vegetation, fish and wildlife, special status species, and prescribed fire management are grouped together because of the close interrelationship and similarity of management actions. Similarly, impacts from recreation management and travel and access management are grouped under the same analysis discussion. Impacts from wildland fire management are limited to those impacts associated with wildland fire suppression. Potential impacts from management of areas of critical environmental concern (ACEC) are presented under the resource programs applicable to the important and relevant values of each ACEC. Potential impacts from management of air quality, soil resources, water resources, and paleontological resources are not expected to occur because no impact-causing management actions are anticipated.

The impact analysis for Alternative A, which is the No Action or continuation of present management alternative, serves as the baseline for comparison of alternatives. Alternative-specific analysis discussions often refer to other alternatives to provide a comparison and comprehensive description of the impacts. It is important to note that management prescriptions for each resource or resource use directly or indirectly relate to each other; therefore, impacts on one particular resource program may also apply to other programs. It is therefore recommended that the reader review all impact analyses to attain a comprehensive description of the impacts on a particular resource or resource use.

Impact analyses and conclusions are based on interdisciplinary team knowledge of resources in the project area and review of existing literature. Effects are quantified where possible or are described in qualitative terms in the absence of quantitative data. Acreage values were calculated using ESRI's ArcGIS Desktop 9.3 and 10.0 software (Appendix J). The projection of geographic information system (GIS) data that were analyzed to provide the acreage calculations is Universal Transverse Mercator (UTM) Zone 15N and 17N, based on the North American Datum of 1983 (NAD83).

4.1.2 Types of Effects

Throughout this chapter, the terms "impact" and "effect" are used interchangeably. Impacts can be direct, indirect, or cumulative. Although impacts may be perceived as positive (beneficial) or negative (adverse), those determinations are left for the reader of this document to make. Table 4-1 provides an overview of the general types of impacts discussed in this chapter.

Table 4-1. Types of Impacts

Type	Description
Direct Impacts	Direct impacts occur at the same time and place as the action responsible for the impact. For example, removal of vegetative cover caused by facility construction would be considered a direct impact on vegetation resources.
Indirect Impacts	Indirect impacts are temporally and spatially removed from the action responsible for the impact but are related to the action through a process of cause and effect. For example, removal of vegetative cover caused by facility construction that consequently results in increased surface runoff and sedimentation of nearby water bodies would be considered an indirect impact on water resources. Indirect impacts may reach beyond the natural and physical environment (i.e., environmental impact) to include growth-inducing effects and other effects related to induced changes to resource uses (e.g., socioeconomic impact).
Cumulative Impacts	Cumulative impacts result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of which agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions that take place over time.

4.1.3 Availability of Data and Incomplete Information

The best available data and information pertinent to management actions were used in developing the Draft RMP and Draft EIS. Considerable effort was taken to acquire and convert resource data into digital format for use in the plan—both from BLM sources and from outside sources. Site-specific data was used to the extent possible. A comprehensive list of the GIS data used in the Draft RMP/EIS is included in Appendix J.

Certain data and information were unavailable for use in developing this plan. Some of the major types of unavailable data include cultural resource data, including Native American traditional use areas, visitor use trends, and specific components of field data for soils and water. Wildlife and special status species data were largely based on state heritage occurrence records. These data do not represent a thorough inventory and these databases are being continually updated with additions that may not be addressed in this document. Future BLM actions are likely to require additional analysis of these resources to ensure that the most recent data on range, occurrences, habitat, and status are assessed. As a result of these unavailable data, some impacts cannot be quantified. In such instances, impacts are described in qualitative terms or, in some instances, are described as unknown. Subsequent project-level analysis will provide the opportunity to collect and examine site-specific inventory data required to determine appropriate application of RMP-level guidance. In addition, ongoing inventory efforts by BLM and other agencies within the *planning area* will be used to further update and refine information and data used to implement this plan.

4.1.4 Analysis Assumptions

Assumptions are made to assist in determining the potential environmental, social, and economic impacts of the management alternatives on the affected environment. Assumptions are for the purpose of analysis only. They are presumed true for the purpose of equitably comparing the alternatives. Assumptions do not constrain or define management; they are based on observations, historical trends, and professional judgment. Assumptions are generally made for the expected life of the RMP, unless otherwise stated.

General assumptions applicable to all resources and resource uses are described below. Resource-specific assumptions are described under each resource program in the following sections.

- The decisions proposed in the alternatives apply to BLM-administered surface tracts and FMO. However, cumulative impact analyses might also consider decisions made for resources managed by other entities or individuals.
- The planning criteria described in Chapter 1 apply to all alternatives.
- The alternatives would be implemented as described in Chapter 2.
- Implementation actions would comply with valid existing rights and all federal laws, regulations, and policies.
- Sufficient funding and personnel would be available to implement the RMP.
- The reasonably foreseeable development scenario (RFD) for oil and gas, in terms of the number of wells expected within each state, would be the same for each alternative. Based on the proposed stipulations, however, the locations of wells would vary by alternative.
- Appropriate maintenance would be carried out to maintain the functional capability of all developments (e.g., roads, fences, and other projects).
- Mitigation measures are incorporated into the RMP alternatives and would be applied as described in Chapter 2 and the applicable appendices.
- Short-term impacts are those that begin and end within 5 years after the action is implemented.

4.2 AIR QUALITY

This section presents potential impacts on air quality from implementing management actions for other resource programs within the analysis area, which includes the states of Arkansas, Florida, Kentucky, Louisiana, Tennessee, and Virginia. It is important to note that, under the EPA's General Conformity requirement, federal agencies comply with national ambient air quality standards by ensuring that all actions conform to the appropriate state implementation plan (SIP). This requirement is underscored in the Air Quality section of Chapter 2, as common to all RMP alternatives.

Impacts are first discussed in general for those impacts that apply to the entire analysis area, followed by state-by-state descriptions of impacts for each of the six states in the analysis area. Regulations that control air quality emissions differ by state. Further, each state has its own air quality compliance issues that necessitate a state-by-state analysis. Because each state tracks statewide air emissions differently, it was also appropriate to compare total cumulative emissions on a state-by-state basis. Table 4-42 compares potential BLM emissions with cumulative emissions.

Air emissions are the release or discharge of a pollutant into the air and include criteria pollutants and hazardous air pollutants (HAP). Criteria pollutants are those compounds for which *National Ambient Air Quality Standards (NAAQS)* have been established. They include nitrogen oxides (NO_x), carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter (PM) less than 10 microns (PM_{10}), PM less than 2.5 microns ($PM_{2.5}$), ozone (O_3), and lead (Pb). NO_x and volatile organic compounds (VOC) are the regulated compounds for O_3. HAPs include those listed by the United States (U.S.) Environmental Protection Agency (EPA) pursuant to *Title III of the 1990 Clean Air Act Amendments*. The criteria pollutant lead is also a designated HAP.

An emissions inventory was developed using the best available information provided by BLM staff regarding activities on BLM land. BLM sources of air emissions are described in more detail in Section 4.2.2. Emissions calculations were based on the best available engineering data, assumptions, emission inventory procedures, and professional and scientific judgment. Emissions factors used for the inventory are accepted and recognized by state and federal regulatory agencies. However, assumptions were used when specific data or procedures were unavailable. Because of the uncertainties regarding the number, nature, and specific location of future sources and activities, this emission comparison approach is defensible and provides a sound basis to compare alternatives. This analysis selected two different timeframes to evaluate future emissions. These timeframes reflect the current base year conditions and the long-term impacts. It is assumed that all, if any, emission growth for BLM activities will be constant and linear in time. The two inventory timeframes are:

- Current emissions (using the year 2010 as a basis)
- Ten-year potential emissions for the long term (2020).

Using the well numbers from the RFD scenario, individual tables for all BLM oil and gas well activities were calculated in linked spreadsheets. Because oil and gas field activities consist of many phases (e.g., exploration, development, production, and closure), the components that need to be included in emission calculations are complex.

In 2011 the BLM entered into a air quality memorandum of understanding (MOU) with the Environmental Protection Agency (EPA). The MOU outlines a number of steps the agencies will take to ensure that federal laws protecting air quality, human health, and the environment are balanced with the nation's energy needs. The agreement provides for early interagency consultation throughout the NEPA process; common procedures for determining what type of air quality analyses are appropriate and when

air modeling is necessary; specific provisions for analyzing and discussing impacts to air quality and for mitigating such impacts; and a dispute resolution process to facilitate timely resolution of differences among agencies. This MOU will be integrated into BLMs NEPA process, including RMP implementation actions. The emissions inventory methodology for this EIS included multiple components, including smaller sources associated with foreseeable actions, including all sources associated with foreseeable oil and gas development. Further emissions inventory work would take place during the approval process for implementation actions.

4.2.1 Assumptions

The analysis is based on the following assumptions:

- The EPA's AP 42, Compilation of Air Pollutant Emission Factors, (EPA 1995), including subsequent supplements and updates, are appropriate for all activities.
- Emission growth would be constant and linear in time.
- Activity factors are appropriate for the base year and in future timeframes.
- Coal production is produced from underground mines and is stabilized at 10.1 million tons per year. (Emissions from underground mines are produced from above ground activities, such as trucking, processing, loading, and venting from the mine.) Because underground coal mining does not have EPA-approved emission factors, factors were used from surface mining as the best emissions data available.
- Hydrocarbon emissions include HAPs.
- Prescribed burning acreage is divided as follows. For Alternatives A and D, an annual average of 50 acres would be burned, all in Florida. For Alternatives B and C, an annual average of 100 acres would be burned, with 50 percent of the total acres located in Florida and the remaining acres divided evenly (16.66%) among Arkansas, Louisiana, and Virginia locations.
- Phosphate mining would occur only in Florida on 802 acres expected to be mined in the next 10 years in Hardee County (602 acres) and Polk County (200 acres) (BLM 2008b).
- As described in Chapter 3, there are 1,083 acres of FMO in Florida with the potential to be leased in the next 10 years and mined during the subsequent 10-year period.

The qualitative analysis used the most conservative assumptions for air quality. When there were ranges of activity factors, the upper limit of the range was used to complete calculations for future timeframes.

Emissions were calculated for the following activities: coalbed natural gas (CBNG) and conventional oil and natural gas well development, coal mining, phosphate mining in Florida, and prescribed burning. Activities related to other resources and uses, such as cultural resources, recreation, lands and realty actions, vegetation management, transportation and access, visual resource management, and fish and wildlife management, are assumed to be minor sources of air emissions and therefore were not quantified.

4.2.2 Alternative A (No Action Alternative)

Prescribed burning activities would cause short-term emissions of PM and CO that could spread over portions of the analysis area in Arkansas, Florida, Louisiana, and Virginia, varying with the size of the fire and the wind conditions. Truck and equipment to conduct and control prescribed fires would generate tailpipe emissions. Areas receiving vegetation treatment would add short-term increases in PM until vegetation recovered sufficiently to stabilize exposed soil. However, prescribed burning would not be

anticipated to involve ground-disturbing activities of a severity or extent that would deteriorate air quality conditions. Prescribed burning conducted to meet vegetation resource objectives would be short term and localized, and would not be anticipated to individually deteriorate air quality conditions. These activities would have negligible contributions to greenhouse gas (GHG) emissions. Actions that would provide habitat improvements and protections under state wildlife conservation strategies, including control of invasive plant species and wetland enhancements, would not be anticipated to involve ground-disturbing activities of a severity or extent that would deteriorate air quality conditions.

The use of heavy equipment during wildland fire suppression activities would result in particulate emissions, CO, NO_x, and hydrocarbons. Because all wildland fires would be suppressed, these occurrences would be short term and localized, depending on wind conditions, and would not be anticipated to individually deteriorate air quality conditions.

Short-term, localized increases in dust and emissions could potentially occur from recreation activities and travel on unpaved roads. Given the small amount and scattered nature of surface ownership, these activities would not be anticipated to individually deteriorate air quality conditions. These activities would have negligible contributions to GHG emissions.

Air emissions would be produced during all phases of oil and gas development, including exploration, well development, production, and well abandonment and reclamation. During exploration and development, traffic on unpaved and paved roads would cause emissions of PM, CO, NO_x, SO_2, and hydrocarbons. In addition, during well development, drilling activities and construction activities would cause particulate emissions and gaseous emissions as a result of heavy equipment use. These activities would contribute to GHG emissions.

Air emissions are also probable during oil and gas production. Emissions of NO_x and CO from compression activities (burning of natural gas) would occur. PM, CO, NO_x, and hydrocarbon emissions (VOCs) would be produced from any glycol operations and flashing. Any flaring would cause PM, CO, NO_x, SO_2, and hydrocarbon emissions (which includes HAPs). Emissions from flaring during well development assume that 8,863 pounds of VOC are produced per well. During well abandonment and road closure, PM from travel on unpaved roads and demolition activities would result. These activities would contribute to GHG emissions.

Air emissions would be produced during mining operations and reclamation activities. During phosphate mining activities, PM emissions would be produced from overburden removal, blasting, truck loading, bulldozing, grading, storage piles, railroad loading, and travel of heavy equipment over unpaved roads. Gaseous emissions from tailpipes (CO, NO_x, SO_2, and hydrocarbon) would occur from heavy equipment, trains, and vehicular travel. For coal mining activities, PM emissions would be produced by truck loading, storage piles, railroad loading, travel by heavy equipment over unpaved roads, and venting from the mine. Gaseous emissions from tailpipes (CO, NO_x, SO_2, and hydrocarbon) would occur from heavy equipment, trains, and vehicular travel. These activities would produce negligible contributions to GHG emissions.

Short-term, localized increases in dust (PM emissions) and other criteria pollutant and HAP emissions would occur from use of trucks and heavy equipment (e.g., bulldozers, backhoes, trenchers) for the development of rights-of-way (ROW). These actions would be conducted in accordance with State Implementation Plans (SIP) and local dust control regulations; however, given the small amount and scattered nature of surface ownership, lands and realty management actions would not be anticipated to individually deteriorate air quality conditions or violate air quality standards or regulations. These activities would produce negligible contributions to GHG emissions because of the few ROWs anticipated.

As noted above, certain BLM-authorized activities within the planning area, including oil and gas development would produce emissions considered to be greenhouse gases (GHF), particularly carbon dioxide. However, due to the small magnitude of these emissions in relation to other sources, the expected emissions from BLM-authorized activities would not have a noticeable or measurable effect. Other BLM activities, such as maintaining vegetation and forested cover, may help offset any emissions and sequester carbon through build organic carbon of duff layers in soils and function functions as "carbon sinks".

Arkansas

Estimated emissions from the development of 440 gas wells over the next 10 years on BLM-administered land, including venting and flaring emissions, would produce slightly less emissions than the baseline emissions from total planned oil and gas developments in the state (presented in Table 4-2). Those emissions would likely occur over a dispersed geographic area and would, therefore, not cause any noticeable or measurable effect. Also included in Table 4-2 are the calculations of anticipated emissions from other alternatives from prescribed burning. Prescribed burning impacts would be less than one ton per year. As shown in Table 4-42, emissions from BLM activities would not considerably contribute to cumulative air quality emissions within the region or GHG emissions.

Table 4-2. Maximum Potential Oil and Gas and Prescribed Burning Air Emissions for BLM Activities in Arkansas (tons per year)[1, 2]

Air Emissions Scenarios	Emission Type/Pollutant (tons/year)				
	Nitrogen Oxides (NO_x)	Sulfur Dioxide (SO_2)	Particulate Matter (PM_{10})	Carbon Monoxide (CO)	Volatile Organic Compounds (VOC)
BLM baseline oil and gas (BLM 2009)	1,737	7	58	2,986	3,621
BLM-administered oil and gas activities for projected new wells—10th year[3]	956	5	40	1,723	1,907
Total oil and gas well emissions (base year + proposed development activities for projected new wells)	2,693	12	98	4,709	5,528
Percentage increase in oil and gas well emissions from base year	55%	71%	69%	58%	53%
Prescribed burning Alternatives A and D	--	--	0	--	--
Prescribed burning Alternatives B and C	--	--	0	--	--

1. Using conservative assumptions typical of wells on BLM lands.

2. BLM proposed wells include 409 horizontal gas wells, 28 vertical gas wells, 2 vertical CBNG wells, and 1 horizontal CBNG well.

3. Emissions for projected new wells for the final year of projected development in 2020. This year has the maximum expected air quality emissions.

Note: Prescribed burning contributes less than 1 ton per year of PM_{10}

Dashes indicate that data were not available.

Class I PSD areas within 200 miles of potential BLM-authorized activities, including oil and gas development, are the Caney Creek and Upper Buffalo Wilderness Areas, as well as the Hercules-Glades

and Mingo Wilderness Areas in Missouri. BLM-authorized activities within the planning area, including oil and gas development would produce emissions with potential to affect visibility. However, due to the small magnitude of these emissions in relation to other sources, the expected emissions resulting from BLM-authorized activities would not have a noticeable or measureable effect on deterioration of visibility in these Class I PSD areas.

If proposed projects areas are located in areas that have been identified as being in nonattainment of the NAAQS, those projects will undergo a Conformity determination, and if applicable will conform to the SIP requirements. Crittenden County is currently the only designated nonattainment area in Arkansas. At this time there are no BLM-authorized mineral development actions, nor BLM surface management actions, expected to occur in this nonattainment area.

Florida

Phosphate mining and the development of approximately three oil and gas wells over the next 10 years would produce emissions from well exploration, development, and production; and mining and processing of phosphate ore. Estimated emissions from mining activities that are anticipated to occur across 802 acres and potential leasing of 1,083 acres over the next 10 years on BLM-administered land would produce the emissions shown in Table 4-3. Those emissions would likely occur over a small geographic area and would cause a small noticeable or measurable effect. Also included in Table 4-3 are the calculations of anticipated emissions from other alternatives from prescribed burning. Prescribed burning impacts are projected to be small—less than one ton per year. As shown in Table 4-42, emissions from BLM activities would not considerably contribute to cumulative air quality emissions within the region or GHG emissions.

Class I PSD areas within 200 miles of potential BLM-authorized activities, including oil and gas development and phosphate mining, are the Everglades National Park, the Chassahowitzka Wilderness Area, the St. Marks National Wildlife Refuge (NWR), as well as Wolf Island NWR on the southeastern coast of Georgia, and Okefenokee Wilderness Area in southern Georgia. BLM-authorized activities within the planning area, including oil and gas development would produce emissions with potential to affect visibility. However, due to the small magnitude of these emissions in relation to other sources, the expected emissions resulting from BLM-authorized activities would not have a noticeable or measureable effect on deterioration of visibility in these Class I PSD areas.

Table 4-3. Maximum Potential Air Emissions for BLM Prescribed Burning and Phosphate Mining Activities in Florida (tons per year)[1, 2]

Air Emissions Scenarios	Emission Type/Pollutant (tons/year)				
	Nitrogen Oxides (NO_x)	Sulfur Dioxide (SO_2)	Particulate Matter (PM_{10})	Carbon Monoxide (CO)	Volatile Organic Compounds (VOC)
Phosphate baseline [3]	1,325	28,881	482	97	50
BLM-administered phosphate mining on 802 acres and 1,083 acres to be leased for mining	0	3	7,489	288	0
Total phosphate mining emissions (base year + proposed development activities)	1,325	28,884	7,971	385	50

Air Emissions Scenarios	Emission Type/Pollutant (tons/year)				
	Nitrogen Oxides (NO_x)	Sulfur Dioxide (SO_2)	Particulate Matter (PM_{10})	Carbon Monoxide (CO)	Volatile Organic Compounds (VOC)
Percentage increase in phosphate mining emissions from base year	0	0	1,554%	297%	0
Prescribed burning Alternatives A and D	--	--	0	--	--
Prescribed burning Alternatives B and C	--	--	1	--	--
Total (prescribed burning and phosphate mining emissions) Alternatives A and D	0	3	7,489	288	0
Total (prescribed burning and phosphate mining emissions) Alternatives B and C	0	3	7,490	288	0

1. Using conservative assumptions typical of wells on BLM lands.

2. BLM proposed mining activities include 20 acres/year in Polk County, 60.1 acres/year in Hardee County, and another 108.3 acres/year with potential to be leased in Florida.

3. Florida Emissions Report (2008) email from Cadedra Parmer 12/11/2009. Represents the State of Florida emissions from permitted phosphate mining and processing facilities. Does not take into account fugitive dust sources (particulate) and mobile sources.

4. Percentage baseline values are skewed because the emissions from the state do not include fugitive sources from mining and minerals processing.

Note: Prescribed burning contributes 1 ton per year of PM_{10}.

Dashes indicate that data were not available.

If proposed projects areas are located in areas that have been identified as being in nonattainment of the NAAQS, those projects will undergo a Conformity determination, and if applicable will conform to the SIP requirements. Hillsborough and Nassau Counties are currently the designated nonattainment areas in Florida. At this time the only expected BLM-authorized actions within this nonattainment area are related to potential for phosphate leasing and development in Hillsborough County.

Kentucky

Estimated emissions from the development of 28 gas wells over the next 10 years on FMO, including venting and flaring emissions, would produce considerably less emissions than the combined emissions from total planned oil and gas developments in the state (Table 4-4). Those emissions would likely occur over a dispersed geographic area and would not cause any noticeable or measurable effect. As shown in Table 4-42, emissions from BLM activities would not considerably contribute to cumulative air quality emissions within the region or GHG emissions.

On the basis of a conservative estimate, it is anticipated that 1.1 million tons of federal coal would be produced annually over the next 10 years (BLM 2009c). The emission calculations for coal mining activities include storage piles, truck and railroad loadout, and venting from heavy equipment are shown in Table 4-4.

Table 4-4. Maximum Potential Oil and Gas and Coal Mining Air Emissions for BLM Activities in Kentucky (tons per year)[1, 2]

Air Emissions Scenarios	Emission Type/Pollutant (tons/year)				
	Nitrogen Oxides (NO_x)	Sulfur Dioxide (SO_2)	Particulate Matter (PM_{10})	Carbon Monoxide (CO)	Volatile Organic Compounds (VOC)
BLM baseline oil and gas (BLM 2009)	474	2	9	814	996
BLM-administered oil and gas activities for projected new wells—10th year[3]	110	0	2	205	187
Total oil and gas well emissions (base year + proposed development activities for projected new wells)	584	2	11	1,019	1,183
Percentage increase in oil and gas well emissions from base year	23%	0	22%	25%	19%
BLM-administered coal mining activities	111	12	87	197	10
Total emissions from BLM proposed activities (oil and gas + coal mining activities)	221	12	14	402	197

1. Using conservative assumptions typical of wells on BLM lands.

2. BLM proposed wells include 28 vertical shallow gas wells.

3. Emissions for projected new wells for the final year of projected development in 2020. This year has the maximum expected air quality emissions.

Note: Dashes indicate that data were not available.

Class I PSD areas within 200 miles of potential BLM-authorized activities, including oil and gas development, are Mammoth Cave National Park, as well as 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. BLM-authorized activities within the planning area, including oil and gas development would produce emissions with potential to affect visibility. However, due to the small magnitude of these emissions in relation to other sources, the expected emissions resulting from BLM-authorized activities would not have a noticeable or measureable effect on deterioration of visibility in these Class I PSD areas.

If proposed projects areas are located in areas that have been identified as being in nonattainment of the NAAQS, those projects will undergo a Conformity determination, and if applicable will conform to the SIP requirements. Boone, Bullitt, Campbell, Jefferson, and Kenton Counties are currently the designated nonattainment areas in Kentucky. At this time there are no BLM-authorized mineral development actions, nor BLM surface management actions, expected to occur in these nonattainment areas.

Louisiana

Estimated emissions from the development of 320 gas wells over the next 10 years on BLM-administered land, including venting and flaring emissions, would produce a lesser amount of emissions than the current baseline emissions from total planned oil and gas developments in the state (Table 4-5). Those

emissions would likely occur over a dispersed geographic area and would, therefore, not cause any noticeable or measurable effect. Also included in Table 4-5 are the calculations of anticipated emissions from other alternatives from prescribed burning. Prescribed burning impacts would be less than one ton per year. As shown in Table 4-42, emissions from BLM activities would not considerably contribute to cumulative air quality emissions within the region or GHG emissions.

Class I PSD areas within 200 miles of potential BLM-authorized activities, including oil and gas development, are the Breton Wilderness Area, and the Caney Creek Wilderness in southwestern Arkansas. BLM-authorized activities within the planning area, including oil and gas development would produce emissions with potential to affect visibility. However, due to the small magnitude of these emissions in relation to other sources, the expected emissions resulting from BLM-authorized activities would not have a noticeable or measureable effect on deterioration of visibility in these Class I PSD areas.

Table 4-5. Maximum Potential Oil and Gas Air Emissions and Prescribed Burning for BLM Activities in Louisiana (tons per year)[1, 2]

Air Emissions Scenarios	Emission Type/Pollutant (tons/year)				
	Nitrogen Oxides (NO_x)	Sulfur Dioxide (SO_2)	Particulate Matter (PM_{10})	Carbon Monoxide (CO)	Volatile Organic Compounds (VOC)
BLM baseline oil and gas activities (BLM 2009)	2,591	16	57	4,271	5,226
BLM-administered oil and gas activities for projected new wells—10th year[3]	784	5	25	1,469	1,697
Total oil and gas well emissions (base year + proposed development activities)	3,375	21	82	5,740	6,923
Percentage change in emissions from base year	30%	315	44%	34%	32%
Prescribed burning Alternatives A and D	--	--	0	--	--
Prescribed burning Alternatives B and C	--	--	0	--	--
Total emissions from BLM proposed activities (oil and gas + prescribed burning activities)	784	5	25	1,469	1,697

1. Using conservative assumptions typical of wells on BLM lands.

2. BLM proposed wells include 19 vertical gas wells and 2 CBNG wells. No percentage change in emissions was calculated because there are no existing oil and gas wells for the base year.

3. Emissions for projected new wells for the final year of projected development in 2020. This year has the maximum expected air quality emissions.

Note: Prescribed burning contributes less than 1 ton per year of PM_{10}.

Dashes indicate that data were not available.

If proposed projects areas are located in areas that have been identified as being in nonattainment of the NAAQS, those projects will undergo a Conformity determination, and if applicable will conform to the SIP requirements. Ascension, East Baton Rouge, Iberville, Livingston, St. Bernard, and West Baton Rouge Parishes are currently the designated nonattainment areas in Louisiana. At this time there are no

BLM-authorized mineral development actions, nor BLM surface management actions, expected to occur in these nonattainment areas.

Tennessee

Estimated emissions from the development of two gas wells over the next 10 years on BLM-administered land, including venting and flaring emissions, would produce emissions (Table 4-6). Because there is minimal current development in the state, the comparison with the baseline emissions shows that there would not be an increase from the baseline combined emissions from total planned oil and gas developments in the state. Emissions would likely occur over a dispersed geographic area and would, therefore, not cause any noticeable or measurable effect. As shown in Table 4-42, emissions from BLM activities would not considerably contribute to cumulative air quality emissions within the region or GHG emissions.

Table 4-6. Maximum Potential Oil and Gas Air Emissions for BLM Activities in Tennessee (tons per year)[1, 2]

Air Emissions Scenarios	Emission Type/Pollutant (tons/year)				
	Nitrogen Oxides (NO_x)	Sulfur Dioxide (SO_2)	Particulate Matter (PM_{10})	Carbon Monoxide (CO)	Volatile Organic Compounds (VOC)
BLM baseline oil and gas activities (BLM 2009)	53	0	1	100	79
BLM-administered oil and gas activities for projected new wells—10th year[4]	52	0	1	102	54
Total oil and gas well emissions (base year + proposed development activities for projected new wells)	105	0	2	202	133
Percentage change in emissions from base year	98%	0	100%	102%	68%

1. Using conservative assumptions typical of liquid mineral wells on BLM lands.

2. BLM proposed wells include 2 horizontal gas wells.

3. Baseline values are high because there is very little current oil and gas activity.

4. Emissions for projected new wells for the final year of projected development in 2020. This year has the maximum expected air quality emissions.

Class I PSD areas within 200 miles of potential BLM-authorized activities, including oil and gas development, are the Great Smoky Mountains National Park and the Joyce Kilmer-Slickrock Wilderness. BLM-authorized activities within the planning area, including oil and gas development would produce emissions with potential to affect visibility. However, due to the small magnitude of these emissions in relation to other sources, the expected emissions resulting from BLM-authorized activities would not have a noticeable or measureable effect on deterioration of visibility in these Class I PSD areas.

If proposed projects areas are located in areas that have been identified as being in nonattainment of the NAAQS, those projects will undergo a Conformity determination, and if applicable will conform to the SIP requirements. Anderson, Blount, Hamilton, Knox, Loudon, Roane, Shelby, and Sullivan Counties are currently the designated nonattainment areas in Tennessee. At this time there are no BLM-authorized

mineral development actions, nor BLM surface management actions, expected to occur in these nonattainment areas.

Virginia

Estimated emissions from the development of 21 gas wells over the next 10 years on BLM-administered land, including venting and flaring emissions, would produce emissions (Table 4-7). There are currently no existing BLM oil and gas wells in Virginia; therefore, there are zero emissions for the base year. However, the emissions from the proposed development activities would likely occur over a dispersed geographic area and would not cause any noticeable or measurable effect. Also included in Table 4-7 are the calculations of anticipated emissions from other alternatives from prescribed burning. Prescribed burning impacts would be less than one ton per year. As shown in Table 4-42, emissions from BLM activities would not considerably contribute to cumulative air quality emissions within the region or GHG emissions.

Class I PSD areas within 200 miles of potential BLM-authorized activities, including oil and gas development, are the Shenandoah National Park and James River Face Wilderness Area, as well as the Dolly Sods and Otter Creek Wilderness Areas in West Virginia, and the Linville Gorge Wilderness Area in North Carolina. BLM-authorized activities within the planning area, including oil and gas development would produce emissions with potential to affect visibility. However, due to the small magnitude of these emissions in relation to other sources, the expected emissions resulting from BLM-authorized activities would not have a noticeable or measureable effect on deterioration of visibility in these Class I PSD areas.

If proposed projects areas are located in areas that have been identified as being in nonattainment of the NAAQS, those projects will undergo a Conformity determination, and if applicable will conform to the SIP requirements. At the present time all nonattainment issues in Virginia are related to the greater Washington D.C. area, and all designated nonattainment areas are counties in that vicinity. As such, the only projects that would be subject to Conformity determination would those related to management of the Meadowood Special Recreation Management Area (SRMA) in Fairfax County.

Table 4-7. Maximum Potential Oil and Gas and Prescribed Burning Air Emissions for BLM Activities in Virginia (tons per year)[1, 2]

Air Emissions Scenarios	Emission Type/Pollutant (tons/year)				
	Nitrogen Oxides (NO_x)	Sulfur Dioxide (SO_2)	Particulate Matter (PM_{10})	Carbon Monoxide (CO)	Volatile Organic Compounds (VOC)
BLM baseline oil and gas activities (BLM 2009)	0	0	0	0	0
BLM-administered oil and gas activities for projected new wells—10th year[3]	75	0	7	142	105
Total oil and gas well emissions (base year + proposed development activities)	75	0	7	142	105
Percentage change in emissions from base year	100%	0	100%	100%	100%
Prescribed burning Alternatives A and D	--	--	0	--	--

Air Emissions Scenarios	Emission Type/Pollutant (tons/year)				
	Nitrogen Oxides (NO_x)	Sulfur Dioxide (SO_2)	Particulate Matter (PM_{10})	Carbon Monoxide (CO)	Volatile Organic Compounds (VOC)
Prescribed burning Alternatives B and C	--	--	0	--	--
Total emissions from BLM proposed activities (oil and gas + prescribed burning activities)	75	0	7	142	105

1. Using conservative assumptions typical of wells on BLM lands.

2. BLM proposed wells include 19 vertical gas wells and 2 CBNG wells. No percentage change in emissions was calculated because there are no existing oil and gas wells for the base year.

3. Emissions for projected new wells for the final year of projected development in 2020. This year has the maximum expected air quality emissions.

Note: Prescribed burning contributes less than 1 ton per year of PM_{10}.

Dashes indicate that data were not available.

4.2.3 Alternative B (Preferred Alternative)

In addition to the impacts described for Alternative A, there would be a slight increase in emissions as a result of the projected increase in prescribed burning in Arkansas, Florida, Louisiana, and Virginia. The prescribed burning calculations for Arkansas, Louisiana, and Virginia show no significant increase in emissions from Alternative B (Table 4-2, Table 4-5, and Table 4-7). Only Florida would have a very minimal increase of PM emissions from proposed activities (Table 4-3).

4.2.4 Alternative C

The impacts on air quality from implementing the actions in Alternative C would be the same as those identified under Alternative B.

4.2.5 Alternative D

The impacts on air quality from implementing the actions in Alternative D would be the same as those identified under Alternative B.

4.3 SOIL RESOURCES

This section presents potential impacts on soil resources from implementing management actions for each resource program. Existing conditions concerning soil resources are described in Chapter 3.

4.3.1 Assumptions

The analysis is based on the following assumptions:

- Vegetation removal and surface disturbance are the primary cause of accelerated soil erosion in upland areas.
- The removal of vegetation would increase the erosive forces of wind and overland water flow, which would result in accelerated soil erosion.
- Erosion would reduce soil productivity because topsoil (where most nutrients used by plants are concentrated) was removed.
- Eroded soil could be deposited as sediment at any point downslope or could be transported to water bodies such as streams, rivers, wetlands, lakes, and reservoirs.
- The amount of sediment from upland soil erosion transported downslope or to water bodies depends on distance, slope, soil texture, filtering capacity of upland and riparian vegetation, and storm intensity and duration.
- Soil compaction would increase overland flow and subsequent soil erosion.
- Compacted soils are less accommodating to plant roots and seed germination is difficult in such soils.

4.3.2 Alternative A (No Action Alternative)

Conducting vegetation treatments (e.g., prescribed burning, mechanical, chemical, manual, and biological) and continuing habitat improvement actions on the Lathrop Bayou Habitat Management Area (HMA), Jupiter Inlet Lighthouse Outstanding Natural Area (ONA), and Meadowood Special Recreation Management Area (SRMA) surface tracts (a total of 1,075 acres) under the vegetation, fish and wildlife, and special status species resource programs, would decrease vegetation cover over the short term. Over the long term, conducting vegetation treatments would enhance the health of vegetation communities and could increase vegetation cover. For example, prescribed burning increases soil productivity by releasing nutrients that promote growth of vegetation. Such enhancements would decrease soil exposure and increase soil organic matter, aggregation of soil particles, and soil porosity.

Suppressing wildland fires would reduce or prevent the loss of organic material and vegetation cover (standing and nonstanding) caused by fire, which would reduce soil exposure. Suppressing wildland fires would also limit the spread of high-intensity fires that could adversely affect soil organisms and kill the root systems of some plants and the existing seed bank. Such fires can compromise future plant recruitment and growth rates over the long term and thereby reduce vegetation cover that serves to stabilize soil. In the long term, fire suppression could alter the fire regime and increase the occurrence of uncharacteristically large or intense wildfires, which could increase vegetation removal, soil erosion, and alterations to soil chemistry.

Management actions (e.g., capping and restoring) to conserve sensitive cultural resource sites would affect soil resources by reducing soil erosion. Such activities would involve revegetation of cultural sites,

which would reduce surface runoff and soil exposure and thereby reduce soil erosion and loss and help to maintain soil productivity. However, impacts would be minor and would only occur in the immediate vicinity of affected cultural sites. These impacts might be greater in the Jupiter Inlet Lighthouse ONA and Egmont Key tract because of more intensive protections afforded to cultural resources in these areas.

Managing 185 acres as visual resource management (VRM) Class II would limit the type and extent of construction projects to retain the existing character of the landscape. This would reduce the amount of vegetation removal, soil disturbance, and subsequent soil erosion, which would help to maintain soil productivity.

Surface disturbing activities associated with oil and gas development, such as the construction of well pads, roads, and pipelines, would disturb and degrade soils. Projected development of 815 oil and gas wells would create an initial disturbance of 4,964 acres and residual disturbance (after reclamation activities) of 1,624 acres (BLM 2012a). Table 4-8 shows the distribution of surface disturbance by state. These surface disturbances would remove vegetation cover, which would expose soils, reduce the ability of vegetation to stabilize soils, increase overland flow, and result in accelerated erosion. The erosive forces of wind and water would mobilize exposed soil and deposit it downslope and in nearby water bodies, which would result in the loss of nutrient-rich topsoil and decreased soil productivity. Effects on soil productivity directly affect vegetation growth rates, which further degrade the health and function of vegetation communities and thereby exacerbate impacts on soil resources. The residual disturbance of 1,624 acres would include roads and developed areas associated with well pads, compressor stations, and fuel tanks. These areas have compacted soils with low infiltration rates, which can lead to high rates of sheet erosion from water running over these compacted surfaces. As water flows from the compacted areas and encounters uncompacted soils, gullying can occur, creating channels and resulting in extensive erosion. Implementation of Best Management Practices (BMP) (Appendix D) would help to mitigate these impacts. In a few locations, there are prime or unique farmlands on FMO. Therefore, it is possible that some of the 4,964 acres of anticipated disturbance could occur on prime or unique farmland. If development were proposed in such areas, BLM would implement appropriate mitigation measures to avoid or minimize impacts.

Table 4-8. Distribution of Oil and Gas Wells and Associated Disturbance by State

State	Number of Wells Drilled	Initial Disturbance (Acres)	Residual Disturbance (Acres)
Arkansas	440	2,608	834
Kentucky	29	139	52
Louisiana	320	2,082	687
Tennessee	2	14	4
Virginia	21	100	41
Florida	3	21	6
Total	**815**	**4,964**	**1,624**

Phosphate mining activities in Florida, including excavation and the construction of roads and associated infrastructure, would disturb and degrade soils. Projected mining would occur on 802 acres (already leased) in Florida and potentially on an additional 1,083 acres expected to be leased over the next 10 years. Such disturbance would decrease vegetation cover, which would expose soils, reduce the ability of vegetation to stabilize soils, increase overland flow, and result in accelerated erosion. The erosive forces of wind and water would mobilize exposed soil and deposit it downslope and in nearby water bodies,

which would result in the loss of nutrient-rich topsoil and decreased soil productivity. Effects on soil productivity directly affect vegetation growth rates, which further degrade the health and function of vegetation communities and thereby exacerbate impacts on soil resources. Such impacts would persist until reclamation actions resulted in the reestablishment of vegetation communities on disturbed areas.

In the removal and stockpiling phase of phosphate mining, the natural soil horizons would be irreversibly altered and soil texture, consistency, structure, plant nutrient levels, and moisture regimes would be changed. The hydrologic characteristics of the disturbed soil materials would be different. Permeability could be increased initially by the breaking up of the soil horizons. The mixing of the soil horizons might limit uses following reclamation. There could be soil loss from the erosion of the stockpiled soils used during reclamation.

In phosphate mining the natural profile of radioactivity, which increases with depth, would be altered by mining and reclamation. The alteration of the radioactivity would result in an increase in the near-surface concentration of radium. An increase in the concentration of radium in the near-surface soil is of concern because of the formation of the decay product radon.

Because coal development activities in eastern Kentucky would be limited to underground mining methods and would use existing infrastructure, these activities would not disturb the soils on the surface.

Dispersed recreation use and travel on the surface tracts would result in soil compaction and trampling and degradation of vegetation. This would reduce the ability of vegetation to stabilize soils and would increase overland flow and subsequent soil erosion. Loss of nutrient-rich topsoil and soil compaction would reduce vegetation growth rates, which would further degrade the health and function of vegetation communities and thereby exacerbate impacts on soil resources. Providing recreation facilities and opportunities (e.g., trail-based and equestrian activities) in the Meadowood SRMA and Big Saline Bayou SRMA would further encourage, and likely increase, recreation use in these areas and increase the degree of related impacts.

Soils would be affected by new land uses after disposal (or exchange) of four surface tracts with a total of 77.27 acres. It is assumed that new land use would be similar to surrounding use in the vicinity of each tract. For three tracts in Arkansas (55 acres), new land use would likely include timber harvest, conversion to pasture, and construction of access roads and possibly home sites. In Florida, the Lake Marion tract (22.27 acres) would likely be incorporated into the surrounding residential development. Impacts would include removal of vegetation cover and soil disturbance, resulting in increased soil erosion. Impacts would be localized and greatest in the short term, immediately following vegetation removal and construction activities. Potential for erosion would be higher on the relatively steep slopes of the Arkansas tracts compared with the relatively flat land and sandy soils of the Lake Marion tract. Over the long term, impacts would diminish as new uses and vegetation cover were established. Transfer of three tracts, with a total of 83.57 acres, for management by other agencies, could result in instances of short-term soil disturbance and erosion but overall would provide for soil conservation. The potential also exists for rights-of-way (ROW) to be developed under the lands and realty program. This would involve clearing vegetation and disturbing soils to make way for communication towers and linear features, such as roads, pipelines, and transmission lines. This would decrease vegetation cover and thereby expose soils, increase overland flow, and result in accelerated erosion. However, based on historic activities, development of ROWs on BLM-administered surface tracts is anticipated to be low.

4.3.3 Alternative B (Preferred Alternative)

Impacts on soil resources from implementing actions for wildland fire, cultural resources, phosphate mining, and coal mining would be the same as those identified under Alternative A.

The impacts on soil resources from conducting vegetation treatments and implementing habitat improvement actions would increase compared with Alternative A because habitat management actions, including vegetation treatments, could be applied to all surface tracts identified for retention (2,776 acres), which would be an increase of 1,701 acres compared with Alternative A. These actions would be implemented to maintain desired vegetation communities and to support habitat goals identified in the state wildlife action plan (WAP). In the short term, these actions would decrease vegetation cover, which would expose soils, increase overland flow, and result in accelerated erosion. However, expanding treatments to maintain desired vegetation would enhance the health of vegetation communities and increase vegetation cover, which would decrease soil exposure, stabilize soils, and increase soil organic matter, aggregation of soil particles, and soil porosity. This, in turn, would reduce soil erosion and subsequent loss and maintain soil productivity.

The impacts on soil resources from VRM would be similar to those identified for Alternative A, except only 92 acres would be managed as VRM Class II (50% decrease compared with Alternative A). This would reduce the amount of area subject to restrictions on surface disturbance and construction activities for the purposes of protecting visual resources. This VRM Class change by itself, however, would not likely lead to actions that would increase vegetation removal, soil disturbance, and subsequent erosion.

Impacts from oil and gas development would be the same as described for Alternative A, except that locations of some well sites would change because of stipulations designed to protect sensitive resources.

The impacts on soil resources from managing recreation and travel would be the same as those identified under Alternative A, except that closing 8,236 feet of roads to off-highway vehicle (OHV) use would reduce the potential for soil disturbance and erosion.

Soils would be affected by new land uses after disposal (or exchange) of six surface tracts with a total of 87.96 acres. It is assumed that new land use would be similar to surrounding use in the vicinity of each tract. For three tracts in Arkansas (65 acres), new land use would likely include timber harvest, conversion to pasture, and construction of access roads and possibly home sites. In Florida, three tracts (22.96 acres) would likely be incorporated into surrounding residential developments. Impacts would include removal of vegetation cover and soil disturbance, resulting in increased soil erosion. Impacts would be localized and greatest in the short term, immediately following vegetation removal and construction activities. Potential for erosion would be higher on the relatively steep slopes of the Arkansas tracts compared with the relatively flat land and sandy soils of the Florida tracts. Over the long term, impacts would diminish as new uses and vegetation cover were established. Transfer of four tracts, with a total of 127.4 acres, for management by other agencies, could result in instances of short-term soil disturbance and erosion but overall would provide for soil conservation. The potential also exists for ROWs to be developed under the lands and realty program. This would involve clearing vegetation and disturbing soils to make way for communication towers and linear features, such as roads, pipelines, and transmission lines. This would decrease vegetation cover and thereby expose soils, increase overland flow, and result in accelerated erosion. However, the likelihood of development would be reduced compared with Alternative A because all surface tracts would be identified as ROW avoidance areas.

4.3.4 Alternative C

Impacts on soil resources from implementing actions for wildland fire, cultural resources, phosphate mining, and coal mining would be the same as those identified under Alternative A. Impacts on soil resources from implementing actions for VRM, oil and gas development, recreation management, travel and access management, and ROW development would be the same as those identified under Alternative B.

The impacts on soil resources from conducting vegetation treatments and implementing habitat improvement actions would be the same as for Alternative B, except that management actions could be implemented on 2,836 (60 additional) acres identified for retention. These actions would be implemented to maintain desired vegetation communities and to support habitat goals identified in the state WAP. In the short term, these actions would decrease vegetation cover, which would expose soils, increase overland flow, and result in accelerated erosion. However, expanding treatments to maintain desired vegetation would enhance the health of vegetation communities and increase vegetation cover, which would decrease soil exposure, stabilize soils, and increase soil organic matter, aggregation of soil particles, and soil porosity. This, in turn, would reduce soil erosion and subsequent loss and maintain soil productivity.

Soils would be affected by new land uses after disposal or exchange) of three surface tracts with a total of 27.75 acres. It is assumed that new land use would be similar to surrounding use in the vicinity of each tract. For the five-acre Drasco tract in Arkansas, new land use would likely be conversion to pasture with possible construction of an access road and home site. In Florida, two tracts (22.75 acres) would likely be incorporated into surrounding residential developments. Impacts would include removal of vegetation cover and soil disturbance, resulting in increased soil erosion. Impacts would be localized and greatest in the short term, immediately following vegetation removal and construction activities. Potential for erosion would be higher on the Drasco tract compared with the relatively flat land and sandy soils of the Florida tracts. Over the long term, impacts would diminish as new uses and vegetation cover were established. Impacts from transfer of four tracts, with a total of 127.4 acres, would be the same for Alternative B.

4.3.5 Alternative D

Impacts on soil resources from implementing actions for vegetation, fish and wildlife, special status species, wildland fire, cultural resources, phosphate mining, and coal mining would be the same as those identified under Alternative A. Impacts on soil resources from implementing actions for VRM, oil and gas development, and ROW development would be the same as those identified under Alternative B.

Impacts on soil resources from travel and access management actions would be the same as those described in Alternative A, except that closing 4,206 feet of roads to OHV use would reduce the potential for soil disturbance and erosion. The impacts from recreation management would be the same as for Alternative A, except that impacts from managing the Big Saline Bayou tract as an SRMA would not occur.

Soils would be affected by new land uses after disposal (or exchange) of 16 surface tracts with a total of 615.87 acres. It is assumed that new land use would be similar to surrounding use in the vicinity of each tract. For 12 tracts in Arkansas (580 acres), new land use would likely include timber harvest, conversion to pasture, and construction of access roads and possibly home sites. In Florida, four tracts (35.87 acres) would likely be incorporated into surrounding residential developments. Impacts would include removal of vegetation cover and soil disturbance, resulting in increased soil erosion. Impacts would be localized and greatest in the short term, immediately following vegetation removal and construction activities. Potential for erosion would be higher on the relatively steep slopes of the Arkansas tracts compared with the relatively flat land and sandy soils of the Florida tracts. Over the long term, impacts would diminish as new uses and vegetation cover were established. Transfer of six tracts, with a total of 542.67 acres, for management by other agencies could result in instances of short-term soil disturbance and erosion but overall would provide for soil conservation.

4.4 WATER RESOURCES

This section presents potential impacts on water resources from implementing management actions for each resource program. Existing conditions concerning water resources are described in Chapter 3.

4.4.1 Assumptions

The analysis is based on the following assumptions:

- Surface disturbance and vegetation removal would increase overland flow and soil erosion and thereby would increase the transport of sediment and nutrients to nearby water bodies.
- Management actions that mitigate impacts on soil and vegetation resources would help minimize soil erosion and subsequent sediment and nutrient loading to water bodies.
- The degree of impact attributed to any one disturbance or series of disturbances is influenced by several factors, including location within the watershed, time and degree of disturbance, existing vegetation, precipitation, and mitigating actions applied to the disturbance.
- Eroded soil could be deposited as sediment at any point downslope or could be transported to water bodies such as streams, rivers, wetlands, lakes, and reservoirs.
- The amount of sediment from upland soil erosion transported downslope or into water bodies depends on distance, slope, soil texture, filtering capacity of upland and riparian vegetation, and storm intensity and duration.

4.4.2 Alternative A (No Action Alternative)

Conducting vegetation treatments (e.g., prescribed burning, mechanical, chemical, manual, and biological) and continuing habitat improvement actions on the Lathrop Bayou HMA, Jupiter Inlet Lighthouse ONA, and Meadowood SRMA surface tracts (a total of 1,075 acres), under the vegetation, fish and wildlife, and special status species resource programs, would decrease vegetation cover over the short term, which could increase overland flow. Increases in overland flow could increase the amount of water sediment and nutrients transported to streams and rivers. Over the long term, conducting vegetation treatments would enhance vegetation communities and the overall health and function of the watershed. This would increase the capacity of the watershed to slow overland flow, minimize soil erosion, and filter water and sediment. Increasing the health and functional conditions of watersheds would reduce the sediment and nutrients transported to water bodies, which would help to maintain water quality.

Suppressing wildland fires would reduce or prevent the loss of vegetation cover (standing and nonstanding) caused by fire, which would reduce soil exposure, overland flow, and subsequent soil erosion. This would reduce the amount of water, sediment, and nutrients delivered to water bodies, which would help to maintain water quality and stream channel structure. Suppressing wildland fires would also help to minimize the extent that fires could burn with enough heat to adversely affect soil organisms and kill the root systems of some plants and the existing seed bank. Such fires could compromise future plant recruitment and growth rates over the long term and thereby reduce vegetation cover and increase erosion and the transport of sediment and nutrients to water bodies. In the long term, however, fire suppression could alter the fire regime and increase the occurrence of uncharacteristically large or intense wildfires, which could increase vegetation removal, soil erosion, alterations to soil chemistry, and related impacts on water resources.

Management actions (e.g., capping and restoring) to conserve sensitive cultural resources would affect water resources by reducing surface runoff. Such activities would involve revegetation of cultural sites, which would increase the capacity of the watershed to slow overland flow, minimize soil erosion, and filter water and sediment. Such conditions would directly reduce the amount of water, sediment, and nutrients delivered to water bodies, which would help to maintain water quality. However, impacts would be minor and would only occur in the immediate vicinity of affected cultural sites. These impacts might be greater in the Jupiter Inlet Lighthouse ONA and Egmont Key tract because of more intensive protections afforded to cultural resources in these areas.

Managing 185 acres as VRM Class II would limit the type and extent of construction projects to retain the existing character of the landscape. This would reduce the extent of vegetation removal, overland flow, and soil erosion, which would decrease the transport of water, sediment, and nutrients to water bodies and thereby help to maintain water quality and stream channel structure.

Land clearing and grading activities associated with oil and gas development, such as the construction of well pads, roads, and pipelines, would remove vegetation and disturb soils. Projected development of 815 oil and gas wells would create an initial disturbance of 4,964 acres and residual disturbance of 1,624 acres (BLM 2012a). Table 4-9 shows the distribution of surface disturbance by state. These surface disturbances would decrease vegetation cover, which would increase overland flow, result in accelerated soil erosion, and decrease the ability of a watershed to buffer high flows and filter water and sediment. Soil mobilized by wind and water erosion would be transported downslope and to nearby water bodies, which would increase sediment and nutrient loads to streams, rivers, lakes, and reservoirs. Excessive inputs of sediment and nutrients could degrade water quality by increasing turbidity and the probability of eutrophication. Increases in overland flow also would directly increase the amount of water transported to streams and rivers, which could lead to increased downcutting, widening, and overall degradation of stream channels. The residual disturbance of 1,624 acres would include roads and developed areas associated with well pads, compressor stations, and fuel tanks. These areas have compacted soils with low infiltration rates, which can lead to high rates of sheet erosion from water running over these compacted surfaces. As water flows from the compacted areas and encounters uncompacted soils, gullying can occur, creating channels and resulting in extensive erosion and subsequent sedimentation of nearby water bodies.

Table 4-9. Distribution of Oil and Gas Wells and Associated Disturbance by State

State	Number of Wells Drilled	Initial Disturbance (Acres)	Residual Disturbance (Acres)
Arkansas	440	2,608	834
Kentucky	29	139	52
Louisiana	320	2,082	687
Tennessee	2	14	4
Virginia	21	100	41
Florida	3	21	6
Total	**815**	**4,964**	**1,624**

Source: BLM 2012

Above ground oil and gas development activities can affect surface water and groundwater used for domestic and public water supplies by leaks and spills associated with the use, transportation, storage, and disposal of chemicals and liquids associated with drilling and production. Operators are required by

Onshore Order No. 1 (See Appendix D) to have an approved surface use plan with provisions for adequate protection of surface water and groundwater, including the means for containment and disposal of all waste materials. Any accidental spill, leak, or contamination would be addressed through permitting and spill response plans in coordination with state agencies with direct responsibilities under the Clean Water and Safe Drinking Water Acts. Inspection and monitoring by BLM would provide a way to anticipate and prevent potential problems. Any surface discharge of waste would require a National Pollution Discharge Elimination System (NPDES) permit from the appropriate state agency.

There is also potential for groundwater contamination below ground from well drilling and completion, and during production. Types of chemical additives used in drilling, completion, and hydraulic fracturing might include acids, alcohols, hydrocarbons, thickening agents, lubricants, and other additives that are operator and location specific. Loss of drilling fluids might occur at any time in the drilling process as a result of changes in porosity or other properties of the rock being drilled through, for both the surface casing and the production hole. When this occurs, drilling fluids might be introduced into the surrounding formations, including aquifers. Proper well construction, including installation of surface casing and cementing, is designed to isolate and protect aquifers from drilling and production fluids. Cementing means that cement is pumped between the surface casing and the annulus or open space between the well bore and the casing. State agencies regulate the depth of protective casings and cementing requirements to protect groundwater resources. For nine counties within the Fayetteville Shale area, for example, a minimum of 1,000 feet of surface casing is required to be set and cemented to the surface, and cement is required to be circulated to the surface on all production casings to isolate the well bore from geologic strata above the Fayetteville Shale (AOGC 2011).

Currently, there is much public concern regarding the potential impacts of hydraulic fracturing, which is a technique to maximize extraction of fluid minerals. At this time, it is unknown how many, or which, of the wells identified in the RFD would be subject to hydraulic fracturing. However, it would be expected to be typical of the horizontal wells drilled in the Fayetteville Shale area. Hydraulic fracturing involves high pressure pumping of fluids into the producing geologic formation to create factures, thus increasing permeability and allowing the gas or oil to move more freely to the well bore. The fluids are typically water based with a variety of additives, which vary to meet the needs of each specific location. Proppants are carried in suspension in the fluid, and emplaced during the fracturing process to help keep fractures open. Fracturing fluids returning to the surface are referred to as flowback. The fluids may be recycled, reused in other wells, or disposed. For disposal, a permit would be required under either the NPDES program or the Underground Injection Control (UIC) program, as regulated by either the Environmental Protection Agency (EPA) or states with UIC primacy. Production wells are not covered under the UIC program, except that hydraulic fracturing would be regulated if diesel fuel were used in the fluid or propping agent.

Groundwater resources would be protected from hydraulic fracturing operations by proper well construction, including the previously described casing and cementing requirements. However, there is also concern about potential for impacts from the fracturing itself, including the potential extension of fracturing into water-bearing formations. A draft investigation (EPA 2011a) of groundwater contamination near Pavillion, Wyoming, concluded that “constituents associated with hydraulic fracturing have contaminated groundwater at and below the depth used for domestic water supply.”

Within the Pavillion study area, hydraulic fracturing “occurred into zones of producible gas located within an Underground Source of Drinking Water.” Water wells in the area were screened as deep as 800 feet, while fracturing had occurred in gas production wells as shallow as 1,220 feet. The EPA (2011b) noted that the investigation findings “are specific to Pavillion, where the fracturing is taking place in and below the drinking water aquifer and in close proximity to drinking water wells—production conditions different from those in many other areas of the country.” The EPA is obtaining peer review of the draft

Pavillion investigation and is conducting further study of the potential impacts of hydraulic fracturing (EPA 2011c). Pavillion conditions are dissimilar, for example, to the Fayetteville Shale play area, where the gas reservoir is found at depths of 1,500 to 6,500 feet (BLM 2008a), which a greater depth relative to those of typical groundwater wells.

Domestic water wells were sampled in the Fayetteville Shale area to describe general water quality and geochemistry, and to investigate the potential effects of gas production on shallow groundwater (Kresse, et al. 2012). Specifically, 127 domestic water wells in Van Buren and Faulkner Counties were sampled, including 51 that were tested for methane. Thirty-two of the samples had methane concentrations above the detection limit of 0.0002 mg/L, including a sample up to 28.5 mg/L. The carbon isotopic composition in the samples with the highest concentrations, however, indicated that the methane was likely biogenic in origin and not from gas production.

In addition to flowback, water is typically produced in conjunction with oil and gas. Produced water is separated from the oil and gas and must be disposed in accordance with Onshore Order No. 7 and BMPs (see Appendix D.) 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 UIC program. Underground injection of flowback water is also regulated through the UIC program. Any surface disposal would require a permit under the NPDES program.

It is expected that typical operations, including regulation of well construction and water disposal, would substantially minimize potential contamination of surface water and groundwater. However, accidental spills and well casing and cement failures could occur, resulting in localized impacts.

Water is required for oil and gas drilling operations, potentially affecting local water supplies. While the quantities of water required for conventional oil and gas drilling is relatively small, hydraulic fracturing operations require substantial amounts of water. The water required for fracturing a well in the Fayetteville Shale area is estimated to be 2.9 million gallons per well (EPA 2011c). Over a 10-year period, a total of 428 wells are projected to be drilled on FMO in 15 counties within the Fayetteville Shale area. This would project to a water use requirement averaging 350,000 gallons of water per day over the 10-year period. This equates to 0.01 percent of average daily water use in 2005 (for myriad uses, including domestic, industrial, commercial, and irrigation) in the same 15-county area (Holland 2007). The relative amount required for hydraulic fracturing of FMO wells would be locally higher in some specific counties. The highest would be Van Buren County, where 100 FMO wells over the 10-year period would require about 80,000 gallons per day or 2.65 percent of the average daily water use in Van Buren County in 2005. Acquiring that water is done under state authorized permits. In the case of the Fayetteville Shale area, the Arkansas Natural Resources Commission (ANRC) issues water permits, including those for oil and gas drilling purposes. ANRC uses the Arkansas Water Plan basin reports to permit the withdrawal of up to 25 percent of the water determined to be excess to the needs of the basin, where it would “cause no significant adverse environmental impact.” In other states, water use for oil and gas well drilling would also be subject to state permitting. The potential for impacts would be reduced, however, because fewer wells are expected and hydraulic fracturing of horizontal would not be as extensive as in the Fayetteville Shale.

Phosphate mining activities in Florida, including excavation and the construction of roads and associated infrastructure, would remove vegetation, disturb soils, and alter surface flow patterns. Projected mining would occur on 802 acres (already leased) in Florida and potentially an additional 1,083 acres expected to be leased over the next 10 years. Such disturbance would decrease vegetation cover, which would increase overland flow, result in accelerated soil erosion, and decrease the ability of a watershed to buffer high flows and filter water and sediment. Soil mobilized by wind and water erosion would be transported downslope, which would increase sediment and nutrient loads to nearby water bodies. Excessive inputs of

sediment and nutrients could degrade water quality by increasing turbidity and the probability of eutrophication. Phosphate mining would also increase the potential for other harmful pollutants to enter surface water and groundwater sources and degrade water quality. Such pollutants include phosphates, metals, lead, and radiological materials formerly contained in the phosphate matrix. Increases in overland flow also would directly increase the amount of water transported to streams and rivers, which could lead to increased downcutting, widening, and overall degradation of stream channels. Such impacts would persist until reclamation actions resulted in the reestablishment of vegetation communities on disturbed areas.

Because coal development activities in eastern Kentucky would be limited to underground mining methods and would use existing infrastructure, these activities would not create substantial impacts on surface water features. However, impacts on groundwater sources could occur if mining occurred in water-bearing formations. Migration of contaminants into the surrounding soils and aquifers could degrade groundwater quality and possibly the baseflow of streams, thereby affecting water sources that might serve household and domestic uses. Furthermore, impacts on groundwater could occur if dewatering activities were required to access coal resources. Any discharges to surface waters from coal mine dewatering activities would require an NPDES permit.

Dispersed recreation use and travel on the surface tracts would result in soil compaction and trampling and degradation of vegetation. This would reduce the ability of vegetation to stabilize soils and increase overland flow and subsequent soil erosion. As a result, sediment and nutrient loading of streams, rivers, lakes, and reservoirs would increase and cause degradation of water quality. Increases in overland flow would also directly increase the amount of water transported to streams and rivers, which could lead to increased downcutting, widening, and overall degradation of stream channels. Providing recreation facilities and opportunities (e.g., trail-based and equestrian activities) in the Meadowood SRMA and Big Saline Bayou SRMA would further encourage and likely increase the recreational use in these areas and increase the degree of impacts on water resources.

Water resources would be affected by new land uses after disposal (or exchange) of four surface tracts with a total of 77.27 acres. It is assumed that new land use would be similar to surrounding use in the vicinity of each tract. For three tracts in Arkansas (55 acres), new land use would likely include timber harvest, conversion to pasture, and construction of access roads and possibly home sites. In Florida, the Lake Marion tract (22.27 acres) would likely be incorporated into the surrounding residential development. Impacts would include removal of vegetation cover and soil disturbance, resulting in increased soil erosion and the transport of sediment and nutrients to surface water sources. Impacts would be greatest in the short term, immediately following vegetation removal and construction activities. Potential for erosion would be higher on the relatively steep slopes of the Arkansas tracts compared with the relatively flat land and sandy soils of the Lake Marion tract. Over the long term, impacts would diminish as new uses and vegetation cover were established. Transfer of three tracts, with a total of 83.57 acres, for management by other agencies, could result in instances of short-term soil disturbance and erosion and transport of sediment and nutrients to surface water sources, but over the long term would provide for watershed conservation. The potential also exists for ROWs to be developed under the lands and realty program. This would involve clearing vegetation and disturbing soils to make way for communication towers and linear features, such as roads, pipelines, and transmission lines. This would increase soil erosion and the transport of sediment and nutrients to surface water sources, and would decrease the ability of the watershed to buffer high flows. However, based on historic activities, development of ROWs on BLM-administered surface tracts is anticipated to be low.

4.4.3 Alternative B (Preferred Alternative)

Impacts on water resources from implementing actions for wildland fire, cultural resources, phosphate mining, and coal mining, would be the same as those identified under Alternative A. Impacts from oil and gas development would be the same except that locations of some well sites would change because of stipulations designed to protect sensitive resources.

The impacts on water resources from conducting vegetation treatments and implementing habitat improvement actions would be similar to those identified for Alternative A, except management actions could be applied to all surface tracts identified for retention (2,776 acres), which is an increase of 1,701 acres compared with Alternative A. In addition, desired vegetation communities would be managed to meet habitat goals identified in the state WAP. These actions would further decrease vegetation cover over the short term, which would increase overland flow, result in accelerated soil erosion, and decrease the ability of a watershed to buffer high flows. However, over the long term, expanding treatments would further enhance vegetation communities and the overall health and function of the watershed, which would serve to reduce the amount of water, sediment, and nutrients transported to water bodies.

The impacts on water resources from VRM would be similar to those identified for Alternative A, except only 92 acres would be managed as VRM Class II (50% decrease compared with Alternative A). This would reduce the amount of area subject to restrictions on surface disturbance and construction activities for the purposes of protecting visual resources, which would allow increases in vegetation removal, soil erosion, and related impacts on water resources.

The impacts on water resources from oil and gas development activities would be similar to those identified under Alternative A. However, stipulations would be implemented to protect specific water features, which would reduce impacts in specific areas. A No Surface Occupancy (NSO) stipulation would be applied in areas within 250 feet of a river, stream, wetland spring, headwater, wet meadow, wet pine savanna, pond, tributary, lake, coastal slough, vernal pool on granite outcrops, and calcareous seepage marsh, which would eliminate impacts associated with new oil and gas leases in these areas. Total initial disturbance of 4,964 acres would be the same as those identified under Alternative A but would avoid the areas protected by stipulations.

The impacts on water resources from managing recreation and travel would be the same as those identified under Alternative A, except that closing 8,236 feet of roads to OHV use would reduce the potential for soil disturbance, erosion and sedimentation, and related impacts on water resources.

Water resources would be affected by new land uses after disposal (or exchange) of six surface tracts with a total of 87.96 acres. It is assumed that new land use would be similar to surrounding use in the vicinity of each tract. For three tracts in Arkansas (65 acres), new land use would likely include timber harvest, conversion to pasture, and construction of access roads and possibly home sites. In Florida, three tracts (22.96 acres) would likely be incorporated into surrounding residential developments. Impacts would include removal of vegetation cover and soil disturbance, resulting in increased soil erosion, and the transport of sediment and nutrients to surface water sources. Impacts would be greatest in the short term, immediately following vegetation removal and construction activities. Potential for erosion would be higher on the relatively steep slopes of the Arkansas tracts compared with the relatively flat land and sandy soils of the Florida tracts. Over the long term, impacts would diminish as new uses and vegetation cover were established. Transfer of four tracts, with a total of 127.4 acres, for management by other agencies, could result in instances of short-term soil disturbance and erosion and transport of sediment and nutrients to surface water sources but over the long term would provide for watershed conservation. The potential also exists for ROWs to be developed under the lands and realty program. This would involve clearing vegetation and disturbing soils to make way for communication towers and linear

features, such as roads, pipelines, and transmission lines. This would increase soil erosion and the transport of sediment and nutrients to surface water sources, and would decrease the ability of the watershed to buffer high flows. However, the likelihood of development would be reduced compared with Alternative A because all surface tracts would be identified as ROW avoidance areas.

4.4.4 Alternative C

Impacts on water resources from implementing actions for wildland fire, cultural resources, phosphate mining, and coal mining would be the same as those identified under Alternative A. Impacts on water resources from implementing actions for VRM, recreation management, travel and access management, and ROW development would be the same as those identified under Alternative B.

The impacts on water resources from conducting vegetation treatments and implementing habitat improvement actions would be similar to those identified for Alternative B, except management actions could be implemented on 60 additional acres identified for retention. In addition, desired vegetation communities would be managed to meet habitat goals identified in the state WAP. These actions would further decrease vegetation cover over the short term, which would increase overland flow, result in accelerated soil erosion, and decrease the ability of a watershed to buffer high flows. However, over the long term, expanding treatments would further enhance vegetation communities and the overall health and function of the watershed, which would serve to reduce the amount of water, sediment, and nutrients that are transported to water bodies.

The impacts on water resources from oil and gas development activities would be similar to those identified under Alternative A. However, stipulations would be implemented to protect specific water features, which would reduce impacts in specific areas. An NSO stipulation would be applied in areas within 500 feet of a river, stream, wetland spring, headwater, wet meadow, wet pine savanna, pond, tributary, lake, coastal slough, vernal pool on granite outcrops, and calcareous seepage marsh, which would eliminate impacts associated with new oil and gas leases in these areas. Total disturbance of 4,964 acres would be the same as those identified under Alternative A but would avoid the areas protected by stipulations.

Water resources would be affected by new land uses after disposal (or exchange) of three surface tracts with a total of 27.75 acres. It is assumed that new land use would be similar to surrounding use in the vicinity of each tract. For the five-acre Drasco tract in Arkansas, new land use would likely be conversion to pasture with possible construction of an access road and home site. In Florida, two tracts (22.75 acres) would likely be incorporated into surrounding residential developments. Impacts would include removal of vegetation cover and soil disturbance, resulting in increased soil erosion, and the transport of sediment and nutrients to surface water sources. Impacts would be greatest in the short term immediately following vegetation removal and construction activities. Potential for erosion would be higher on the Drasco tract compared with the relatively flat land and sandy soils of the Florida tracts. Over the long term, impacts would diminish as new uses and vegetation cover were established. Transfer of four tracts, with a total of 127.4 acres, for management by other agencies, could result in instances of short-term soil disturbance and erosion and transport of sediment and nutrients to surface water sources but over the long term would provide for watershed conservation.

4.4.5 Alternative D

Impacts on water resources from implementing actions for vegetation, fish and wildlife, special status species, wildland fire, cultural resources, phosphate mining, and coal mining would be the same as those identified under Alternative A. Impacts on water resources from implementing actions for visual resources and ROW development would be the same as those identified under Alternative B.

The impacts on water resources from oil and gas development activities would be similar to those identified under Alternative A. However, stipulations would be implemented to protect specific water features, which would reduce impacts in specific areas. An NSO stipulation would be applied in areas within 100 feet of a river, stream, wetland spring, headwater, wet meadow, wet pine savanna, pond, tributary, lake, coastal slough, vernal pool on granite outcrops, and calcareous seepage marsh, which would eliminate impacts associated with new oil and gas leases in these areas. Total disturbance of 4,964 acres would be the same as those identified under Alternative A but would avoid the areas protected by stipulations (BLM 2009a).

Impacts on water resources from travel and access management actions would be the same as those described in Alternative B, except that closing 4,206 feet of roads OHV use would reduce the potential for soil disturbance, erosion and sedimentation, and related impacts on water resources. The impacts from recreation management would be the same as those identified under Alternative A, except that impacts from managing the Big Saline Bayou tract as an SRMA would not occur.

Water resources would be affected by new land uses after disposal (or exchange) of 16 surface tracts with a total of 615.87 acres. It is assumed that new land use would be similar to surrounding use in the vicinity of each tract. For three tracts in Arkansas (580 acres), new land use would likely include timber harvest, conversion to pasture, construction of access roads and possibly home sites. In Florida, four tracts (35.87 acres) would likely be incorporated into surrounding residential developments. Impacts would include removal of vegetation cover and soil disturbance, resulting in increased soil erosion, and the transport of sediment and nutrients to surface water sources. Impacts would be greatest in the short term, immediately following vegetation removal and construction activities. Potential for erosion would be higher on the relatively steep slopes of the Arkansas tracts compared with the relatively flat land and sandy soils of the Florida tracts. Over the long term, impacts would diminish as new uses and vegetation cover were established. Transfer of six tracts, with a total of 542.67 acres, for management by other agencies could result in instances of short-term soil disturbance and erosion and transport of sediment and nutrients to surface water sources but over the long term would provide for watershed conservation.

4.5 VEGETATION

This section presents potential impacts on vegetation from projected energy and mineral and surface tract management. A general discussion of impacts from oil and gas development in all states is followed by state-by-state analysis of impacts from mineral development and surface tract management. The impacts from development of federal minerals are based on RFD scenarios. Impacts from coal mining are limited to Kentucky, and impacts from phosphate mining are limited to Florida.

Impacts from surface tract management are based on Allowable Uses and Management Actions described by surface tract in Chapter 2 and Appendix B, and are limited to those states where BLM manages surface tracts: Arkansas, Florida, Louisiana, and Virginia. On surface tracts, vegetation would be affected by implementing management actions proposed for vegetation/wildlife and special status species management, wildland fire suppression, cultural resource management, VRM, recreation management, travel and access management, and lands and realty actions. No actions are planned specifically for water, soils, or paleontology, so they are not discussed further.

4.5.1 Assumptions

The analysis is based on the following assumptions:

- Implementing an activity plan, including SRMA and ACEC plans, would result in increased BLM management across all resources, including management for vegetation.
- Without intervention, invasive plant species found on surface tracts would expand their distribution, and new invasive species would become established.
- Transferring a tract out of federal ownership would result in land uses similar to those on surrounding private lands.

4.5.2 Alternative A (No Action Alternative)

Impacts from Energy and Minerals

All States

The leasing of federal oil and gas resources is a competitive process. After leasing, future well drilling would be processed through an application for permit to drill (APD), submitted by the leaseholder. The RFD scenario in this RMP identifies those general areas where development is most likely to occur over the next 10 years. This is based on geology, and historical and present activity, as well as factors such as economics, technological advances, access to oil and gas areas, transportation, and access to processing facilities. However, the specific locations of future BLM-authorized oil and gas wells cannot be predicted at this time. Across the six states, it is estimated that 4,964 acres of vegetation would be disturbed as a result of BLM-authorized oil and gas development (BLM 2012a). More than 90 percent of that disturbance is projected to occur in Arkansas and Louisiana.

Under the Alternative A, standard lease terms would be applied and additional leasing stipulations developed on a case-by-case basis, after field assessments and coordination with the surface management and regulatory agencies; however, there would be no systematic application of NSO and Controlled Surface Use (CSU) lease stipulations. The exception would be in Florida, where the Florida RMP, approved in 1995, provides mineral leasing stipulations that would continue to be implemented under Alternative A.

The typical oil and gas development scenario includes land clearing and grading for the construction of access roads, well pads, flowlines, and ancillary facilities. Vegetation and top soil are removed and top soil stockpiled for use during restoration activities. Adjacent vegetation could be damaged directly by equipment during construction or indirectly because of increased vulnerability to blowdowns in dense timber stands and degradation caused by increased dust and erosion. Disturbed areas are prone to erosion and runoff, particularly on cut and fill slopes in steeper terrain before an adequate cover of vegetation is established. Riparian vegetation is vulnerable to increased siltation, particularly after heavy or prolonged rain events near unconsolidated slopes.

There is some latitude to shift well locations at the APD stage to avoid sensitive vegetation but this does not provide for the application of lease stipulations that would preclude occupation of rare or localized plant communities such as riparian zones, native grasslands, and more widely distributed populations of priority plant species. Standard operating procedures are generally in place through Onshore Oil and Gas Order 1 (2007) to provide for site stabilization and restoration of roadsides and well pads through revegetation, seeding, and erosion control methods.

Most horizontal and directional wells can be drilled from multi-well pads with up to eight wells drilled on a single five- to six-acre well pad. This results in removal of less vegetation per individual well than on single well pads. Because of the larger area required for multi-well pads and some additional latitude in siting these far-reaching directional wells, there may be increased incentives to place well pads in flatter terrain, but if located in steeper terrain, impacts from the extensive cut and fill needed to create an adequate drilling pad could result in offsite impacts on nearby drainages. Extensive cut and fill slopes are vulnerable to erosion during heavy or prolonged precipitation events, particularly before an adequate cover of vegetation is established. This is likely to be more of an issue in Arkansas, eastern Kentucky, Tennessee, and Virginia where terrain is more rugged.

Once the well pad has been constructed and the drilling completed, the size of the well pad is typically reduced, retaining only those portions necessary for ongoing well monitoring and maintenance. At that time, BLM would require the operator to stabilize and complete interim restoration on the unneeded portions of the well pad. Of the initial 4,964 acres of disturbance, an estimated 3,340 acres would be available for interim restoration, with 1,624 acres used for maintenance over the life of the producing wells. Construction-related activities can impair the suitability of the site to support pre-construction vegetation communities even after reclamation; for example, if soil horizons have been mixed, soils compacted, or non-native soils brought in, it might be difficult to restore the original vegetation community at the site. Compaction and loss of top soil can retard germination and alter soil permeability, hindering the reestablishment of vegetation and compounding erosive influences.

Oil and gas development has the potential to facilitate the spread of invasive plants in new areas and to increase the extent of existing infestations. Invasive species, by definition, have the potential to displace native species and can alter the way vegetation communities function. Infestations are likely to occur or expand along access roads, flowlines, and in disturbed, unsurfaced areas on the edges of well pads. There is also the potential to introduce or augment invasive species in situations where the private landowner, or, to a lesser extent, the surface management agency, requires a specific seed mixture or planting on non-BLM surface FMO. The need to stabilize soils quickly can result in the use of “reliable” non-native species, such as annual rye, winter wheat, clovers, and non-native warm season grasses, which can slow the progression of natural succession and the reestablishment of native species. Both Onshore Order 1 and the BLM “Gold Book” include requirements for the operator to address the control of invasive weeds in their surface use plan and ensure that the well site is free of state or county noxious weeds before final abandonment (Gold Book 2007).

The acres of vegetation expected to be disturbed in each state by BLM-authorized oil and gas development are shown in Table 4-10.

Table 4-10. Distribution of Oil and Gas Wells and Associated Disturbance by State

State	Number of Wells Drilled	Initial Disturbance	Residual Disturbance
Arkansas	440	2,608	834
Kentucky	29	139	52
Louisiana	320	2,082	687
Tennessee	2	14	4
Virginia	21	100	41
Florida	3	21	6
Total	**815**	**4,964**	**1,624**

Source: BLM 2012

State-Specific Impacts from Energy and Minerals

Impacts on vegetation resources from energy and mineral actions in Alternative A specific to each state are discussed below.

Arkansas

In Arkansas, 440 oil and gas wells are expected to be developed within the FMO, resulting in 2,608 acres of initial disturbance of vegetation and 834 acres of residual disturbance (Table 4-10). Of this, 1,774 acres would be available for interim restoration, and 834 acres would continue to be used over the life of producing wells. The well locations would depend on the level of industry interest in a particular area and the presence of FMO in those areas. Map 3-13 shows the counties with projected oil and gas development, and Table 3-84 shows the number of anticipated wells by county.

Arkansas Ecoregions

Although wells could occur on FMO across the state, the percentage of projected disturbance by ecoregion is anticipated to be Arkansas Valley Ecoregion—67 percent, Ouachita Mountains Ecoregion—11 percent, Mississippi Alluvial Plains Ecoregion—10 percent, Boston Mountains Ecoregion—eight percent, South Central Plains Ecoregion—three percent, and Ozark Highlands Ecoregion—0.4 percent.

Up to 280 BLM-authorized wells are expected to target the Fayetteville Shale gas field in five counties: Van Buren (100 wells), Cleburne (60 wells), White (40 wells), Conway (40 wells) and St. Francis (40 wells). These wells are projected to be located primarily in the eastern Arkansas Valley Ecoregion and to a lesser extent the Boston Mountain Ecoregion, where there is considerably less FMO. The eastern portion of the Fayetteville Shale play extends into the Mississippi Alluvial Plain Ecoregion, where there is a block of FMO underlying the University of Arkansas, Pine Tree Research Center.

In the South Central Plain Ecoregion, 12 BLM-authorized wells are expected to be drilled over the next 10 years, with up to two wells each in Columbia, Lafayette, Miller, Nevada, Ouachita, and Union counties. Much of the FMO in this ecoregion is associated with Poison Springs State Park/Forest and scattered split-estate tracts in Ouachita and Nevada counties. This FMO includes an estimated 52 acres of

the Poison Springs State Forest Sand Barren and Oak-Forest Preserve. Leasing of federal minerals underlying state lands would not occur prior to consultation with the state.

Arkansas Vegetation Communities

Although BLM-authorized oil and gas development could occur on FMO across the state, it is anticipated that 75 percent of the impacts would occur in vegetation communities associated with the Fayetteville Shale area. Most of this FMO is in four relatively widespread plant communities: Ozark-Ouachita Dry-Mesic Oak Forest, Ozark-Ouachita Pine Bluestem Woodland, Ozark-Ouachita Pine Oak Woodland and Forest, and Ozark-Ouachita Riparian/South Central Interior Large Floodplain (see Table 3-24 for FMO acreage by vegetation community). Impacts on these vegetation communities would result in the loss of structure, reduction in canopy closure and stand sizes, and increases in edge with potential increases in invasive plant species. Species composition would be altered because these plant communities transition through early successional stages. If local hydrography and soils were maintained however, these plant communities are expected to be restored to the site, although it might be many decades for the forest and woodland structure to be reestablished.

The remaining 25 percent of the disturbance could occur in any of the other vegetation communities found on FMO. This could include disturbance in the almost 60,000 acres of FMO in agriculture and pasture. Impacts on less common and more sensitive vegetation communities, such as glades and barrens, remnant native prairies, riparian zones, mesic slopes, and seep vegetation communities are expected to be more long term and detract from state conservation goals. Glades and barrens occupied during oil and gas activities are not expected to be fully restored after construction and drilling activities. Clearing these areas would alter the thin soil characteristics associated with these vegetation communities, and changes to the hydrography would likely alter the species composition for the foreseeable future. Once disturbed, these sites would also be vulnerable to the establishment of invasive plants. Native prairies would also be difficult to restore because of changes to soils and the long-term management needed to restore the full component of native grasses and forbs. In addition, surface disturbances in these remnant prairies could introduce invasive non-native grasses and forbs that would be difficult to selectively remove in these grasslands and that could substantially alter species composition. Vegetation associated with seepage and mesic slopes would likely be irreversibly altered by construction activities in these habitats because of changes in hydrography and soils. Well pads can typically be shifted away from narrow riparian zones, but riparian areas can be damaged by access roads, flowlines, and stream crossings that can directly damage vegetation and increase downstream siltation.

Arkansas Priority Plant Species

Of the 57 priority plant species with occurrence records on or within one mile of FMO in the areas of expected development (AED), all but eight are associated primarily, although not exclusively, with specialized habitats such as glades, native grass prairies, sandhills, bluffs, wetlands, mesic slopes, or riparian zones. These habitats tend to occur in small patches embedded in more widespread vegetation communities, or are highly localized in distribution. Under the Alternative A, impacts on these plants would be addressed at the APD stage, as part of the onsite assessment and subsequent NEPA analysis. Construction activities could be adjusted to avoid identified populations of these plants or vegetation communities by making minor design changes to well pads and roads to reduce potential impacts on these species. However, direct and indirect impacts on these priority plant species would be expected. The limited acreage of these specialized habitats on FMO mitigates some of the impact only by reducing the probability that a federal well would be located on or near these priority species or in their associated habitat. In cases where these species are associated with larger blocks of FMO, direct and indirect impacts are more likely. For instance, 7,679 acres, or 80 percent, of the FMO in the southern AED is located in Ouachita and Nevada counties and near Poison Springs State/Forest and Park/Sand Barren and Oak-Pine

Forest Preserve. There are 15 endemic priority plant species located on or within a mile of these FMO tracts that occur on regionally important sand barrens and woodlands found nowhere else in the state. Development in this region is likely to occur in these key habitats. While federally listed species are provided more protection, and potential impacts would be reviewed in light of the Endangered Species Act (ESA); modifications to the surface use plan to protect priority species would be more limited in scope, and although impacts could be locally mitigated, they are not likely to be avoided.

Table 4-11 ranks the relative potential for each of these priority plant species to be affected by the projected oil and gas development based on proximity of known occurrences to FMO, distribution of the known occurrences in the AED, and potential for development activities to occur in the associated vegetation community. No priority plant species in Arkansas are ranked as having High Potential for impacts because ground disturbing activities are expected to occur on only two percent of the FMO in the AED. Species ranked as "Moderate" occur in multiple locations in areas near FMO. Species ranked as "Low" occur in very limited habitats or have very limited distribution near FMO. Species ranked as "Unlikely to Impact" occur in areas where drilling is unlikely to occur or have very limited known distribution that is near but not on FMO. Also included in the table is the reference to stipulations that do not apply to this alternative but would provide some level of protection in Alternatives B, C, and D (see Table C-2 in Appendix C for the full text of the stipulations).

The Ozark-Ouachita Riparian South Central Interior Large Floodplain habitat type, which contains 30,225 acres of FMO within high-priority habitat, is likely to be largely protected by wetland buffers under BLM's BMPs, as are the Lower Mississippi Alluvial Plain Grand Prairie and Lower Mississippi River High Bottomland and Riparian Forest habitat types.

Table 4-11. Potential Impacts on Priority Plant Species from Oil and Gas Development in Arkansas

Common Name *Scientific Name*	Natural Heritage Rank[1]	Occurrence Record Within 1 Mile of FMO or Surface Tract	Occurrence on FMO or Surface Tract	Habitat/ Occurrence Records	Potential Impact	Stipulation
Field pussytoes *Antennaria neglecta*	S1	X		Prairies, open woodlands, and abandoned fields across northern Arkansas.	Moderate—Three occurrences in 2 counties with 30 wells, including 2 east of Fort Chaffee. FMO at Wattensaw SWMA in Prairie County FMO 8 miles from occurrence record.	NSO #18
Curly threeawn *Aristida desmantha*	S1	X		Sandy fields and dry pine woods. Occurrence records in Nevada County associated with Poison Springs Park/ Forest.	Low—Only 2 wells projected over 10 years near 2 occurrence records in Nevada County.	
Wooly threeawn *Aristida lanosa*	S2	X		Dry fields, pine-oak woods, and	Low—Only 4 wells projected	

Common Name *Scientific Name*	Natural Heritage Rank[1]	Occurrence Record Within 1 Mile of FMO or Surface Tract	Occurrence on FMO or Surface Tract	Habitat/ Occurrence Records	Potential Impact	Stipulation
				uplands, typically in sandy soils. Occurrence records in Nevada County associated with Poison Springs Park/ Forest.	over 10 years near 4 occurrence records in Ouachita and Nevada counties.	
Savannah milkweed *Asclepias obovata*	S2	X		Sandy soils in pine and oak forests in central and southeastern areas of Arkansas.	Moderate—Ten wells projected over next 10 years near Wattensaw SWMA in Prairie County.	
Slimpod milkvetch *Astragalus leptocarpus*	S2	X	X	Sandy soils. Occurrence records in Nevada County associated with Poison Springs Park/ Forest.	Moderate—Seven occurrence records on or near FMO in Ouachita and Nevada counties near Poison Springs State Park/Forest. Low potential to affect species in Miller County, where 2 occurrence records are 3 miles from FMO, and 2 wells are projected.	
Soxman's milkvetch *Astragalus soxmaniorum*	S2	X		Xeric sandhills, abandoned fields, and roadsides. Occurrence records in Nevada County associated with Poison Springs Park/ Forest.	Low—Three occurrence records near FMO in Ouachita and Nevada counties near Poison Springs State Park/Forest. Low potential to affect species in Miller County, where 1 occurrence record is 3 miles from FMO, and 2 wells are projected.	
Texas bergia *Bergia texana*	S2	X	X	Wetlands in mud and moist soils along edges of rivers and pools. Occurrence	Low—One occurrence record on Lake Dardanelle, but not likely drilling	NSO #16

Common Name *Scientific Name*	Natural Heritage Rank[1]	Occurrence Record Within 1 Mile of FMO or Surface Tract	Occurrence on FMO or Surface Tract	Habitat/ Occurrence Records	Potential Impact	Stipulation
				records from the southeast and central areas of Arkansas.	location; also low potential in Faulkner County where there is 1 occurrence record near split-estate FMO.	
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.	Low—In Franklin County where no wells are projected. Moderate—in Prairie County on the Pine Tree Research Center.	NSO #16 NSO #18
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.	Moderate—Potential to occur on split-estate inholdings in the Ozark NF in Johnson County, where 20 wells are projected.	NSO #16
Threadstem caric sedge *Carex leptalea var. harperi*	S2S3	X		Wetlands. Occurrence records across state.	Low—One occurrence record near FMO in Nevada County (Poison Spring State Park); only 2 wells projected.	NSO #16
A caric sedge *Carex opaca*	S2S3		X	Low areas in prairies, roadside ditches, and poorly drained sites. Occurrence	Low—One occurrence record on Camp Joseph T. Robinson on edge of AED. Ten wells projected in	NSO #16 NSO #18

Common Name *Scientific Name*	Natural Heritage Rank[1]	Occurrence Record Within 1 Mile of FMO or Surface Tract	Occurrence on FMO or Surface Tract	Habitat/ Occurrence Records	Potential Impact	Stipulation
				records scattered across the central and northern portions of Arkansas.	Faulkner County.	
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.	Low—One record within a mile of 80 acres of split-estate FMO in Cleburne County. Searcy County records outside AED.	NSO #16
Blue cohosh *Caulophyllum thalictroides*	S2	X		Wide range of mesic deciduous forest communities. Occurrence records in north central and northwest portions of Arkansas.	Low—Only 1 occurrence record near FMO in the AED on north side of Greers Ferry Lake.	
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.	Low—Occurrence records on and near FMO at Greers Ferry Lake, but bluff habitat is not likely to be directly affected by oil and gas development.	
A tickseed *Coreopsis basalis*	S2	X		Sandy soils in open areas. Occurrence records associated with Poison Springs State Park/Forest.	Low—Four occurrence records near Poison Springs State Park/Forest, but only 1 within a mile of FMO and only 2 wells projected in Ouachita County.	
Scratch-daisy *Croptilon hookerianum var. validum*	S2	X	X	Sand, sandy gravel, dunes, stream terraces, and sandstone outcrops, often in areas of oak	Moderate—Populations near Fort Chaffee and Lake Dardanelle in counties expecting 20 wells	

Common Name *Scientific Name*	Natural Heritage Rank[1]	Occurrence Record Within 1 Mile of FMO or Surface Tract	Occurrence on FMO or Surface Tract	Habitat/ Occurrence Records	Potential Impact	Stipulation
				woodlands, roadsides, and road banks. Occurrence records along the length of the Arkansas River.	each.	
Mohlenbrock's flatsedge *Cyperus grayoides*	S1	X		Sandy soils. Occurrence records near Poison Springs State Park/Forest.	Low—Two occurrence records in Ouachita County near FMO, but only 2 wells projected.	
Downy oatgrass *Danthonia sericea*	S1	X		Well-drained sandy soils. Occurrence record associated with Poison Springs State Park/Forest.	Low—One occurrence record 0.3 miles from FMO in Nevada County, but only 2 wells projected.	
Carolina larkspur *Delphinium carolinianum ssp. vimineum*	S2	X		Limestone and dolomite glades, open rocky woods, and prairies. Occurrence records in southwest Arkansas.	Moderate—Occurrence adjacent to FMO near Poison Springs State Park/Forest.	NSO #4
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.	None—Not expected in AED on FMO outside NFs or Buffalo National River. One of state's largest populations occurs on Campbell Hollow surface tract in Searcy County outside the AED.	
Trelease's larkspur *Delphinium treleasei*	-		X	Limestone and dolomite glades, outcrops, and bluffs. Occurs in the Ozark Highlands Ecoregion in	Low—Most occurrences north of AED, except for northern Stone County, where there are several occurrence	NSO #4

Common Name *Scientific Name*	Natural Heritage Rank[1]	Occurrence Record Within 1 Mile of FMO or Surface Tract	Occurrence on FMO or Surface Tract	Habitat/ Occurrence Records	Potential Impact	Stipulation
				Arkansas.	records within 2–3 miles of FMO. Occurs on 2 surface tracts: Bennett Bayou and Foster Branch tracts in Fulton County outside the AED.	
Hay-scented cup fern *Dennstaedtia punctilobula*	S2	X		Rocky slopes, meadows, woods, streambanks, and roadsides in acid soils. Occurrence records across northwestern half of Arkansas.	Low—Only occurrence record near FMO is in White County and three-quarters of a mile away from 160-acre split estate.	
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.	Moderate—Occurrence record near split-estate FMO is in Pope County where up to 20 wells are expected.	NSO #4
Three-way sedge *Dulichium arundinaceum var. arundinaceum*	S2S3	X		Open wet areas, lake and pond edges, marshes, and stream edges. Occurrence records across state.	Low—Occurrence records in Cleburne County are more than 4 miles from FMO, and most wells expected at Greers Ferry Lake. Low—At Poison Springs, where 2 occurrence records are within a mile, but only 4 wells are expected in Ouachita and Nevada counties.	NSO #16
Twisted spike rush *Eleocharis tortilis*	S1	X		Wet soils, freshwater, seeps, bogs, and ditches.	Low—One occurrence record at Poison Spring State Forest, but	NSO #16

Common Name *Scientific Name*	Natural Heritage Rank[1]	Occurrence Record Within 1 Mile of FMO or Surface Tract	Occurrence on FMO or Surface Tract	Habitat/ Occurrence Records	Potential Impact	Stipulation
				Occurrence records associated with Poison Springs State Park/Forest.	only 2 wells expected in Ouachita County.	
Smooth scouring rush *Equisetum laevigatum*	S1	X		Moist prairies, riverbanks, and roadsides. Occurrence records in Arkansas limited to Sebastian County.	Low—One occurrence record almost one-half mile from Ozark Lake FMO.	NSO #16
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.	Low—Most occurrence records on NFs. One record north of Greers Ferry Lake, 1.5 miles from an FMO tract.	NSO #16
Six-angled spurge *Euphorbia hexagona*	S2	X		Dry to mesic prairies. Only occurrence record in Arkansas along the Arkansas River in Yell County.	Low—Only 1 occurrence record near FMO, three-quarters of a mile south of Lake Dardanelle.	NSO #18
Wedgeleaf spurge *Euphorbia longicruris*	S1	X		Grasslands and open prairie sites with calcareous soils. Few occurrence records scattered in west central portions of Arkansas.	Low—Only 1 occurrence record near FMO, 1 mile southwest of Lake Dardanelle.	NSO #18
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	Low—Only 1 occurrence record near FMO in AED at Fort Chaffee in Sebastian County where 20 wells projected.	NSO #16

Common Name *Scientific Name*	Natural Heritage Rank[1]	Occurrence Record Within 1 Mile of FMO or Surface Tract	Occurrence on FMO or Surface Tract	Habitat/ Occurrence Records	Potential Impact	Stipulation
				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.	Low—One occurrence record 1 mile southwest of FMO at Lake Dardanelle in Logan County with 20 wells projected.	NSO #4
Shortleaf skeletongrass *Gymnopogon brevifolius*	S2		X	Dry to somewhat moist sand pine woodlands and tall grass prairie. Occurrence records across central Arkansas.	Moderate—Potential to affect 2 occurrences at Camp Joseph T. Robinson in Faulkner County.	NSO #18
Browne's waterleaf *Hydrophyllum brownei*	S2		X	Shaded riparian areas, although may grow up to 100 meters from stream channels. Occurrence records are restricted to the Ouachita Mountains in Arkansas.	Low—Potential to affect 1 occurrence record east of Blue Mountain Lake.	NSO #16
Engelmann's quillwort *Isoetes engelmannii*	S1	X		Ephemeral pools, bogs, 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.	Moderate—Potential for drilling of 80-acre split-estate tract to affect population 1.5 miles downstream in Little Red River.	NSO #16
A crabapple	S2S3	X		Open	Low—Occurrence	

Common Name *Scientific Name*	Natural Heritage Rank[1]	Occurrence Record Within 1 Mile of FMO or Surface Tract	Occurrence on FMO or Surface Tract	Habitat/ Occurrence Records	Potential Impact	Stipulation
Malus coronaria				woodlands, woodland edges, savannas, and thickets. Occurrence records across entire state.	record in Yell County is 0.4 miles north of 40-acre split-estate tract, but in different drainage.	
Yellow monkey flower *Mimulus floribundus*	S2S3	X		Moist low areas and along streams and creeks across the Ozarks.	Moderate—Potential to affect populations in Johnson and Pope counties from drilling on split-estate tracts. No FMO near Logan County population.	NSO #16
A sandwort *Minuartia drummondii*	S2S3		X	Open, grassy woodlands, sandy soils. Occurrence records in locations across state.	Moderate—Potential to affect population at Fort Chaffee. No FMO near populations in Faulkner and Monroe counties.	
Nuttall's pleat-leaf *Nemastylis nuttallii*	S2	X		Limestone barrens, bluffs, and wet prairies. Occurrence records scattered across the Ozarks.	Low—Potential to affect 1 population on north side of Greers Ferry Lake. No wells projected for Pulaski County, where there is a population on Camp Joseph T. Robinson.	NSO #4
Prairie evening primrose *Oenothera pilosella ssp. sessilis*	S2	X		Remnant tall grass prairies. Occurrence records clustered in east central Arkansas.	Low—One occurrence record 0.5 mile south of FMO at Wattensaw SWMA.	NSO #18
Scarlet beard-tongue *Penstemom murrayanus*	S2	X	X	Open, sandy ground. Occurrence records associated with Poison Springs State Park/Forest.	Moderate—Multiple occurrence records in Ouachita and Nevada counties near Poison Springs; only 4 wells total projected in area.	

Common Name *Scientific Name*	Natural Heritage Rank[1]	Occurrence Record Within 1 Mile of FMO or Surface Tract	Occurrence on FMO or Surface Tract	Habitat/ Occurrence Records	Potential Impact	Stipulation
Robbin's scorpionweed *Phacelia strictiflora var. robbinsii*	S1S2	X		Sandy soils. Occurrence records associated with Poison Springs State Park/Forest.	Moderate—Multiple occurrence records in Ouachita and Nevada counties near Poison Springs; only 4 wells total projected in area.	
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.	Low—One occurrence record 0.25 miles from 93-acre split-estate tract in Ouachita County.	NSO #16 NSO #18
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.	Moderate—Potential to affect population in Pine Tree WMA in St. Francis County and population near the AED in Camp Joseph T. Robinson in Faulkner County.	NSO #16
Clammyweed *Polanisia erosa ssp. erosa*	S1S2	X		Sandhills, prairies, open woods. Occurrence records associated with Poison Springs State Park/Forest.	Moderate—Multiple occurrence records in Ouachita and Nevada counties near Poison Springs; only 4 wells total projected in area.	NSO #18
Yellow mandarin *Prosartes lanuginosa*	S2	X		Mesic deciduous woods. Occurrence records in Arkansas are limited to 3 counties in the Boston Mountain Ecoregion.	Low—One occurrence record 0.9 miles from 40-acre split-estate tract in Johnson County.	

Common Name *Scientific Name*	Natural Heritage Rank[1]	Occurrence Record Within 1 Mile of FMO or Surface Tract	Occurrence on FMO or Surface Tract	Habitat/ Occurrence Records	Potential Impact	Stipulation
Scarlet oak *Quercus coccinea*	S2S3	X		Dry upland forests. Occurrence records located primarily in South Central Plain Ecoregion.	Low—One occurrence record 0.8 miles north of FMO at Greers Ferry Lake. In Cleburne County.	
Laurel oak *Quercus laurifolia*	S2S3	X		Sandy floodplains and bottoms, riverbanks and terraces, and occasionally on poorly drained uplands.	Low—One occurrence record 0.8 miles north of FMO at Greers Ferry Lake in Cleburne County.	NSO #16
California bulrush *Schoenoplectus californicus*	S1S2		X	Brackish to fresh water marshes, shores, and often emergent in water. Occurrence records are scattered across state.	Low—One occurrence record in Dardanelle Lake, not likely drilling location.	NSO #16
Redberry greenbrier *Smilax walteri*	S2S3	X	X	Wet thickets, low pinelands, swamps, and boggy areas. Occurrence records associated with Poison Springs State Park/Forest.	Moderate—Multiple occurrence records in Ouachita and Nevada counties near Poison Springs. Only 4 wells total projected in area.	NSO #16
White-flowered goldenrod *Solidago ptarmicoides*	S1S2	X		Rocky prairies, glades, bluffs, rocky open woods. Occurrence records limited to the Ozark region.	Moderate—Two occurrence records 0.3 miles from FMO associated with Greers Ferry Lake in Cleburne County.	NSO #4 NSO #18
Fragrant ladies' tresses *Spiranthes odorata*	S1		X	Cypress and hardwood swamp, marshes, prairies, riverbanks, and ditches in seasonally inundated sites.	Low—Potential to affect 1 occurrence record on eastern end of Lake Dardanelle in Pope County.	NSO #16

Common Name *Scientific Name*	Natural Heritage Rank[1]	Occurrence Record Within 1 Mile of FMO or Surface Tract	Occurrence on FMO or Surface Tract	Habitat/ Occurrence Records	Potential Impact	Stipulation
				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	Moderate—Multiple occurrence records in Ouachita and Nevada counties near Poison Springs. Only 4 wells projected in area. No FMO near occurrence record in Miller County.	NSO #4 NSO #18
Patterson's dawnflower *Stylisma pickeringii var. pattersonii*	S2	X		Sandhills and dry prairies. Occurrence records associated with Poison Springs State Park/Forest.	Moderate—Multiple occurrence records in Ouachita and Nevada counties near Poison Springs. Only 4 wells projected in area.	NSO #18
Silky aster *Symphyotrichum sericeum*	S2	X		Rocky prairies, glades, and gravel hill prairies. Occurrence records in Ozark region.	Moderate—Potential to affect populations on north side of Greers Ferry Lake.	NSO #4 NSO #18
Appalachian filmy fern *Trichomanes boschianum*	S2S3		X	Deeply sheltered grottoes on non-calcareous rocks. Occurrence records primarily in the Boston Mountain ecoregion.	Not likely to affect—One population located below Greers Ferry Dam where drilling would be excluded. Other populations in NF or outside AED.	
White flowered trillium *Trillium flexipes*	S1	X		Intact mesic deciduous woodlands, wooded slopes, shady ravines, and rocky bluffs. All occurrence records in Stone County.	Low—Populations in Ozark NF are 0.7 miles from closest FMO.	

Common Name *Scientific Name*	Natural Heritage Rank[1]	Occurrence Record Within 1 Mile of FMO or Surface Tract	Occurrence on FMO or Surface Tract	Habitat/ Occurrence Records	Potential Impact	Stipulation
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.	Low—Potential to affect 1 population at Fort Chaffee.	NSO #4 NSO #18
Rain lily *Zephyranthes chlorosolen*	S1S2		X	Wide range of soils and conditions. Occurrence records scattered across western portions of state.	Low—Potential to affect 1 population at Fort Chaffee. No impacts on population in Union County 1.9 miles from 40-acre split-estate tract.	

[1]S1 = Extremely rare. Typically 5 or fewer estimated occurrences in the state, or only a few remaining individuals, may be especially vulnerable to extirpation.

S2 = Very rare. Typically between 5 and 20 estimated occurrences or with many individuals in fewer occurrences, often susceptible to becoming extirpated.

Arkansas Invasive Plant Species

Many of the invasive plant species that would be encountered during mineral development activities in Arkansas are widespread across the state, including Japanese honeysuckle (*Lonicera japonica)*, Chinese privet *(Ligustrum sinese)*, mimosa *(Albizia julibrissin)*, multiflora rose *(Rosa multiflora)*, and autumn olive *(Elaeagnus umbellata var. parviflora)*. Oil and gas activities have the potential to extend existing infestations and would require ongoing maintenance to ensure that these plants were controlled along access roads, flowlines, and well pad edges. More critically, there is the potential for mineral development activities to introduce invasive species into new areas or facilitate the spread of aggressive invasive plants expanding into the region. For example, introductions of cogongrass *(Imperata cylindrica)* into Arkansas are probably inevitable given its current distribution in neighboring states. This species has the tendency to form dense stands that displace native vegetation, reduce recruitment of native species, and alter fire regimes. Purple loosestrife *(Lythrum salicaria)* still has limited distribution in the Arkansas (EDDAPS 2012), but has the potential to severely displace native wetland vegetation. Tropical soda apple *(Solanum viarum)* has the potential to degrade pastures/hay fields, natural grasslands, and mesic forests as its range extends across the state. Transportation of seeds of these and other invasive plants could occur

on construction equipment or other vehicles or in mulch material or soils, and would be a major concern to surface management agencies and private landowners.

Florida

In Florida, no more than three oil and gas wells are anticipated to be drilled on FMO over the next 10 years. Those wells are expected in portions of three counties (Collier, Lee, and Hendry) as shown on Map 3-14, and would result in up to 21 acres of initial disturbance with six acres used over the life of the producing wells (Table 4-10).

Florida Ecoregions

The AED in Florida includes the southwestern portion of the Peninsular Ecoregion and the northwestern portion of the Tropical Florida Ecoregion. The FMO in these areas is primarily scattered split-estate, but there is FMO associated with state lands at Cayo Costa State Park and the Rookery Bay Estuarine Research Reserve. It should be noted that BLM does not lease federal minerals underlying national parks, such as the Big Cypress National Preserve and Everglades National Park, or national wildlife refuges (NWR), nor the FMO within municipal city limits, except in the case of drainage.

Florida Vegetation Communities

There are 5,285 acres of FMO in Florida in the oil and gas AED. As shown in Table 3-29, two-thirds of the land cover of that FMO is something other than intact native vegetation communities. This includes Disturbed/Transitional, Grasslands/Improved Pastures, Agriculture, Urban/Developed, or Water. Oil and gas activities in these land cover types are not expected to result in impacts on native vegetation communities, or these impacts would be reduced by the limited resource value of the site. In addition, certain vegetation communities in Florida would be available for lease only with a NSO stipulation, in accordance with the Florida RMP. These include Coastal Strand, Florida Scrub (including sand pine and xeric oak scrub), Sandhills, Tropical Hardwood Hammock, and a 550-foot buffer around aquatic and wetland vegetation communities. Exceptions to these NSO stipulations might be considered if a mitigation or compensation program was developed in cooperation with the United States Fish and Wildlife Service (USFWS), Florida Fish and Wildlife Commission, and/or other state agencies. These existing stipulations protect most of the high-value vegetation communities in the AED. There remains some potential to affect upland forest sites, including hardwood hammock, mixed pine-hardwood forests, natural pinelands, and dry prairies. Given the limited number of wells expected, and the low percentage of FMO acreage in these habitats (15 %), adverse impacts on these vegetation communities are not expected.

Phosphate development would be subject to constraints, as described in Appendix M. Through mitigation and compensation actions, however, it is expected that 1,885 acres of FMO would be mined for phosphate (see Map 3-15), with 802 acres expected to be mined in the next 10 years (already leased) and an additional 1,083 acres available for lease during that timeframe. Of the total acreage expected to be mined or leased in the next 10 years 1,341 acres (71%) are in citrus groves, pasture, agriculture, and other disturbed areas. The remaining 544 acres (29%) are in Shrub Swamp, Grassland, and Freshwater Marsh, Wet Prairie, and Hardwood Swamp (see Table 3-29).

Table 4-12 shows the vegetation communities expected to be mined on already leased phosphate FMO in Florida.

Table 4-12. Acres of Habitat Expected to Be Disturbed on Already Leased Phosphate FMO

Habitat	Acres	Percentage
Bare Soil and Clearcut	6.36	0.8%
Bay Swamp	0.53	0.1%
Citrus	229.15	28.6%
Cypress Swamp	1.41	0.2%
Dry Prairies	2.48	0.3%
Freshwater Marsh and Wet Prairie	33.04	4.1%
Grassland	40.96	5.1%
Hardwood Hammock Forest	3.97	0.5%
Hardwood Swamp	9.43	1.2%
High Impact—Urban	7.41	0.9%
Improved Pasture	320.25	39.9%
Mixed Hardwood—Pine Forests	6.91	0.9%
Mixed Wetland and Forests	0.67	0.1%
Natural Pinelands	4.68	0.6%
Not Classified	7.54	0.9%
Other Agriculture	3.49	0.4%
Row Field Crops	1.63	0.2%
Shrub Brushland	25.34	3.2%
Shrub Swamp	87.42	10.9%
Urban Development—Extractive	9.55	1.2%
Total	**802.22**	**100.0%**

Table 4-13 shows the acres of vegetation communities on FMO expected to be leased over the next 10 years and eventually mined.

Table 4-13 Acres of Habitat on FMO Expected to Be Leased for Phosphate

Habitat	Acres	Percentage
Not Classified	0.06	0.0%
Bare Soil and Clearcut	5.03	0.5%
Cypress Swamp	5	0.5%
Dry Prairies	136.82	12.6%
Freshwater Marsh and Wet Prairie	86.59	8.0%
Grassland	0.2	0.0%
Hardwood Hammock Forests	26.67	2.5%
Hardwood Swamp	43.87	4.0%
High Impact—Urban	38.3	3.5%

Habitat	Acres	Percentage
Improved Pasture	462.72	42.6%
Low Impact—Urban	7.83	0.7%
Mixed Hardwood—Pine Forests	19.4	1.8%
Mixed Wetland and Forests	12.11	1.1%
Natural Pinelands	23.16	2.1%
Other Agriculture	31.83	2.9%
Row Field Crops	154.63	14.2%
Shrub Brushland	14.45	1.3%
Shrub Swamp	17.96	1.7%
Total	**1,083**	**100%**

Phosphate mining involves strip mining and the complete removal of typically 15 to 50 feet of overburden to reach the 10- to 20-foot thick phosphate ore matrix. The phosphate ore is removed with a dragline and slurried for transport to the processing plant. Typically, no backfill material is added during reclamation, so the construction of lakes/emergent wetlands balances the deficit. Although there are examples of restoration of many of the native vegetation communities in the area, including scrub, hardwood hammock, and pine flatwoods, restoration of the original native vegetation communities is generally not feasible on a large scale because of changes in soil characteristics and hydrography. Loss of native seedbeds limits the reestablishment of native habitats (Odum et al. 1991). Agriculture, forestry, and creation of emergent wetlands are major post-reclamation lands uses. Additional information on the mining process, effects, and restoration activities are available at multiple sources, including the University of Florida's Electronic Data Information Source (EDIS) website (http://edis.ifas.ufl.edu/about.html) and Florida Industrial and Phosphate Research Institute (http://www.fipr.state.fl.us/research-area-reclamation.htm).

Florida Priority Plant Species

In the oil and gas AED, there are six priority plant species with occurrence records on or near FMO in Florida. Habitat for three state-listed species—iguana hackberry *(Celtis iguanaea)*, sand-dune spurge *(Chamaesyce cumulicola)*, and joewood *(Jacquinia keyensis)*—are expected to be protected under the existing Florida RMP stipulations, which exclude mineral development from coastal and wetland habitats. Three other state-listed species—Gulf Coast Florida lantana *(Lantana depressa var. sanibelensis)*, Florida thatch palm *(Thrinax radiate)*, and fuzzy-wuzzy airplant *(Tillandsia pruinosa)*—occur in habitats that are not protected by existing stipulations and would be vulnerable to disturbance at Cayo Costa State Park and the Rookery Bay Estuarine Research Reserve. Gulf Coast Florida lantana, which is known from only three locations, would be particularly vulnerable to disturbance of grasslands at Cayo Costa State Park. However, given the low number of wells anticipated, the likelihood of oil and gas development affecting this species is very low.

There are no known priority plant occurrence records on the FMO expected to be mined or leased for phosphate mining over the next 10 years. There is an occurrence of nodding pinweed *(Lechea cernua)*, but there is no Florida scrub mapped on the FMO, and this species is restricted to Florida scrub communities.

Table 4-14 ranks the relative potential for mineral development to affect priority plant species with occurrence records in the AED. The potential for impacts on surface tracts is included; however, none of

the BLM surface tracts are within areas of expected mineral development. The assessment is based on proximity of known occurrences to FMO, distribution of the known occurrences in the AED, and likelihood of development of the FMO in the associated vegetation community. No priority plant species are ranked as having high or moderate potential for impacts from oil and gas because only three wells are projected for the entire state. Species ranked as "Low" occur in very limited habitats or have very limited distribution in areas where there is FMO. Species ranked as "Unlikely to Impact" occur in areas where drilling is unlikely to occur or the species is associated with sensitive habitats protected by existing NSO stipulations from the Florida RMP. Also included in the table is the reference to stipulations that do not apply to this alternative but would provide some level of protection in Alternatives B, C, and D (see Table C-2 in Appendix C for the full text of the stipulations).

Table 4-14. Potential Impacts on Priority Plant Species from Energy and Mineral Development in Florida

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO or Surface Tract	Habitat/ Occurrences Records	Potential Impact	Stipulation
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.	Not likely to affect—JILONA withdrawn from mineral leasing and outside the AED. Within AED, scrub is protected by NSO lease stipulation.	NSO #10
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 Florida Panhandle and in northeastern Florida. Occurs on Lathrop Bayou tract.	Not likely to affect—JILONA withdrawn from mineral leasing and outside the AED. Within AED, scrub is protected by NSO lease stipulation.	NSO #10
Iguana hackberry *Celtis iguanaea*	S1	E	X		Shell mounds and tidal swamps. Occurrence records in Lee and Collier counties.	Not likely to affect—Occurs in coastal habitats protected by NSO lease stipulation.	NSO #6, NSO #16

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO or Surface Tract	Habitat/ Occurrences Records	Potential Impact	Stipulation
Sand-dune spurge *Chamaesyce cumulicola*	S2	E	X		Coastal dunes and coastal scrub. Occurrence records on both coasts of peninsula Florida.	Not likely to affect—JILONA withdrawn from mineral leasing, outside the AED, and coastal and scrub habitats protected by NSO lease stipulation.	NSO #6
Piedmont jointgrass *Coelorachis tuberculosus*	S3	T		X	Moist to wet areas, depressions, marshy sites, and lake borders. Occurrence records throughout state north of Everglades. Occurs on the Lathrop Bayou tract.	Not likely to affect—Occurs on surface tract outside AED and habitats protected by NSO lease.	NSO #16
Large-flowered rosemary *Conradina grandiflora*	S3	T		X	Scrub habitats on the eastern coast of the Florida peninsula. Occurs on the Jupiter Inlet ONA.	Not likely to affect—JILONA withdrawn from mineral leasing and outside the AED. Within AED, scrub is protected by NSO lease stipulation.	NSO #10
Florida pinewood privet *Forestiera segregata var. pinetorum*	S2		X		Shell mounds and coastal habitats. Occurrence records in tropical regions of Florida.	Not likely to affect—Occurs in habitats protected by NSO lease stipulation.	NSO #6, NSO #9
Wiregrass gentian *Gentiana pennelliana*	S3	E		X	Open treeless savannas or wet prairies. Restricted to the central Panhandle of Florida. Occurs	Not likely to affect—Occurs outside the AED.	NSO #18

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO or Surface Tract	Habitat/ Occurrences Records	Potential Impact	Stipulation
					on the Lathrop Bayou tract.		
Joewood *Jacquinia keyensis*	S3	T	X	X	Coastal strand and coral exposures. Occurs on FMO at Cayo Costa State Park, on FMO in the Keys, and within 0.3 miles of Sugarloaf Key tract.	Not likely to affect—Occurs in habitats protected by NSO lease stipulation.	NSO #6, NSO #9
Gulf Coast Florida lantana *Lantana depressa var. sanibelensis*	S1	E		X	Open grassy areas and in wet limestone prairies in interior. Known from only 3 locations in Pinellas to Collier counties. Occurs on FMO at Cayo Costa State Park.	Low—Only 3 wells projected in state over next 10 years.	NSO #16 NSO #18
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 Everglades. Occurs at the Jupiter Inlet ONA.	Not likely to affect—JILONA withdrawn from mineral leasing and outside the AED. Within AED, scrub is protected by NSO lease stipulation.	NSO #10
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.	Not likely to affect—Occurs outside the AED.	NSO #16
Bog tupelo	S2	-		X	Open bogs, wet flatwoods, and	Not likely to affect—	NSO

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO or Surface Tract	Habitat/ Occurrences Records	Potential Impact	Stipulation
Nyssa ursina					swamps. Florida endemic restricted to Bay and Gulf counties in the Florida Panhandle. Occurs on the Lathrop Bayou tract.	Occurs outside the AED.	#16
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.	Not likely to affect—Occurs outside the AED.	NSO #16
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.	Not likely to affect—Occurs outside the AED.	NSO #16
Florida thatch palm *Thrinax radiata*	S2	E	X		Pinelands and littoral hammocks and scrub on limestone soils. Occurrence records in tropical regions through the Keys. Occurrence near Rookery Bay Aquatic Preserve.	Low—Only 3 wells projected in state over next 10 years.	NSO #6, NSO #9
Banded air plant *Tillandsia flexuosa*	S3	T		X	Coastal hammocks. Occurrence	Not likely to affect—JILONA	NSO #6,

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO or Surface Tract	Habitat/ Occurrences Records	Potential Impact	Stipulation
					records in tropical regions of Florida. Occurs on the Jupiter Inlet ONA.	withdrawn from mineral leasing and outside the AED.	
Fuzzy-wuzzy air-plant *Tillandsia pruinosa*	S1	E	X		Hammocks and dry woods. Occurrence records limited Collier County.	Low—Only 3 wells projected in state over next 10 years.	
Chapman's crownbeard *Verbesina chapmanii*	S2	T		X	Wet flatwoods and prairies. Florida endemic limited to central Panhandle region. Occurs on Lathrop Bayou tract.	Not likely to affect—Occurs outside the AED.	NSO #18
Karst pond xyris *Xyris longisepala*	S2S3	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.	Not likely to affect—Occurs outside the AED.	NSO #16

[1]S1 = Extremely rare. Typically 5 or fewer estimated occurrences in the state, or only a few remaining individuals, may be especially vulnerable to extirpation.

S2 = Very rare. Typically between 5 and 20 estimated occurrences or with many individuals in fewer occurrences, often susceptible to becoming extirpated.

Florida Invasive Plant Species

Any mineral-related surface disturbance in Florida is likely to require ongoing maintenance activities to control the spread of invasive plant species. Seeds, spores, or vegetative material carried in on construction equipment or in fill dirt can introduce additional species that can create ongoing management issues and can be of particular concern in natural areas, commercial forests, and pastures. The small number of oil and gas wells anticipated is not likely to result in substantial changes in the distribution or occurrence of invasive plant species in Florida, although there is potential for local impacts, particularly if non-native soils are brought into the site and if there are disturbances in intact natural areas. Cogongrass is of particular concern in the phosphate mining area.

Kentucky

Over the next 10 years, BLM expects to authorize 29 oil and gas wells in Kentucky. Construction of the well pads, access roads, and ancillary facilities are estimated to disturb 4.79 acres of vegetation per well—a total of 139 acres of initial disturbance, with 87 acres available for interim restoration and 52 acres used for the life of the producing wells (Table 4-10). Map 3-16 show the counties with projected oil and gas development, and Table 3-85 shows the number of projected wells by county. The majority of the wells are expected to target FMO associated with U.S. Army Corps of Engineers (USACE) reservoirs/ lakes, as well as Kentucky Ridge and Pennyrile State Forests. A list of these facilities is available in Appendix L.

Three coal mines are projected in eastern Kentucky, including two at Dewey Lake in eastern Kentucky. The FMO is expected to be mined as part of an underground mine with existing surface facilities on private land. No new surface disturbance or impacts on vegetation are projected.

Kentucky Ecoregions

In the Central Appalachians and the Western Allegheny Plateau ecoregions in Kentucky, up to 16 wells targeting natural gas are expected to be authorized by BLM in the next 10 years. The initial disturbance from these BLM-authorized wells is estimated at 77 acres of vegetation with 48 of those acres available for interim restoration after the wells are completed.

In the southern portions of the Interior Plateau and very eastern portions of the River Valleys and Hills ecoregions, up to 10 BLM-authorized oil and gas wells are expected to be drilled. This would result in a total of 50 acres of initial disturbance to vegetation with 30 of those acres available for interim restoration after the wells are completed.

In the southwestern portion of the Interior Plateau Ecoregion, up to three BLM-authorized wells targeting gas are projected over the next 10 years. This would result in a total of 14 acres of initial disturbance to vegetation and 9 acres available for interim restoration after the wells were completed.

All coal mining is expected to occur in the Central Appalachians Ecoregion.

Kentucky Vegetation Communities

Just over one-third of the FMO in Kentucky is classified as water, the vast majority lying beneath USACE reservoirs (see Table 3-34). Of the remaining 171,721 terrestrial acres, 86 percent is classified as Upland Forest, and this is the native vegetation community most likely to be affected by the projected BLM oil and gas development. Most of Kentucky's forests have been logged in the past, and impacts on Upland Forest would depend on the species composition, age, and structure at the well site location. However, in most cases, the forests associated with USACE lakes/reservoirs and state forests are expected to be relatively mature second growth forests. Barring the establishment of invasive plant species, the woody species diversity is not expected to be altered over the long term, but it would be many decades before the forest structure would be reestablished. In addition, rugged terrain increases the potential for offsite erosion, resulting in rills and gullies in both cut and fill slopes and sedimentation in adjacent drainages, particularly after major rain events. These degrade surrounding vegetation and complicate restoration activities because of the loss of top soil and the difficulty of stabilizing these in steep terrain. This would pose a greater risk in the more mountainous areas of eastern Kentucky.

Two BLM wells are projected to be authorized on state forests over the next 10 years, one each at Pennyrile State Forest and Kentucky Ridge State Forest. These forests are expected to be relatively mature, and terrain varies from rolling terrain at Pennyrile State Forest in Christian County to very rugged

in the Kentucky Ridge State Forest in Bell County. No BLM-authorized drilling is expected to occur at the sites identified as important remaining old growth stands in the state (Kentucky Statewide Assessment of Forests, 2010), such as the hemlock-mixed mesophytic forest at Rock Creek Research Natural Area in Laurel County; Lilley Cornett Woods, a registered national natural landmark; Blanton Forest in Harlan County; Letourneau Woods in the southwestern portion of the Obion Creek Wildlife Management Area (WMA) in Fulton County; or Curtis Gates Lloyd WMA in Grant County. The Big Woods of Mammoth Cave National Park, with its remnant of upland tulip tree-oak-hickory forest, would be excluded from leasing, in accordance with federal regulation.

Just over four percent of the FMO is mapped as Agriculture, which includes improved pasture. This land cover type is likely to be disproportionally targeted because of ease of access and lower well pad construction costs. In most cases, these areas are also relatively flat, reducing the potential for erosion. Impacts would be limited in the absence of natural vegetation communities, and in most cases, the function of the site could be fully restored within a few years of abandonment.

Three percent of the FMO is mapped as Savanna/Shrub/Scrub; the limited acreage reduces the likelihood of a well being located in this vegetation community. Naturally occurring sites, including prairies, glades, and barrens are small and scattered in a larger forested landscape. Construction of a well pad, access roads, or facilities in these areas could alter the soil and hydrography sufficiently to limit the chances for full restoration. This vegetation community also includes previously mined areas currently classified as Shrub/Scrub. Oil and gas development in these previously mined areas would set back the ongoing succession but is not likely to alter the long-term restoration of these sites.

Just over two percent of the FMO is in Forested Wetlands and much of this acreage is associated with USACE lakes and includes small patches along feeder streams and inlets. These areas are unlikely to be directly affected by construction activities, but they could be affected by increased sedimentation in steeper terrain, if cut and fill slopes are were adequately stabilized above these vegetation communities. This vegetation community could also be directly affected by construction of access roads, as well as indirectly by changes in the hydrology supporting these Forested Wetlands.

Caves, rock shelters, and clifflines can provide important microclimates and support specialized or rare endemic species. These features are found throughout the state, but on FMO, they are clustered in the northeast and south central AEDs, including Fishtrap Lake, Carr Creek Lake, Grayson Lake, Kentucky Ridge State Forest, Lake Cumberland, Dale Hollow Reservoir, Green River Lake, and Nolin Lake. This acreage represents less than one percent of the overall terrestrial FMO acreage. Rock shelters and clifflines are unlikely to be directly affected by oil and gas development. They tend to be unsuitable for road or well pad construction, which can be shifted away from these landforms at the APD stage. The potential remains for construction above these locations to alter the hydrography supporting seeps or increase erosion at the site to the detriment of vegetation communities associated with these landforms.

Caves have a potential to be affected over a larger area because of the connectivity of karst formations, but the potential to affect associated vegetation is largely limited to the cave entrances.

In many cases, drilling access to upland FMO is limited because of setbacks associated with USACE reservoirs. In these cases, FMO might be targeted from well pad locations on adjacent private land. There might be additional options for placing well pads in previously disturbed areas in these situations.

Kentucky Priority Plant Species

A total of 55 priority plant species have occurrence records either on or within a mile of FMO in the AEDs. Of these, 15 species are associated primarily with habitats found in areas mapped as Upland

Forest, the dominant vegetation community found on FMO. This includes priority plant species found in more specialized habitats, such as mesic ravine forests, mesic slopes, and xeric forests. These habitats tend to be embedded in a larger matrix of more common Upland Forest vegetation types, including oak/hickory, maple/beech/birch, elm/ash/cottonwood, and oak/pine. The potential for direct impacts on these specific habitats would be relatively low because of the small acreage involved, but these areas would not be specifically protected by NSO stipulations in this alternative. There is also the potential for indirect impacts as a result of changes in hydrography.

Twenty-four of the priority plant species are primarily associated with seeps, bogs, streambanks, aquatic habitats, riparian zones, and other wetland situations. There is some potential for these species to be affected directly from oil and gas development construction in wetland vegetation communities, but these plant species could also be damaged indirectly by increased sedimentation resulting from erosion off unconsolidated or inadequately consolidated well pads or roads.

Some habitats, such as bluffs, outcrops, and talus slopes are generally avoided because of the higher cost of construction; in addition, these sites tend to be small, and construction activities can often be shifted away without major redesign efforts. Therefore, the species found in these areas are not likely to be directly affected by drilling operations. These include northern white cedar *(Thuja occidentalis)*, Canby's mountain lover *(Pazistima canbyi)*, mock orange *(Philadelphus inodorus)*, and rock skullcap *(Scutellaria saxatilis)*. Glades and barrens were not mapped and likely represent a small proportion of the overall FMO. The potential for impact is expected to be low for associated species, such as plains muhlenbergia (*Muhlenbergia cuspidata)*.

Table 4-15 ranks the relative potential for each of these priority plant species to be affected by the projected oil and gas development, based on proximity of known occurrences to FMO, distribution of the known occurrences in the AED, and accessibility of associated vegetation community. In Alternative A, there is moderate potential to affect five of these priority plant species and low potential to affect 28 species. There are 22 priority plant species that are not expected to be affected, primarily because known occurrences are located on nearby national forests or because the occurrence record is outside the AED. No priority plant species are ranked as having high potential for impacts because ground disturbing activities are expected to occur on less than one percent of the FMO in the AED. Also included in the table is the reference to stipulations that do not apply to this alternative but would provide some level of protection in Alternatives B, C, and D (see Table C-2 in Appendix C for the full text of the stipulations).

No impacts from coal are anticipated because all of the coal development is projected to be underground with no new surface facilities.

Table 4-15. Potential Impacts on Priority Plant Species from Oil and Gas Development in Kentucky

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Vegetation Community/ Habitat	Potential Impact	Stipulation
Blue monkshood *Aconitum uncinatum*	S2	T	X		Low, moist woods and slopes and alluvial soils along streams in the Cumberland Plateau.	Not likely to affect—Occurrence records in Laurel and McCreary counties outside oil and gas	NSO #16

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Vegetation Community/ Habitat	Potential Impact	Stipulation
						AED.	
Red buckeye *Aesculus pavia*	S2S3	T		X	Swamp forests, usually stagnant; rich damp woods; and thickets.	Low—One well projected over next 10 years at Lake Barkley in Lyon County.	NSO #16
Lake-cress *Armoracia lacustris*	S1S2	T	X	X	Quiet shores or muddy waters of sloughs, cypress swamps, seasonal sloughs, or slow water.	Low—Two wells projected over next 10 years at Lake Barkley in Lyon and counties.	NSO #16
Yellow wild indigo *Baptisia tinctoria*	S1S2	T		X	Sandhills, pine flatwoods, xeric woodlands, ridges, woodland edges, and roadbanks.	Low—Population at Kentucky Ridge State Forest; only 1 well projected over next 10 years.	
Yellow screwstem *Bartonia virginica*	S2	T	X		Bogs, swamps, savannas, and dry or wet acid soils, in Kentucky mossy seeps.	Not likely to affect—Populations are outside the AED.	NSO #16
Brook saxifrage *Boykinia aconitifolia*	S2	T	X		Streambanks, riverbanks, in crevices in spray cliffs around waterfalls, and seepage.	Not likely to affect—Populations outside the AED. Population in Pike County not near FMO at Fishtrap Lake.	NSO #16
Glossy red byrum moss *Bryum miniatum*	S1?	E	X		Wet rocks, especially in or near brooks or on cliffs.	Not likely to affect—Populations outside the AED.	NSO #16

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Vegetation Community/ Habitat	Potential Impact	Stipulation
Tuberous grass-pink *Calopogon tuberosus*	S1	E		X	Sphagnous bogs, fens, savannas and wet shores; in Kentucky dry sandy pine (oak) woods and swamps.	Low—Population near Kentucky Ridge State Forest, with only 1 well projected over next 10 years.	NSO #16
Sweet shrub *Calycanthus floridus var. glaucus*	S2	T	X		Rich mountain woods, hillsides, and streambanks.	Not likely to affect—Populations outside the AED.	NSO #16
Allegheny chinquapin *Castanea pumila*	S2	T		X	Xeric forests and woodlands, generally fire-maintained habitats.	Not likely to affect—Populations outside the AED.	
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.	Not likely to affect—Population in AED in Land Between the Lakes is 3 miles from nearest FMO.	
Red turtlehead *Chelone obliqua var. obliqua*	S1	E		X	Streambanks, swamp forests, alluvial swamps, and wet woods.	Low—Population at Kentucky Ridge State Forest; only 1 well projected over next 10 years.	NSO #16
Sweet-fern *Comptonia peregrina*	S1	E	X		River bars, open woods, clearings, and pastures, often on sandy soils.	None—Populations are outside the AED.	NSO #16
Star tickseed *Coreopsis pubescens*	S2S3	-	X	X	Open woods, dry slopes and cliffs, and back edge of boulder-cobble bars near riverbank.	Not likely to affect—Populations are outside the AED.	NSO #16

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Vegetation Community/ Habitat	Potential Impact	Stipulation
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.	Not likely to affect—Populations are outside the AED.	NSO #16
Small yellow lady's-slipper *Cypripedium parviflorum*	S2	T		X	Bogs, mossy swamps, and woods, wet shores; in Kentucky, rich mesic forested slopes.	Low—Population occurs at southern end of Cave Run Lake near FMO, but only 1 well projected over next 10 years in Morgan County.	NSO #16
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 base of trees.	Not likely to affect—Populations outside the AED.	
Yellow spikerush *Eleocharis flavescens*	S1?	-		X	Streambanks, open wet areas, and marshes.	Low—Population occurs near upper portions of Grayson Lake, but only 1 well projected over next 10 years in Elliott County.	NSO #16
Yellow trout-lily *Erythronium rostratum*	S2S3	-	X	X	Mesic ravine forests.	Moderate—Potential to affect populations near Grayson Lake, Dewy	

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Vegetation Community/ Habitat	Potential Impact	Stipulation
						Lake, and Paintsville Lake, although only 5 wells projected over next 10 years.	
Small-flower thoroughwort *Eupatorium semiserratum*	S1?	E		X	Wet woods and openings.	Not likely to affect—Populations outside the AED.	
Mercury spurge *Euphorbia mercurialina*	S1S2	T		X	Rich soil on wooded slopes of ravines, and dry-mesic woods in mountains.	Moderate—Potential to affect population at southern end of Lake Cumber-land; 2 wells projected in Clinton County.	
Rockcastle wood-aster *Eurybia saxicastellii*	S1S2	T	X	X	Thickets in transition from open boulder-cobble bars to adjacent slope forest.	Not likely to affect—Populations outside the AED.	NSO #16
Mountain silverbell *Halesia tetraptera*	S1S2	E	X	X	Rich woods and edges of sloughs and oxbow lakes.	Low—Population on east side of Yatesville Lake; only 1 well projected in next 10 years. Population west of Lake Barkley.	NSO #16
Eggert's sunflower *Helianthus eggertii*	S2	T	X		Open oak hickory forest on highland rim in Kentucky; rocky hills and barrens and roadside remnants of	Moderate—Populations near Nolin River Lake and Green River Lake, although only 3 wells projected over next 10	

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Vegetation Community/ Habitat	Potential Impact	Stipulation
					this habitat.	years.	
Blue mud-plantain *Heteranthera limosa*	S2S3	-	X		Sloughs, pond margins, and mud flats.	Low—1 Population near Green River Lake, but habitats not likely to be suitable for oil and gas well pads.	NSO #16
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.	Low—One population near Kentucky Ridge State Forest, but only 1 well projected over next 10 years.	NSO #16
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.	Low—Occur-rences in higher reaches of Grayson Lake; only 1 well projected in Elliott County.	NSO #16
John's-cabbage *Hydrophyllum virginianum*	S2?	T	X		Moist or wet woods and open wet places.	Low—Occur-rences near Martins Fork Lake, but only 1 well projected in Harlan County.	NSO #16
St. Peter's-wort *Hypericum crux-andreae*	S2S3	T	X		Moist or dry sandy woods, meadows and barrens, and pine flatwoods.	Low—Occurrence records in Russell County are more than 3 miles from closest FMO. Other records are	NSO #4

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Vegetation Community/ Habitat	Potential Impact	Stipulation
						outside the AED or on NF.	
Jointed rush *Juncus articulatus*	S2S3	-	X	X	Bogs, wet meadows, beaches, and shores.	Low—Occurrence records in Russell County are more than 3 miles from closest FMO. Populations near Grayson Lake, but only 1 well projected in next 10 years. Other records are outside the AED or on NF.	NSO #16
Ground juniper *Juniperus cummunis. var. depressa*	S2	T	X		Sandy cliff edges and in adjacent pine-oak woodlands.	Not likely to affect—Populations outside the AED, or in NF.	
Vetchling peavine *Lathyrus palustris*	S2	T	X	X	Wet meadows, swamps, wet woods; in Kentucky boulder cobble bars along creeks and rivers.	Not likely to affect—Populations outside the AED, or in NF.	NSO #16
Wood lily *Lilium philadelphicum*	S2S3	T		X	Openings in seasonally moist forests, prairies, and roadsides.	Not likely to affect—Populations outside the AED, or in NF.	
Loesel's twayblade *Liparis loeselii*	S2S3	T		X	Bogs, peaty meadows, and damp seeping thickets or mesic slopes: has been found in abandoned	Low—potential to affect Populations at Carr Creek Lake and Kentucky Ridge State	NSO #16

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Vegetation Community/ Habitat	Potential Impact	Stipulation
					strip mines.	Forest. Only 3 wells projected in Bell and Knott counties over next 10 years.	
Appalachian sandwort *Minuartia glabra*	S1S2	T	X		Sandstone outcrops associated with mesophytic forest.	Not likely to affect—Populations outside the AED, or in NF.	
Sweet pinesap *Monotropsis odorata*	S2	T	X		Sandstone ridgetops, chiefly pine woods, but also mesophytic woods.	Low—Potential to affect populations at Kentucky Ridge State Forest, but only 1 well projected.	
Plains muhlenbergia *Muhlenbergia cuspidata*	S2	T		X	Barrens in south central part of state.	Low—Population in Wayne County on Lake Cumber-land, but only 2 wells projected.	NSO #4
Thread-like naiad *Najas gracillima*	S2S3	-		X	Aquatic, in muddy or sandy ponds and lake shores.	Low—Some potential to affect population near Lake Barkley in Trigg County where 1 well is projected.	NSO #16
Largeleaf grass-of-parnassus *Parnassia grandifolia*	S1	E		X	Wet calcareous soil in mountains and herbaceous seepage areas.	Low—Some potential to affect population near Kentucky Ridge State Park in Bell County, but only 1 well	NSO #16

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Vegetation Community/ Habitat	Potential Impact	Stipulation
						projected.	
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.	Low—One population on Lake Cumberland in Russell County, where 2 wells are projected. Habitats not typically suitable for oil and gas.	NSO #16
Mock orange *Philadelphus inodorus*	S1S2	T	X		Limestone bluffs/rocky slopes, streambanks, and river bluffs; also rich forests and woodlands.	Low—One population near Lake Barkley, but only 1 well projected in Lyon County.	NSO #16
Mock bishopweed *Ptilimnium capillaceum*	S1S2	T		X	Marshes, wet meadows, and open wetlands.	Low—Population on Lake Barkley, but only 2 wells projected in Lyon and Trigg counties.	NSO #16
Nuttall's mock bishopweed *Ptilimnium nuttallii*	S1S2	E		X	Damp prairies, glades, shores, and wet soil.	Low—One population near Lake Barkley but only 1 well projected in Trigg County.	NSO #16 NSO #4
Smooth blackberry *Rubus canadensis*	S1?	E	X		Forests, woodlands, grassy balds, and woodland edges and openings.	Low—Population near Martins Fork Lake; only 1 well projected in Harlan County.	
Bay starvine *Schisandra glabra*	S1	E	X		Mesic wooded slopes.	Moderate—Population near upper reaches of	

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Vegetation Community/ Habitat	Potential Impact	Stipulation
						Dewey Lake, with 4 wells projected in Pike County.	
Rock skullcap *Scutellaria saxatilis*	S2S3	T	X	X	Rocky mixed mesophytic woods, talus slopes, and bluffs, usually sandstone substrate.	Low—Population in upper reaches of Grayson Lake; 1 well projected in Elliott County.	
Buckley's goldenrod *Solidago buckleyi*	S2S3	-	X		Dry to mesic woods.	Low—Population located in Between the Lakes, and only 1 well projected in Lyon County.	
Virginia goldenrod *Solidago gracillima*	S2?	-	X	X	Swamps and wet open rocky river banks.	Not likely to affect—Populations outside the AED or in NF.	NSO #16
Eastern featherbells *Stenanthium gramineum*	S2S3	T		X	Mesic forests on river bluffs and in seeps and ridge tops, ephemeral streambanks, wet boulder-cobble bars and riverbanks.	Not likely to affect—Populations outside the AED, or in NF.	NSO #16
Round fameflower *Talinum teretifolium*	S1	E	X		Sandstone glades, dry shallow soil seasonally wet by seepage, often between vegetation and open rock.	Not likely to affect—Populations outside the AED, or in NF.	NSO #16
Spiked hoary-pea *Tephrosia spicata*	S1S2	E	X	X	Sandy fields, open woods, and barrens.	Not likely to affect—Populations	

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Vegetation Community/ Habitat	Potential Impact	Stipulation
						outside the AED, or in NF.	
Cutleaf meadow-parsnip *Thaspium pinnatifidum*	S2S3	T		X	Dry mesic forests with limestone outcropping.	Low—Population near Lake Cumber-land, with 1 well projected in Clinton County.	
Northern white cedar *Thuja occidentalis*	S2S3	T	X	X	Limestone bluffs and ledges along streams.	Moderate—Multiple occurrence records on north side of Lake Cumber-land, with 2 wells projected in Russell County.	NSO #16
Least trillium *Trillium pusillum*	S1	E		X	Depression swamps and slopes of thin-canopied oak-hickory forest.	Low—One population north side of Lake Cumberland with 2 wells projected in Russell County.	NSO #16
Rock grape *Vitis rupestris*	S2	T	X	X	Sandy deposits of rocky river shores.	Not likely to affect—Populations outside the AED, or in NF.	NSO #16

[1]S1 = Extremely rare. Typically 5 or fewer estimated occurrences in the state, or only a few remaining individuals, may be especially vulnerable to extirpation.

S2 = Very rare. Typically between 5 and 20 estimated occurrences or with many individuals in fewer occurrences, often susceptible to becoming extirpated.

Kentucky Invasive Plant Species

Most of the facilities where BLM is anticipating oil and gas development have ongoing management issues with invasive plant species. Oil and gas drilling activities could exacerbate these issues, particularly along new access roads and well pads placed in the interior of forested blocks or other intact vegetation communities. Loss of native vegetation and soil disturbance would promote the spread of invasive plant

species already in the general area, particularly those spread by seed. In addition, the use of non-native species during restoration activities could result in local naturalization of these species. Areas where fill dirt is needed for road or pad construction also provide an opportunity for invasive species to be spread as seed or stolons.

The projected underground coal mining of FMO is not expected to affect the spread of invasive species in Kentucky.

Louisiana

A total of 320 wells are expected to be authorized by BLM in Louisiana over the next 10 years. The BLM-authorized well locations are expected to result in the initial disturbance of 2,082 acres. Of this, 1,395 acres are expected to be restored after the wells are completed, and 687 acres would continue to be used for the life of the producing wells (Table 4-10). Map 3-18 shows the parishes with projected oil and gas development, and Table 3-86 shows the number of expected wells by parish.

Louisiana Ecoregions

Although development is expected to occur across all of the state's ecoregions, most of the BLM-authorized wells are expected to be located in the Upper West Gulf Coastal Plain and the Gulf Coast Prairies and Marshes ecoregions. Two-thirds of the BLM wells in Louisiana are expected to be located in five parishes, Bossier, Caddo, and Webster parishes in the Upper West Gulf Coastal Plain ecoregion, and Plaquemines and Lafourche parishes in the Gulf Coast Prairies and Marshes Ecoregion. The bulk of the FMO in the Upper West Gulf Coastal Plain Ecoregion is associated with Barksdale Air Force Base and the Louisiana Ammunition Depot, but there is scattered split-estate FMO across this ecoregion, and BLM-authorized wells could occur on or near any of these tracts. In the Gulf Coast Prairies and Marshes Ecoregion, most of the FMO is associated with the Delta NWR and Bonnett Carre Spillway, with small scattered tracts of split-estate, particularly in Plaquemines Parish. A list of the state and federal facilities in Louisiana where BLM-authorized drilling is projected is provided in Appendix L.

Louisiana Vegetation Communities

In Louisiana, almost 60 percent of the FMO in the AEDs are covered by water, seasonally inundated bottomland hardwoods, swamps, marshes, or sandbars (see Table 3-38). Impacts on vegetation in these areas would depend on the drilling methods and timing. In these wetland areas, elevated roads can disrupt sheet flow and alter water depths that sustain green tree reservoirs, or can result in additional or extended impoundments that can also damage or kill trees and other vegetation. Elevated well pads in flooded areas can also result in increases in local sedimentation, as well as dispersion of surface contamination from the well site, which could degrade vegetation. Closed mud systems are typically used in wetland situations to replace mud pits and contain the drilling fluids, but these systems can require larger pads to contain the series of tanks needed, particularly for deeper wells.

In Plaquemines Parish, wells are typically drilled from a barge and often require dredging to move the barge to the drilling location. Dredging and any associated prop-washing can damage sea grass beds and can also result in the incremental loss of marsh or upland vegetation removed in process. This can be mitigated if dredged material is used to create or augment existing marsh/upland habitats in this delta region.

Just over 25 percent of the upland vegetation community found on FMO in the AED is Mixed Hardwood-Loblolly Pine/Hardwood Slope Forest. This vegetation community is found across the state, but is the

dominant vegetation community in the northern AED. Because of the high number of wells projected in this area, this vegetation community is the most likely to be affected by BLM-authorized wells.

Almost 13 percent of the FMO in the AED is mapped as Agriculture or Disturbed. This land cover type is likely to be disproportionately targeted for development because of relative accessibility.

Some vegetation communities are not likely to be affected because of scarcity on FMO in Louisiana. Only five acres of Calcareous Prairie is mapped on FMO and only one acre of Longleaf Pine Savannah. Twelve acres of Southern Mesophytic Forests are mapped on split-estate in West Feliciana Parish, but only one BLM well is projected to be drilled in this parish over the next 10 years.

Louisiana Priority Plant Species

There are 80 priority plant species that have occurrence records on or within a mile of FMO or surface tracts in Louisiana and that could potentially be affected by BLM-authorized oil and gas development. There are several areas where FMO in the AEDs is associated with clusters of these rare endemic plants. Eighteen of the species are found in prairie remnants or sandhill areas in the northwestern portions of the state. This region is expected to have the highest density of drilling overall. Sixteen species are primarily found in the "Florida Parishes." This area in southeast Louisiana includes the following parishes: East Baton Rouge, East Feliciana, Livingston, St. Helena, St. Tammany, Tangipahoa, Washington, and West Feliciana. FMO in this area occurs in small, scattered split-estate tracts. Fourteen species are associated with wetlands across the state.

Table 4-15 ranks the relative potential for each of these priority plant species to be affected by the projected development, based on proximity of known occurrences to FMO, distribution of the known occurrences in the AED, and accessibility of associated vegetation community. In Alternative A, there is moderate potential to affect 47 of these priority plant species and low potential to affect 31 species. No priority plant species are ranked as having high potential for impacts because ground disturbing activities are expected to occur on less than two percent of the FMO in the AED. Also included in the table is the reference to stipulations that do not apply to this Alternative A but would provide some level of protection in Alternatives B, C, and D (see Table C-2 in Appendix C for the full text of the stipulations).

Table 4-16. Potential Impacts on Priority Plant Species from Oil and Gas Development in Louisiana

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	Potential Impact	Stipulation
White baneberry *Actaea pachypoda*	S2	X		Deciduous and mixed forests. Occurrence records associated with split-estate in West Feliciana Parish.	Moderate—Only 1 well projected in West Feliciana Parish, but FMO is near 2 occurrence records and species is found in a widespread vegetation community.	
Tenpetal thimbleweed *Anemone berlandieri*	S2	X		Open grasslands, prairies, hillsides, often limey	Moderate—Unknown populations in Bossier, Caddo, and Webster parishes could be affected.	NSO #18

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	Potential Impact	Stipulation
				substrate, also woods over thin shale in northern portion of state.	FMO in these areas are expected to have more than half of all wells projected in the state.	
Soxman milk-vetch *Astragalus soxmaniorum*	S2	X	X	Xeric sandhills, abandoned fields, roadsides in Caddo, Natchitoches, and Winn parishes.	Moderate—Most likely to affect in northern Caddo Parish on scattered FMO split-estate. Known populations in other parishes are more than 6 miles from FMO.	
Wine cup *Callirhoe digitata*	S1	X		Rocky, dryish, soils in limestone glades, meadows, and prairies, Occurrence records limited to Caddo Parish.	Not likely to affect—Known population, but could affect currently unidentified populations near Caddo Lake.	NSO #4 NSO #18
Golden aster *Chrysopsis gossypina ssp. hyssopifolia*	S1	X		Open sandy soils, pine woods, and roadsides. Occurrence records associated with split-estate in Washington Parish.	Not likely to affect—Known population is upstream of FMO 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.	Moderate—Potential to affect populations near FMO on Caddo Lake in Caddo Parish. Not likely to affect population near Wallace Lake in De Soto Parish.	NSO #18
Autumn coral-root *Corallorhiza odontorhiza*	S1		X	Upland hardwood dominated slopes and upland ridges, and in calcareous	Low—Occurrence record on 40-acre split-estate tract near northern boundary of Caldwell Parish, away from bulk of	

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	Potential Impact	Stipulation
				forests. Occurrence records in Caldwell and Ouachita parishes.	FMO.	
Golden wave tickseed *Coreopsis intermedia*	S2	X		Hardwood forests in extreme northwestern portion of state. Occurrence records near FMO in Caddo Parish.	Moderate—Potential to affect unidentified populations on split-estate in northern Caddo Parish.	
Stiff tickseed *Coreopsis palmata*	S2		X	Prairie remnants with occurrence records near FMO in Bossier Parish.	Moderate—Four occurrence records on FMO in a county with high development potential.	NSO #18
Silver croton *Croton argyranthemus*	S2		X	Sandhills and sandy roadsides, with occurrence records in Caddo, Sabine, and Vernon parishes.	Low—Potential to affect 1 population on split-estate FMO in northern Caddo Parish. Other populations outside AED.	
An umbrella sedge *Cyperus grayoides*	S2		X	Sandy prairies, dune, with occurrence records in west central portions of state.	Low—Most known populations are on NF or outside AED. One population on 80-acre split-estate tract in Bienville Parish.	NSO #18
Slim-spike prairie-clover *Dalea phleoides*	S1	X		Sandy woodlands in Caddo Parish.	Low—Four known populations near small, scattered split-estate FMO in northern Caddo Parish.	
Summer-fairwell *Dalea pinnata*	S1	X		Sandhills and scrub. Occurrence record associated with split-estate in Washington Parish.	Low—Only 1 population located 0.5 miles from split-estate FMO.	
Prairie-clover	S2	X	X	Sandy woodlands with	Moderate—Multiple populations in area	

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	Potential Impact	Stipulation
Dalea villosa var. grisea				occurrence records in Bienville and Caddo parishes.	with scattered split-estate.	
Silvery glade fern *Deparia acrostichoides*	S2	X		Damp woods, often on slopes in Florida parishes.	Low—Only 1 well projected in parish.	
Glade fern *Diplazium pycnocarpon*	S2	X		Moist woods and slopes in neutral soils. Occurrence records associated with split-estate in West Feliciana Parish.	Low—Only 1 well projected in parish.	
Common shooting-star *Dodecatheon meadia*	S2	X		Moist or dry woodlands, prairies, limestone slopes, and cliff faces, with occurrence records in Bossier, Caddo, and Natchitoches parishes.	Moderate—In Bossier and Caddo parishes, multiple populations in area of high development potential. Unlikely to affect in Natchitoches Parish, where population is on NF.	NSO #18
Purple coneflower *Echinacea purpurea*	S2	X		Open woodlands, thickets, edge of prairie remnants, and glades. Occurrence records scattered across state.	Moderate—Widespread species with populations in parishes with high development potential, particularly in Caddo, Caldwell, and Richland parishes.	NSO #18
Punctate cupgrass *Eriochloa punctata*	S2	X		Coastal marshes, along watercourses, moist swales, and ditches, with occurrence records in Cameron, Plaquemines, and Vermillion parishes.	Low—One population 0.5 miles from 150-acre split-estate tract in Cameron Parish. No FMO near other recorded populations.	NSO #16

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	Potential Impact	Stipulation
Long-leaved wild-buckwheat *Eriogonum longifolium*	S2	X		Sandy soil mainly on the edges of pine and oak woodlands, calcareous clay, or sandy soils, with occurrence records in Beauregard, Caddo, Natchitoches, Vernon, and Winn parishes.	Moderate—Multiple records in area of split-estate in northern Caddo Parish. Other populations on NF or outside AED.	
White trout-lily *Erythronium albidum*	S2	X	X	Mesic hardwood forest slopes. Occurrence records in Bossier and Caddo parishes.	Moderate—Multiple records in area of high development potential.	
Thoroughwort *Eupatorium purpureum*	S1	X		Calcareous prairies with 2 occurrence records in Caldwell Parish.	Low—Closest record is 0.5 miles from split-estate tract in Caldwell Parish.	NSO #18
American alumroot *Heuchera americana*	S2	X		Mature hardwood dominated forests, often on slopes. Occurrence records in northwestern portions of state.	Moderate—Multiple records in vicinity of split-estate in Caddo and De Soto parishes.	
Hawkweed *Hieracium longipilum*	S1	X		Prairie, open woods, sandy areas with occurrence records in Caldwell Parish.	Low—Single occurrence record 0.8 miles from split-estate in Caldwell Parish.	NSO #18
Large whorled pogonia *Isotria verticillata*	S1?	X	X	Dry to mesic forests, and seeps. Occurrence records across northern	Moderate—Particularly at Barksdale AFB and on scattered split-estate in northern 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	Potential Impact	Stipulation
				portion of state.		
June grass *Koeleria macrantha*	S1		X	Prairie, open woods, and rocky slopes. Occurrence records in Bossier and Winn parishes.	Moderate—Particularly at Barksdale AFB. Winn Parish record on NF.	NSO #18
Southern red lily *Lilium catesbaei*	S1	X		Wet pine flatwoods and savannas, often with pitcher plants. Occurrence record associated with split-estate in Washington Parish.	Low—One population 0.6 miles from 2 small (20–22-acres) split-estate tracts in Washington Parish.	NSO #16
Lady lupine *Lupinus villosus*	S2	X		Sandy soils. Occurrence record associated with split-estate in Washington Parish.	Moderate—One population on 2.4 acre split-estate tract and 0.5 miles from 22-acre tract.	
Stagger-bush *Lyonia mariana*	S1	X		Swamps and moist or dry forests, especially on sandy soils. Occurrence records in Caddo and Claiborne parishes.	Low—One population within 0.8 miles of 40-acre split-estate tract in northern Caddo Parish. Claiborne Parish population on NF outside AED.	NSO #16
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.	Low—Multiple records but closest downstream record is 0.6 miles from FMO.	NSO #16
Pyramid magnolia *Magnolia*	S2	X		Mesic woodlands along streams, ravine slopes,	Moderate—Occurrence records near split-estate in West Feliciana and	NSO #16

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	Potential Impact	Stipulation
pyramidata				bluffs, and uplands. Occurrence records in the Florida parishes.	Washington parishes.	
Barbara's buttons *Marshallia caespitosa var. signata*	S1	X		Limestone outcrops and sandy soils, with occurrence records in Bossier Parish.	Low—One occurrence record near split-estate in Bossier Parish.	
Prairie milkvine *Matelea cynanchoides*	S1	X		Prairie remnants with occurrence records in Caddo Parish.	Moderate—Multiple occurrence records near split-estate in Caddo Parish.	NSO #18
Snow melanthera *Melanthera nivea*	S2	X		Rich soils of salt dome hardwood forests, and bottomland hardwood forests. Occurrences in parishes along Mississippi River, but also includes Rapides Parish and coastal parishes. Small population occurs just off the Big Saline tract.	Moderate—Near FMO already leased and held by production. Could be affected by production facilities on adjacent private land.	
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.	Moderate—Particularly population at Bonnet Carre Spillway.	NSO #16
Pale umbrella-wort *Mirabilis albida*	S2		X	Xeric and sandhill woodlands, with occurrence records in Bossier,	Moderate—Particularly at Barksdale AFB and on scattered split-estate tracts in northern Caddo	

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	Potential Impact	Stipulation
				Caddo, De Soto, and Natchitoches parishes.	Parish.	
Saltflat grass *Monanthochloe littoralis*	S1	X		Coastal saline mud flats and salt marshes on bay shores and behind beaches, with occurrence records in Cameron Parish.	Moderate—Limited FMO in Cameron Parish but there are occurrence records near split-estate along coast.	NSO #6 NSO #16
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.	Moderate—Occurrence records across northern AED, potential to affect Caddo, Bossier, and Bienville parishes.	
Prairie pleat-leaf *Nemastylis geminiflora*	S2S3	X	X	Prairies, woodlands, and pastures in Bossier, Caddo, Caldwell, and De Soto parishes.	Moderate—Potential to affect in Caddo, Bossier, and Caldwell parishes.	NSO #18
Allegheny spurge *Pachysandra procumbens*	S2	X		Mesic forests of the Tunica Hills ravines in West Feliciana Parish.	Low—Only 1 well projected in West Feliciana; closest FMO is within 0.1 mile of occurrence record but in adjacent drainage.	
Drummond nailwort *Paronychia drummondii*	S2	X		Sandy soil in dry oak and pine woodlands, clearings, and roadsides. Occurrence records in Caddo, Natchitoches, and Winn parishes.	Low—No FMO in vicinity of occurrences in Natchitoches and Winn parishes. One occurrence immediately adjacent to 160-acre split-estate tract 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	Potential Impact	Stipulation
Palm-leaf scarf-pea *Pediomelum digitatum*	S1		X	Xeric sandhills, with occurrence records in Caddo Parish.	Moderate—Occurrence record on split-estate tract in Caddo Parish.	
Awl-shaped scarf-pea *Pediomelum hypogaeum var. subulatum*	S2	X		Open, mesic prairies with occurrence records in Caddo and Natchitoches parishes.	Moderate—Occurrence record on split-estate tract in Caddo Parish.	NSO #18
Downy phlox *Phlox pilosa ssp. ozarkana*	S2?		X	Prairies, roadsides, and woods. Occurrence records in Bossier Parish.	Moderate—Occurrence record on Barksdale AFB.	NSO #18
Correll's false dragon-head *Physostegia correllii*	S1	X		Wetlands, wet roadsides, and canals. Occurrence records in Cameron Parish and southeastern Louisiana.	Low—Only 2 wells projected, and closest occurrence record is 1 mile from FMO.	NSO #16
Woolly plantain *Plantago patagonica*	S2	X		Grasslands and woodlands. Occurrence records in Allen and Caddo parishes.	Moderate—Occurrence record immediately adjacent to spit-estate in Caddo Parish.	NSO #18
Green-fringe orchid *Platanthera lacera*	S1	X		Prairies and open woods, usually in damp ground. Occurrence records in Caddo and Vernon parishes.	Low—Occurrence record is 0.5 miles from 35-acre split-estate tract in Caddo Parish.	NSO #18
Scalloped milkwort *Polygala crenata*	S2	X		Flatwoods, bogs, and swamps. Occurrence records associated with split-estate in Tangipahoa Parish.	Low—Only 2 wells projected in Tangipahoa Parish with 1 occurrence record immediately adjacent to split-estate tract.	NSO #16

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	Potential Impact	Stipulation
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.	Low—Occurrence records in Caldwell Parish are 1 mile downstream of closest FMO. In West Feliciana Parish, occurrence records are more than 1 mile upstream of FMO or in separate drainage.	
Oklahoma plum *Prunus gracilis*	S2	X	X	Sandy open woodlands, forest openings, and slopes. Occurrence records in Caddo Parish.	Moderate—Multiple occurrence records near and on split-estate in northern Caddo Parish.	
Arkansas oak *Quercus arkansana*	S2	X	X	Rolling, sandy areas across extreme northern portion of state.	Moderate—Multiple occurrence records near and on split-estate in northern Caddo Parish.	
Turkey oak *Quercus laevis*	S1	X		Sandhill and dry sites. Occurrence record near split-estate in Washington Parish.	Moderate—Potential to affect in the "Florida Parishes."	
Mexican hat *Ratibida peduncularis*	S2S3	X		Coastal dune grassland, Gulf beach, and coastal prairie, primarily in Cameron Parish.	Low—Very limited FMO in the coastal habitats of this species. Closest occurrence record almost a mile away from split-estate tract.	NSO #6
Yellow coneflower *Ratibida pinnata*	S2?	X	X	Prairies, savannas, wood edges, and roadsides. Occurrence records in central and northwestern portions of state.	Moderate—Particularly in Caddo and Caldwell parishes.	NSO #18
Flat-fruit beakrush *Rhynchospora*	S2	X		Flatwoods and bogs. Occurrence	Low—Most occurrence records outside AED,	NSO #16

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	Potential Impact	Stipulation
compressa				records associated with split-estate in Washington Parish.	Nearest occurrence record 0.5 miles from FMO in Washington Parish.	
Granite gooseberry *Ribes curvatum*	S2	X		Open woods along intermittent streams and slopes. Occurrence records in Caddo Parish.	Low—Closest occurrence records almost 1 mile upstream of FMO in Caddo Parish.	NSO #16
Bloodroot *Sanguinaria canadensis*	S2	X		Rich hardwood-dominated forests on hillsides and on infrequently flooded terraces. Occurrence records in northern portions of state.	Low—Most occurrence records outside the AED. One record more than 0.5 miles from split-estate FMO in Caddo Parish.	
Tumble grass *Schedonnardus paniculatus*	S1	X		Saline prairies in Caddo and De Soto parishes.	Low—Closest occurrence record is 0.3 miles from FMO in Caddo Parish, no FMO in vicinity of occurrence records in De Soto Parish.	NSO #18
Delta bulrush *Scirpus deltarum*	S1?	X		Brackish, coastal shores, marshes, ditches along Gulf Coast.	Moderate—Potential to affect, particularly in Plaquemines Parish.	NSO #6 NSO #16
Heart-leaved skullcap *Scutellaria cardiophylla*	S2	X		Rocky open woods, savannas, and wooded slopes along streams in Caddo Parish.	Moderate—Potential to affect split-estate tracts in very northwestern Caddo Parish.	
Narrowleaf aster *Sericocarpus linifolius*	S2	X		Open deciduous and pine woods, oak and pine barrens, and roadsides. Occurrence	Low—Because FMO is limited in Washington Parish, and closest known occurrence record is located 0.2 miles above split-estate	

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	Potential Impact	Stipulation
				records associated with split-estate in Tangipahoa and Washington parishes.	tract.	
Starry campion *Silene stellata*	S2	X	X	Rich, deciduous woods, river flats, and tall grass prairies across central and northern Louisiana.	Moderate—Potential to affect at Barksdale AFB and across most of the state.	NSO #18
Fire pink *Silene virginica*	S2		X	Older slope forests and mixed hardwood loblolly pine forests in Ozark region.	Moderate—Particularly on split-estate tract in Red River Parish.	
Eared goldenrod *Solidago auriculata*	S2		X	Rocky wooded slopes, alluvial soils near streams, woods. Occurrence records across northern portion of state.	Moderate—Potential to affect across northern sections of AED.	NSO #16
Smooth twistflower *Streptanthus hyacinthoides*	S2		X	Sandy prairies, open glades in woods, and grassy roadsides. Occurrence records in northwestern portions of Louisiana.	Moderate—Potential to affect across northern sections of AED.	NSO #18
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.	Moderate—Potential to affect at Barksdale AFB and in southern 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	Potential Impact	Stipulation
Yellow pimpernell *Taenidia integerrima*	S2		X	Open hardwood dominated calcareous forests, on lower slopes, or near small, intermittent stream. Occurrence records in the central and northwestern portions of Louisiana.	Moderate—Potential to affect across northern portions of AED.	NSO #16
Prairie flameflower *Talinum rugospermum*	S1	X		Xeric open prairies, sand barrens, rocky outcrops, and open sandy woods. Occurrence records in Caddo Parish.	Low—Closest occurrence record is 0.4 miles from split-estate tract in Caddo Parish.	NSO #18
Windflower *Thalictrum revolutum*	S1		X	Dry open woods, brushy banks, thickets, barrens, and prairies. Occurrence records in Bossier, Claiborne, and Acadia parishes.	Moderate—Potential to affect at Barksdale AFB.	
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.	Low—Limited FMO and few wells projected in these parishes, and habitat constrains well pad construction.	
Reflexed trillium *Trillium recurvatum*	S2	X		Rich, moist woods and bluffs, often inundated while in flower. Occurrence records in	Moderate—Potential to affect split-estate in Caddo and Bossier parishes.	NSO #16

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	Potential Impact	Stipulation
				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.	Moderate—Potential to affect on split-estate in Caddo Parish.	NSO #16
Yellowleaf tinker's-weed *Triosteum angustifolium*	S2	X		Dry, open woods and savannas. Occurrence records across northern portion of Louisiana.	Moderate—Potential to affect, particularly in Bossier and Caddo parishes.	
Nodding pogonia *Triphora trianthophora*	S2	X	X	Humus soils in hardwood dominated forests. Occurrence records across central and northwestern potions of Louisiana.	Moderate—Potential to affect at Barksdale AFB and in central Caddo Parish.	
Perennial sandgrass *Triplasis americana*	S1	X		Sandy soils in prairies and woods. Occurrence records associated with split-estate in Washington Parish.	Low—Nearest occurrence record is 0.6 miles from FMO.	NSO #18
Sea oats *Uniola paniculata*	S2	X		Coastal dunes along Gulf Coast.	Low—Very limited FMO in coastal vegetation communities.	NSO #6
Sessile-leaved bellwort *Uvularia*	S2	X		Mesic woods in central and northwestern	Low—Most occurrence records outside AED or on	

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	Potential Impact	Stipulation
sessilifolia				portions of Louisiana	NFs. Closest occurrence record 0.7 miles from small split-estate tract in northern Caddo Parish.	
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.	Moderate—Potential to affect, particularly in central Caddo Parish.	
Northern prickly ash *Zanthoxylum americanum*	S1	X		Open woods, slopes, and thickets. Occurrence records in Caldwell Parish.	Moderate—Closest occurrence record is 0.5 miles from split-estate, but there are a number of tracts in vicinity of occurrences.	
Nuttall death camas *Zigadenus nuttallii*	S1	X		Usually found in dry, open areas. Occurrence records in Bossier, Caddo, and Caldwell parishes.	Moderate—Potential to affect in Caddo, Caldwell and Bossier parishes.	

[1]S1 = Extremely rare. Typically 5 or fewer estimated occurrences in the state, or only a few remaining individuals, may be especially vulnerable to extirpation.

S2 = Very rare. Typically between 5 and 20 estimated occurrences or with many individuals in fewer occurrences, often susceptible to becoming extirpated.

Louisiana Invasive Plant Species

Many of the invasive plant species expected to be encountered during mineral development activities, particularly in the northern portions of the state, are ubiquitous on disturbed lands or forest edges. These include Chinese tallow *(Triadica sebifera)*, kudzu *(Pueraria montana var. lobata)*, Japanese honeysuckle, Chinese privet, Japanese privet *(Ligustrum japonicum)*, chinaberry (*Melia azedarach)*, tall fescue *(Festuca arundinacea)*, and Johnsongrass *(Sorghum halepense)*. Oil and gas activities have the potential to extend existing infestations and would require ongoing maintenance to ensure that these plants were controlled along access roads, flowlines, and well pad edges. There is the potential for mineral

development activities to introduce invasive species to new areas or facilitate the spread of aggressive invasive plant expanding into the state. In Louisiana, cogongrass, tropical soda apple, and Japanese climbing fern *(Lygodium japonicum)* are of particular concern. Transportation of seeds could occur on construction equipment or other vehicles or in mulch material or soils, and would be a major concern to surface management agencies and private landowners. Although BLM expects to authorize less than two percent of the wells projected to be drilled in Louisiana over the next 10 years, the FMO includes publically managed natural lands where invasive species management may be a more significant issue. It should be noted that while invasive plant species tend to be less of an issue in marine environments, there is potential to facilitate the spread of invasive plant species, if created uplands are not tidally inundated.

Tennessee

Two wells are projected to be drilled on FMO in Tennessee over the next 10 years. These wells are expected to disturb 14 acres of vegetation. Four of these acres would continue to be used for the life of the producing wells (Table 4-10). Development is projected with Dale Hollow Lake or Standing Stone State Park/Forest. Map 3-19 shows the counties with expected oil and gas development, and Table 3-87 shows the number of projected wells by county.

Tennessee Ecoregions

All projected oil and gas development is expected to occur in the Interior Low Plateau Ecoregion.

Tennessee Vegetation Communities

Outside the area inundated by Dale Hollow Lake, almost 93 percent of the FMO in the AED is mapped as Southern Interior Low Plateau Dry Oak Forest (see Table 3-43). Both wells projected to be drilled in Tennessee are most likely to be located in this widespread vegetation community and would result in the disturbance of up to 14 acres of this forest community. Local impacts would be related to the maturity and integrity of the site. Although most of these areas are expected to be second growth stands, mature stands would result in loss of structure that would take many decades to recover, and new access roads could contribute to local fragmentation of forest blocks.

A total of 1,277 acres of FMO are mapped as Forest Plantation, Pasture, Agriculture, and Developed. These areas may be disproportionately targeted for oil and gas development because of accessibility.

There are 78 acres of South-Central Interior Mesophytic Forest on FMO in the AED. The Tennessee state WAP ranks this vegetation community as having the highest priority for Tennessee species of greatest conservation concern. This vegetation community is embedded in the more extensive Southern Exterior Low Plateau Dry Oak Forest along the shoreline of Dale Hollow Lake. Impacts from drilling activities would likely be limited here because of setbacks from the lake shoreline, but access roads and flowlines could affect this vegetation community in upper reaches of tributaries.

Tennessee Priority Plant Species

Table 4-17 ranks the relative potential for each of these priority plant species to be affected by the projected development, based on proximity of known occurrences to FMO, distribution of the known occurrences in the AED, and accessibility of associated vegetation community. Three of the following priority plant species occurrence records are clustered in a limestone area along the Wolf River to the east of Dale Hollow Lake. Also included in the table is the reference to stipulations that do not apply to this alternative but would provide some level of protection in Alternatives B, C, and D (see Table C-2 in Appendix C for the full text of the stipulations).

Table 4-17 Potential Impacts on Priority Plant Species from Oil and Gas Development in Tennessee

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Occurrence Record Within 1 Mile of FMO	Occurrence Record on FMO	Vegetation Community/ Habitat	Potential Impact	Stipulation
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.	Low—Occurrence records below 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.	Low—Potential to affect in upper reaches of 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.	Low—Potential to affect in upper reaches of Dale Hollow Lake.	NSO #16 NSO #18
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.	Low—Potential to affect in upper reaches of Dale Hollow Lake.	NSO #16

[1]S1 = Extremely rare. Typically 5 or fewer estimated occurrences in the state, or only a few remaining individuals, may be especially vulnerable to extirpation.

S2 = Very rare. Typically between 5 and 20 estimated occurrences or with many individuals in fewer occurrences, often susceptible to becoming extirpated.

Tennessee Invasive Plant Species

Because only two wells are projected in Tennessee, there is limited potential to affect the spread of invasive plant species. However, local impacts could occur at the well pad and along access roads or flowlines. Some species are particularly opportunistic in openings in wooded situations, such as Japanese stiltgrass and tree-of-heaven. Impacts are expected to be local, but there is the potential to facilitate the spread of invasive plant species, especially those already in the vicinity of the drilling location.

Virginia

In Virginia, 21 oil and gas wells are expected to be drilled on FMO at the John W. Flannagan Dam and Reservoir, or at the Radford Ammunition Plant unit in Montgomery County. The drilling on FMO is estimated to initially disturb 100 acres, with 40.81 of those acres continuing to be used for the life of the producing wells (Table 4-10). Map 3-20 shows the counties with expected oil and gas development, and Table 3-88 shows the number of projected wells by county.

Virginia Ecoregions

All of the projected oil and gas development would occur in the Northern Cumberland and Northern Ridge and Valley ecoregions.

Virginia Vegetation Communities

The majority of the FMO in the AED is mapped as Deciduous Forest (7,704 acres). This is the most likely vegetation community to be affected by the projected drilling, particularly at the John W. Flannagan Dam, and the southern portions of the Radford Ammunition Plant. Forests at Flannagan Dam tend to be mature contiguous stands with limited access. Oil and gas development in these areas is expected to require more road construction and cut and fill slopes because of the steep terrain. Both of these factors can increase the potential area of disturbance and the chance of erosion damaging vegetation below the well pad. At Radford Ammunition Plant, the flatter terrain and smaller forest blocks would limit the extent of these impacts.

Almost one-third of the FMO (4,309 acres) in Virginia is mapped as Water, Developed, Agriculture, or Transitional. Agriculture and Transitional areas may be considered preferred locations because of accessibility and the previous disturbances. Drilling activities in these modified areas is expected to have limited impacts on natural vegetation communities.

The remaining vegetation communities mapped in the AED include Evergreen Forest (207 acres), Mixed Forest (255 acres), and Woody Wetlands (87 acres), which are unlikely to be affected because of their relative scarcity at both facilities. However, construction in Woody Wetlands could alter local hydrology resulting in offsite impacts on downstream vegetation.

Virginia Priority Plant Species

Table 4-18 ranks the potential for Priority Plant Species in Virginia to be affected by BLM-authorized oil and gas development. Impacts on these species are anticipated only at John W. Flannagan Reservoir. Also included in the table is the reference to stipulations that do not apply to this alternative but would provide some level of protection in Alternatives B, C, and D (see Table C-2 in Appendix C for the full text of the stipulations).

Table 4-18. Potential Impacts on Priority Plant Species from Oil and Gas Development in Virginia

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	Potential Impact	Stipulation
Small spreading pogonia	S2	-	X		Savannas, meadows, and openings in oak or	Low—Occurrence record 0.8	NSO #18

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	Potential Impact	Stipulation
Cleistes bifaria					pine woodlands, mountain habitat often xeric, in acidic soils. Occurrence records near FMO in Dickinson County.	miles from FMO associated with John W. Flannagan Reservoir.	
River bulrush *Schoenoplectus fluviatilis*	S2	-	X		Freshwater shores, inland marshes, and coastal estuaries. Occurrence records in Fairfax County near Meadowood SRMA.	No impacts anticipated—no distur-bances planned at Meado-wood, and occurrence records are outside the AED.	NSO #16
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.	Low– Most occurrence records on Jefferson NF.	

[1]S1 = Extremely rare. Typically 5 or fewer estimated occurrences in the state, or only a few remaining individuals, may be especially vulnerable to extirpation.

S2 = Very rare. Typically between 5 and 20 estimated occurrences or with many individuals in fewer occurrences, often susceptible to becoming extirpated.

Virginia Invasive Species

The projected oil and gas drilling is likely to increase the number of intrusions into larger forested block, particularly at John M. Flannagan Dam. Disturbed areas along access roads and the well pads would be vulnerable to infestations from those species spread by seed, and from seeds or stolons brought in by vehicles or with fill dirt. Species that tolerate semi-shaded conditions, such as Japanese stiltgrass *(Microstegium vimineum)*, garlic mustard *(Alliaria petiolata)*, and tree-of-heaven *(Ailanthus altissima)*, could spread from the well pad into adjacent forested areas. At the Radford Ammunition Plan, there are likely more non-native species in the AED. The construction of well pads, roads, and flowlines could increase the areas of infestation at Radford in forested areas, but there is a higher likelihood at Radford of well pads being located in areas already disturbed.

Alternative A: Impacts from Resources Other Than Minerals and Energy

General Impacts on All Tracts

Conducting vegetation treatments (e.g., prescribed burning, mechanical, chemical, manual, and biological) and continuing habitat improvement actions on the Lathrop Bayou HMA, Jupiter Inlet Lighthouse ONA, and Meadowood SRMA surface tracts (a total of 1,075 acres) under the vegetation, fish and wildlife, and special status species resource programs would improve and maintain native vegetation communities at those tracts. Active management would include early detection and treatment of invasive plant species and intervention, as needed, to curtail situations that would degrade vegetation.

Most of the other tracts retained by BLM, totaling 1,755 acres, without active management are expected to be increasingly degraded by encroachment of invasive plant species and unauthorized uses. The lack of appropriate burning in fire-adapted communities eventually reduces the ability of these areas to support associated species, many of which are priority species. These areas also accumulate excess fuels, and habitats can be severely damaged or lost in the event of catastrophic wildfire.

Cultural management actions (e.g., capping and restoring) to conserve sensitive cultural resource sites would have negligible impacts on vegetation. Capping these sites would allow the replacement of non-native plants with natives, where needed, and curtail erosion. Hardened surfaces can help to reduce trampling of vegetation near high-use areas.

Managing 185 acres as VRM Class II would limit the type and extent of construction projects to retain the existing character of the landscape. This would reduce the footprint of future projects and the area disturbed.

There is very little evidence of dispersed recreational use on most of the BLM surface tracts. However, where it does occur, there could be increased damage to vegetation from trampling and off-road vehicle use. These disturbed areas are susceptible to an increase in invasive plant species and erosion.

Based on past activities, requests for ROWs on BLM-administered surface tracts are anticipated to be few. If permitted, these could involve land-clearing activities to make way for communication towers and linear features, such as roads, pipelines, and transmission lines. This would result in removal of vegetation, potentially increasing erosion and runoff. Maintenance of these ROWs could involve suppression of woody regrowth and could tend to foster invasive plant species.

State-Specific Impacts

The following state sections provide additional details on impacts from management actions proposed for vegetation, fish and wildlife, special status species, wildland fire, cultural resource management, recreation management, travel and access management, and land tenure adjustments.

Arkansas

Under Alternative A (No Action), no resource management is proposed for the 18 surface tracts retained by BLM in Arkansas. Vegetation communities are expected to deteriorate from lack of management, with continuing unauthorized use, lack of fire, and increasing invasive species coverage. Currently 36 percent of the vegetation is in poor condition with lower than expected plant diversity and visible loss of community structure. This is most pronounced in glades and barrens, where 68 percent are in poor condition, primarily because of invasion by eastern red cedar *(Juniperus virginiana)* and compounded by the lack of fire and unauthorized uses.

Of the three priority plant species occurring on the surface tracts in Arkansas, Trelease's delphinium glade habitat at the Bennett Bayou and Foster Branch tracts is expected to continue to decline. Moore's delphinium forested habitat at Campbell Hollow is expected to remain relatively undisturbed. Non-reproducing clones of Ozark chinquapin *(Castanea pumila var ozarkensis)* on the Calf Creek, Middle Fork, and Lost Creek tracts could be damaged by unauthorized uses, but the species is primarily at risk because of chestnut blight.

Under this alternative, the Point Peter and Redland Mountain tracts, totaling 84 acres, would be transferred to the U.S. Forest Service (USFS). The vegetation communities on these tracts are in good to fair condition and would benefit from future management. Three tracts, Drasco, Middle Fork, and West Fork, totaling 55 acres, would be available for disposal. Vegetation on the Drasco tract is in poor condition, and the tract's small size reduces the value and effectiveness of potential restoration efforts. Middle Fork and West Fork tracts contain forest and glades in poor to fair condition that could be managed to improve conditions, and disposal would incrementally reduce the acreage of the these habitats in public ownership.

Florida

Under Alternative A, BLM would continue vegetation management at two special management areas, Jupiter Inlet Lighthouse ONA and Lathrop Bayou HMA, discussed in more detail below. Six tracts would be retained by BLM with no resource management actions planned. Vegetation communities on these tracts are at risk from unauthorized uses and lack of invasive species control. Egmont Key, where an ongoing management program would be curtailed, would be substantially damaged by any lapse in management, and hardwood hammock and coastal vegetation communities would be degraded by the abandonment of invasive species control and unmanaged public use. On the Citrus County tract, wetlands would continue to be degraded from both aquatic and terrestrial invasive plant species. Coastal vegetation communities at Gasparilla and Park Key would be degraded by terrestrial invasive plant species and unauthorized or unmanaged public use. On two small tracts, Freeport and Suwanee, lack of management would likely result in accumulation of shrubby growth and an increase in invasive plants.

No impacts from cultural resource management actions are expected in this alternative, other than those related to Jupiter Inlet Lighthouse ONA and Lathrop Bayou HMA, which are discussed below.

Recreational use of the tracts would continue to be primarily casual, with some potential to degrade vegetation communities primarily through trampling. The high levels of public use at Egmont Key, in particular, have the potential to damage hammock and coastal habitats throughout the tract by the creation of braided trails and trash.

In Alternative A, the Lake Marion tract would be available for exchange or transfer to the USFWS or Florida Department of Environmental Protection. The goal would be for this tract to be either incorporated into Everglades Headwaters NWR or used to benefit land acquisition for the NWR system. If retained in public ownership, scrub and wetland resources and special status plants are expected to benefit from site management, which could include prescribed burning/fuel reduction and removal of invasive plant species. In private ownership, the tract is expected to be developed with the loss of 14 acres of scrub, flatwoods, and bay swamp. The Sugarloaf Key tract would be available for exchange to the USFWS and is expected to benefit from invasive species control.

At Jupiter Inlet Lighthouse ONA, ongoing management is expected to maintain 63 acres of scrub, tropical hardwood hammock, and mangrove swamp in good condition. Twenty-three acres of scrub and hardwood hammock, returned to BLM management in 2011, are in poor condition and are being restored through mechanical and chemical control of extensive stands of woody and herbaceous invasive plants. Plantings

will augment retained native plants, and the acreage is expected to return to fair condition over the next five to 10 years and ultimately to good condition. The remainder of the BLM acreage is in maintenance mode, with at least annual manual sweep and hand applications of herbicides as needed. Jupiter Inlet Lighthouse ONA is a cooperative weed management area, and work is coordinated through agreements with local partners.

Seven priority plant species at Jupiter Inlet Lighthouse ONA, including Curtiss' milkweed, nodding pinweed, large-leaved rosemary *(Conradina grandiflora)*, and four species of bromeliads, would benefit from ongoing management. Curtiss' milkweed, nodding pinweed, and large-leaved rosemary are all fire-adapted and respond favorably to prescribed fire. The bromeliads are associated with older scrubs, and although individuals may be killed by fire, habitat conditions are expected to be maintained or improved over the long term.

Jupiter Inlet Lighthouse ONA is an urban tract, and wildfire suppression activities would be coordinated with local communities.

Protection of buried cultural resources at the Jupiter Inlet Lighthouse ONA might exclude or require some modification of vegetation treatments. It might limit the size of holes that could be dug for plantings in some sensitive areas or require limits on mechanical or hand grubbing of invasive plants to reduce ground disturbance. As an alternative, most treatments could be accomplished with stump applications or hand cutting to accomplish vegetation objectives. Cultural resource monitoring is generally required for all ground disturbing activities at the Jupiter Inlet Lighthouse ONA. Capping exposed cultural sites is likely to reduce erosion and if planted with natives, would contribute to reestablishment of a native vegetation community.

Recreational use at Jupiter Inlet Lighthouse ONA would continue to be managed under the existing activity plan, which includes trails, overlook, and interpretive signage. Existing facilities funnel most use through sensitive vegetation communities, and most public use is concentrated around developed facilities on the south side of the tract. Opening areas for public use without developed facilities could result in trampling of sensitive vegetation, particularly in open scrub areas.

Travel management decisions at Jupiter Inlet Lighthouse ONA would not change. There is no off-road use permitted. No impacts are expected from the continuing public use of established, paved roads at Jupiter Inlet Lighthouse ONA. Frequently disturbed edges along firebreaks and unpaved maintenance roads would continue to require regular manual and/or chemical treatments to control herbaceous invasive plants, particularly natal grass. These areas are for administrative use only and not available for public vehicle use.

Vegetation communities at Lathrop Bayou are expected to continue to benefit from active management, including prescribed fire and management of priority plant species.

At Lathrop Bayou, mature longleaf/slash pine flatwoods and freshwater marsh are in good condition. These vegetation communities would continue to benefit from frequent prescribed burns and manual fuel reduction. Invasive species control would focus on early detection and manual control methods, with chemical treatments expected to be primarily stump treatment of woody invasive, such as camphor trees *(Cinnamomum camphora)*.

Priority species at Lathrop Bayou would benefit from ongoing management. Of the nine priority plant species recorded at Lathrop Bayou, Chapman's crownbeard, wiregrass gentian, bog tupelo, southern milkweed, and West's flax are associated with fire-maintained habitats, although specific research on their response to prescribed burning is lacking. Species associated with isolated freshwater wetlands at

Lathrop Bayou, including giant water-dropwort, karst pond xyris, Piedmont jointgrass, and Apalachicola dragon-head, are not expected to be adversely affected by prudent burning that is conducted when soil conditions are wet, and these plants would likely benefit from reduction of competition with more aggressive herbaceous and shrubby plants.

Wildland fire on BLM land at Lathrop Bayou, which is basically an island, is likely to be managed through containment, particularly if the fire were within prescription. Aerial suppression, hand crews, and firebreaks on private forest lands on the mainland would be an option to control spread of wildfire across the marsh to the mainland.

Current recreational use levels at Lathrop Bayou are low, limited by lack of access and remoteness. No actions are planned that would increase the public use, and no impacts on vegetation are expected.

Travel management decisions at Lathrop Bayou HMA would not change. No public vehicle use is permitted at Lathrop Bayou.

Louisiana

Under Alternative A, all five surface tracts in Louisiana would be retained by BLM, but no resource management actions are planned, except for those implemented as part of the SRMA activity level planning at the Big Saline tract. The vegetation communities on surface tracts in Louisiana are in fair to good condition, except where there have been unauthorized uses. These unauthorized uses would continue to displace or alter native vegetation at the Baldwin, Big Saline, and Rocky Bayou tracts. Invasive plant species are expected to continue to expand and degrade native vegetation communities on these tracts. At Duck Lake, no actions are planned to support removal of aquatic invasive plants in coordination with local efforts. The other Louisiana tracts—Baldwin, Black Lake, and Rocky Bayou—would continue to be vulnerable to increases in exotic species, particularly on the perimeter of the tracts.

Wildland fire is infrequent in most of the vegetation communities found on the Louisiana tracts. The pinelands at Rocky Bayou and coastal marshes at the Baldwin tract could carry fire, but the bulk of Big Saline, Black Lake, Baldwin, and Duck Lake tracts are seasonally flooded and have little ground cover to support a ground fire. Wildfires with sufficient intensity to be carried across these tracts are expected to result in a complete stand replacement.

Impacts from recreation management at the Big Saline SRMA are expected to benefit vegetation. More active management, including signage and coordination with the adjacent Dewey W. Wills WMA should reduce the unauthorized off-road use that is damaging vegetation at the northwest corner of the tract. The 13 acres of disturbed areas at Big Saline are expected to continue to be used for existing oil and gas production, with a portion of that acreage used to construct a hardened boat launch in the northwest corner of the tract, reducing soil erosion and rutting along the bayou where boats are currently launched along the bayou. In addition, control of unauthorized off-road use in the extreme northwest corner of the tract would allow those areas to vegetate naturally.

Virginia

Continuing vegetation manipulation (e.g., prescribed burning, mechanical, chemical, manual, and biological) on the Meadowood SRMA, under the vegetation, fish, and wildlife programs, would help maintain and/or enhance the quality of vegetation. Although short-term losses of vegetation cover would occur after prescribed burning and other vegetation manipulation activities, over the long term, vegetation treatments would remove undesired species, increase species diversity and age class, improve vegetation composition and structure, and increase vegetation cover resulting in healthier vegetation communities.

Cultural resource management would involve ground disturbing activities related to the restoration, protection, and excavation of sites. These are expected to be temporary and very limited in area. Ground disturbing activities would require additional environmental review, including the identification of any priority plant species and appropriate mitigation. Prompt capping or restoring of exposed sites would further limit the impacts.

Recreational use and travel could result in increased disturbance to soil and vegetation resources, leading to soil erosion and trampling and loss of vegetation resources. Recreation use could also result in the spread of invasive plant species from human-caused distribution of non-native seeds. Providing recreational facilities and opportunities (e.g., trail-based and equestrian activities) could encourage and increase recreational use in this area and increase the degree of related impacts.

4.5.3 Alternative B (Preferred Alternative)

Impacts from Energy and Minerals

All States

General impacts on vegetation from projected energy and mineral development activities would be the same as those identified under Alternative A with regard to the types, duration, and extent of impacts. The projected number of wells, the acreage of vegetation disturbed, as well as the general distribution of those wells within each state and ecoregion are the same as those in Alternative A. Refer to Alternative A for discussions on anticipated impacts within ecoregions and the potential for energy and mineral development to affect the spread of invasive weeds.

The following sections provide a general discussion of the impacts on vegetation communities and priority plant species and the effects of the proposed lease stipulations, as well as the effect of the stipulations in reducing the spread of invasive plant species. This is followed by state-specific sections, including more detail on impacts on vegetation communities and a state-specific summary of the impacts on priority plant species.

Vegetation Communities and Priority Plant Species

Impacts on vegetation communities and priority plant species would be the same as those in Alternative A, except where the application of lease stipulations shifts energy and mineral development away from sensitive vegetation communities. Table 4-18 lists the stipulations that protect vegetation resources, either directly or through association with another resource, and the acreage of the FMO affected by alternative. The full text of the oil and gas lease stipulations is provided in Appendix C. The proposed solid mineral lease stipulations, which include stipulations protecting specific vegetation communities, are provided in Appendix M.

Table 4-19. Oil and Gas Lease Stipulations Protecting Vegetation Resources for All States

Stipulation	Vegetation/Habitat Protected	Buffer Distance/Acres Protected		
		Alternative B	Alternative C	Alternative D
No Lease				
FMO acreage closed to leasing	Meadowood SRMA and Jupiter Inlet (Alternative A) Meadowood SRMA, Jupiter Inlet, Lathrop Bayou and Egmont Key tracts	1,132 acres	1,132 acres	945 acres

Stipulation	Vegetation/Habitat Protected	Buffer Distance/Acres Protected		
		Alternative B	Alternative C	Alternative D
	(Alternatives B and C) Meadowood SRMA, Jupiter Inlet, and Egmont Key (Alternative D)			
No Surface Occupancy/No Surface Disturbance				
Red-cockaded Woodpecker *Picoides borealis*	Occupied mature natural pinelands	0.5 mile, plus 200 feet 1,241 acres	0.75 mile, plus 200 feet 2,204 acres	0.5 mile, plus 200 feet 1,241 acres
Coastal/Shoreline Habitats	Coastal/shoreline habitat (inclusive of beaches, coastal strands, mangrove swamps, salt marshes, sandy beaches, and scrub mangrove)	6,671 acres	6,671 acres	6,671 acres
Florida Keys	Surface tracts and FMO south of Key Largo (including mangrove swamp, tidal flats, and hardwood hammock)	148 acres	148 acres	0 acres
Florida Scrub Habitat and Associated Threatened, Endangered and Special Status Species	Xeric oak and sand pine scrub	3,584 acres	3,584 acres	3,584 acres
Wetlands, Freshwater Aquatic Habitat, and Associated Species	Wetlands, wet meadows, wet pine savannas, seepage marshes, streams, rivers, lakes, and ponds[1]	250 feet 389,816 acres	500 feet 508,726 acres	100 feet 295,256 acres
Tropical Hardwood Hammock	Tropical hardwood hammock	19 acres	19 acres	0
Calcareous Glades, Fens, and Salt Barrens	Calcareous glades, fens, and salt barrens	Not mapped in all states	Not mapped in all states	No mapped in all states
Native Grasslands and Prairies	Native Grasslands and Prairies	Not mapped in all states	Not mapped in all states	Not mapped in all states

[1]Acreage shown represents the acreage of FMO associated with water. The periphery of the acreage may often contain wetland vegetation.

In Alternative B, those vegetation communities particularly vulnerable to oil and gas development would be protected wherever they occur by several NSO lease stipulations. A NSO lease stipulation on wetland vegetation communities would be applied across all states. This stipulation would include a 250-foot buffer around these communities to reduce the potential for impacts from drilling activities. This buffer is expected to be adequate to capture sediments and most runoff from well pads, access roads, and other facilities. It would also reduce the chances of altering the hydrology supporting wetlands. In cases where slopes are more than 10 percent, the buffer could be increased to 600 feet to meet site conditions and provide additional protection for wetlands from excessive runoff and accidental spills from well pads and other facilities.

Glades, barrens, native grasslands, and prairies would be excluded from surface disturbing activities in all states. On FMO, these areas tend to be small, and in most cases, wells could be drilled from offsite. This stipulation would avoid irreparable damage to these remnant plant communities and reduce the potential for impacts on priority and federally listed species associated with these vegetation communities.

Coastal vegetation communities, including beaches, coastal dunes, and strand are also excluded from oil and gas development. This stipulation would be limited to coastal Louisiana and the southwest coast of Florida, and is discussed below for those states.

Some NSO lease stipulations that provide protection for special status species also reduce the amount of surface disturbance in their associated vegetation communities. In most cases, these stipulations are limited to a single state and discussed below; however, some apply to multiple states. For instance, the NSO lease stipulation for red-cockaded woodpecker excludes surface disturbing activities within 0.5 miles of occupied clusters, and in Alternative B would be applied to 1,242 acres of FMO. A portion of that acreage is expected to be intact mature open pine forests. These areas are often maintained with prescribed fire and typically support a high diversity of herbaceous endemic plant species.

Invasive Plant Species

Avoiding disturbance in wetland vegetation communities would reduce the potential for invasive plants to become established in wetlands near wells pads, and to spreading to adjacent areas or downstream. Excluding coastal areas, grasslands, and native prairies from development would also reduce the potential for invasive plants species to become established. Other impacts would be the same as those in Alternative A.

State-Specific Impacts from Energy and Minerals

Impacts on vegetation resources from energy and mineral actions in Alternative B specific to each state are discussed below.

Arkansas

Vegetation Communities

Lease stipulations excluding wetlands and aquatic habitats from surface disturbance in Arkansas would be applied to 146,070 acres of FMO across the state. A total of 1,559 acres of glades and barrens would be excluded from surface occupancy, primarily in the northwestern portion of the state. Remnant native grasslands and prairies could not be mapped but are expected to be applied most often in the northern and western counties in the AED.

Arkansas Priority Plant Species

The potential to affect priority plant species in Arkansas is assessed by species as previously shown in Table 4-11. In Alternative B, 36 priority species occur in vegetation communities that would receive some level of protection in this alternative. Most of these, 20 species, are associated with wetlands and riparian zones, with an additional seven species in native grasslands and prairies, and nine in glades and barrens (multiple stipulations apply to some species). Impacts on 22 other priority plant species would be the same as those in Alternative A.

Florida

Florida Vegetation Communities

Impacts from oil and gas development would be similar to Alternative A, except that the aquatic and wetland buffer would be reduced from 550 feet to 250 feet. The 250-foot buffer would apply to 8,814 acres of FMO. No surface occupancy is permitted on 148 acres of FMO in the Florida Keys, 3,584 acres of Florida Scrub, and 18 acres of Tropical Hardwood Hammock, including two acres in the AED.

Impacts from phosphate mining would be the same as those identified under Alternative A. Despite the application of leasing stipulations, the FMO tracts are expected to be mined with offsite compensation or mitigation developed through the mining plan approval process.

Florida Priority Plant Species

The potential to affect priority plant species in Florida is assessed by species as previously shown in Table 4-11. The NSO lease stipulations for coastal vegetation communities, scrubs, and tropical hardwood hammocks exclude development from suitable habitat for all of the priority plant species found on or near FMO in the oil and gas AED, except for the fuzzy-wuzzy air plant in Collier County. The projected drilling of up to three wells in south Florida is most likely to occur outside natural areas with very low potential to affect this species in hardwood hammock/dry forest communities.

Impacts from projected phosphate mining would be the same as those in Alternative A.

Kentucky

Kentucky Vegetation Communities

Lease stipulations excluding wetlands and aquatic habitats from surface disturbance in Kentucky would be applied to 164,164 acres of forested wetlands, herbaceous wetlands, and riparian zones. Stipulations would also exclude development from glades and barrens and native grasslands; however, the acreage of these vegetation communities on FMO is not available. Impacts on other vegetation communities would be the same as those identified under Alternative A.

Impacts from projected coal mining would be the same as those in Alternative A.

Kentucky Priority Plant Species

The potential to affect priority plant species in Kentucky is assessed by species in Table 4-15. Of the 56 priority plant species with occurrence records on or near FMO in the AEDs, 35 would benefit from the 250-foot buffer of aquatic and wetland habitats, although some of these species are not found exclusively in protected vegetation communities. Two species St. Peter's-wort and Nuttall's mock bishopweed are expected to benefit from excluding oil and gas development from native grasslands and glades/barrens. The remainder of the priority species is associated, at least in part, with Upland Hardwood Forests, and the potential to affect these species would be the same as those in Alternative A.

Impacts from projected coal mining would be the same as those identified under Alternative A.

Louisiana

Louisiana Vegetation Communities

Lease stipulations would exclude surface disturbance on 38,976 acres of aquatic and wetland vegetation communities on FMO in Louisiana. It is important to note that this would pertain only to new leases; additional drilling on pre-existing leases would continue to be assessed on a case-by-case basis in areas such as Plaquemines Parish, where 48 wells are projected to be drilled over the next 10 years. In Louisiana, surface occupancy would be excluded from suitable Louisiana black bear *(Ursus americanus luteolus)* habitat in 15 parishes that have Louisiana black bear critical habitat. This stipulation covers 10,691 acres of bottomland and hardwood forests, although all but 40 acres are outside of the AED.

Louisiana Priority Plant Species

The potential to affect priority plant species in Louisiana is assessed by species in Table 4-15. Of the 80 priority plants with occurrence records on or near FMO in the AEDs, 17 would benefit from the 250-foot buffer of aquatic and wetland habitats. Twenty priority plant species would benefit from excluding oil and gas development from native grasslands and prairies, and glades and barrens, primarily in the northwestern portion of the state. Impacts on sea oats and saltflat grass would be avoided by excluding development in coastal vegetation communities. Impacts on the remainder of the priority plant species would be the same as those in Alternative A.

Tennessee

Tennessee Vegetation Communities

The aquatics and wetlands buffer would exclude 43,314 acres of FMO (93 percent) of Dale Hollow Lake from surface disturbance. Remaining areas are primarily located in the central and western fringe on the north side of that portion of the lake in Tennessee. Although the same number of wells is projected to be drilled, this lease stipulation increases the likelihood that wells would be drilled directionally from outside the project boundary. At Standing Stone State Park, the lake and riparian zones would also be excluded from surface disturbing activities, but impacts on other vegetation communities would be the same as those in Alternative A.

Tennessee Priority Plant Species

The potential to affect priority plant species in Tennessee is assessed by species as previously shown in Table 4-11. All four of the priority plant species with occurrence records on or within a mile of FMO occur at Dale Hollow Lake. One occurrence record along the Wolf River, with three priority plants, including starflower false Solomon's-seal, shining ladies tresses, and Schreber's aster, is within the wetland buffer, and that location is unlikely to be affected by drilling activity. The potential to affect Ouachita sedge would be the same as in Alternative A.

Virginia

Virginia Vegetation Communities

The aquatics and wetlands NSO lease stipulation and 250-foot buffer would exclude 4,679 acres of FMO at the John W. Flannagan Dam and along the New River on the portion of the Radford Ammunition Plant in Montgomery County. Much of this unit of the Radford Ammunition Plant is developed with a wooded fringe along the New River and along on the southern border. Impacts on upland forests in these areas would be the same as those in Alternative A.

Virginia Priority Plant Species

The potential to affect priority plant species in Virginia is assessed by species as previously shown in Table 4-11. It is unlike that any of the priority plant species with occurrence records on or near FMO would be affected by oil and gas activities. The occurrence records for small spreading pogonia *(Cleistes bifaria)* and nodding trillium *(Trillium flexipes)* are on the Jefferson National Forest and west of FMO at the John W. Flannagan Reservoir. There is some potential to affect suitable habitat and unidentified populations of these plants in the surrounding area. Small spreading pogonia would be provided some protection through the lease stipulation excluding surface disturbances in native grasslands and prairies and glades.

Alternative B: Impacts from Resources Other Than Minerals and Energy

General Impacts on All Tracts

Under Alternative B, the surface tracts retained by BLM (2,776 acres) would be actively managed to meet resource objectives and future desired conditions for vegetation communities. Five tracts, totaling 66 acres, would be available for disposal from federal ownership, primarily because they are too small to be effectively managed or have lower resource values. Five tracts, totaling 150 acres, would be available for transfer to another agency for inclusion in adjacent national forests or NWRs, or exchange to benefit regional conservation goals.

Impacts from VRM would be similar to those identified for Alternative A, except only 92 acres would be managed as VRM Class II (50% decrease compared with Alternative A). This would reduce the amount of area subject to restrictions on surface disturbance for the purposes of protecting visual resources. This VRM Class change by itself, however, would not likely lead to actions that would increase impacts on vegetation.

Designating all surface tracts as ROW avoidance areas would further reduce the probability of ROW development on BLM-managed surface tracts and thereby reduce the potential for impacts associated with such development.

State-Specific Impacts

The following state sections provide additional detail on impacts from management actions proposed for vegetation, fish and wildlife, special status species, wildland fire suppression, cultural resources management, recreation management, travel and access management, and land tenure adjustments.

Arkansas

In Alternative B, 17 Arkansas surface tracts, totaling 890 acres, would be retained by BLM and managed as the Ozark Highlands HMA (see Appendix E for the land tenure adjustments by alternative). On retained tracts, management actions would be taken to correct intrusions, unauthorized uses, and other issues in vegetation communities to bring them to at least fair condition within 10 years of beginning implementation of the activity level plan. It would take longer for most communities to restore forest and woodland structure sufficiently to be considered in good condition. Vegetation management activities to meet desired future conditions (see Appendix B) include prescribed burning, where feasible, in fire-adapted vegetation communities, and invasive species control to meet desired future conditions (see Appendix B). Prescribed burning would be conducted in coordination with other land managing agencies to meet regional objectives. Manual fuel reduction might be used, particularly in glades and barrens, to meet resource objectives. These management actions would benefit 94 acres of glades and barrens (65 acres currently in poor condition), 16 acres of pine bluestem woodland (15 acres in poor condition), 94 acres of pine-oak woodland (37 acres in poor condition), 194 acres of dry oak woodland (74 acres in poor condition), 387 acres of dry-mesic oak forest (36 acres in poor condition), and 93 acres of mesic hardwood forest (0 acres in poor condition).

In Alternative B, all of the surface tracts with priority plant species would be retained in federal ownership and are expected to benefit from active management and resource protection. Removal of excess eastern red cedar and prescribed fire, where feasible, would improve glades for Trelease’s larkspur at the Bennett Bayou tract. Another Trelease’s larkspur population would be transferred to the Ozark National Forest for management. Two populations of Moore’s larkspur, including one of the state’s largest at Campbell Hollow, would benefit from additional protection. Retention would provide

protection for living, but non-producing Ozark chinquapin clones at Calf Creek, Lost Creek, and Middle Fork.

Impacts from wildland fire suppression activities would be the same as those in Alternative A; however, vegetation actions, including removal of eastern red cedar and a prescribed burn program would tend to reduce the potential for wildfire.

Impacts from cultural resource management would be the same as those in Alternative A.

Impacts from recreation management and travel and access management actions would be reduced in Alternative B. Increased management, including signage, is expected to reduce unauthorized vehicle use. Restoration of affected areas would assist in returning some disturbed areas to at least fair condition.

Impacts from land tenure adjustments would result from the transfer and disposal of six surface tracts. Three tracts would be transferred to the USFS: Redland Mountain (40 acres), Point Peter (40 acres), and Henderson Mountain (40 acres). These tracts are contiguous with the Ozark National Forest; vegetation communities are generally in fair to good condition and would benefit from active management. Three tracts, generally in poor condition or too small to be effectively managed, would be disposed from federal ownership. Disposal of the Gepp tract (40 acres) would result in the loss of a relatively large patch of dry oak woodland (40 acres) in very poor condition. Two additional small tracts, Drasco (5 acres) and Norfolk Lake (20 acres), are dominated by forested communities in poor condition.

Florida

Management of vegetation resources at Jupiter Inlet Lighthouse ONA and Lathrop Bayou would be the same as those identified under Alternative A. ACEC designations at Lathrop Bayou, Egmont Key, and for additional acreage at Jupiter Inlet Lighthouse ONA would increase emphasis on vegetation protection and restoration of the longleaf pine, scrub, mangrove, and hardwood hammock vegetation communities found at those sites. In Alternative B, there would be active management of the four other tracts retained by BLM. Exotic species control would be the primary emphasis in improving the condition of vegetation communities on the Citrus County, Egmont Key, Park Key, and Sugarloaf Key tracts. Prescribed burns would be conducted only in fire-adapted habitats at Jupiter Inlet Lighthouse ONA, Lathrop Bayou, and possibly Egmont Key, in coordination with the USFWS.

Impacts from wildland fire suppression activities are expected to be less in this alternative. All of the retained tracts with fire-adapted vegetation communities would be actively managed, which would include the removal of excess fuels and the use of prescribed fire, where feasible. The Lake Marion tract would be either transferred to the USFWS or exchanged. In either case, the excess fuels are expected to be removed from the tract.

Impacts from cultural resource management would be the same as those in Alternative A, except that management of historic resources at Egmont Key might include some removal of vegetation as part of the stabilization of structures related to Fort Dade. This impact is expected to be very local, and any restoration would involve replanting in native species, with negligible impacts on vegetation communities or priority plant species at Egmont Key.

Impacts from recreation management and travel and access management would be the same as those identified under Alternative A. Most new facilities are expected to be located near the lighthouse or in previously disturbed sites. Some native vegetation could be removed to accommodate new interpretive trails and visitor use access points south of Beach Road, and extensions of the existing trail system north of Beach Road. In general, these uses could be added with very limited removal of woody vegetation. At

Egmont Key, active management and oversight of public use would reduce impacts related to vegetation trampling and trash.

In Alternative B, the two smallest and most isolated surface tracts, the Freeport and Suwannee tracts, would be available for disposal from federal ownership. Both tracts are less than an acre, are of limited resource value, and the impacts from disposal from federal ownership would be negligible. Two tracts would be available for transfer to another agency or for exchange. The Gasparilla tract would be available for transfer to the Florida State Park Service with provisions for protection of natural resources. The coastal strand and hammock communities would benefit from state management if it included removal of the heavy infestation of Brazilian pepper *(Schinus terebinthifolius)* and Australian pine *(Casuarina equisetifolia)*. The Lake Marion tract would be available for transfer to the USFWS for either inclusion in the Everglades Headwater NWR or as exchange base to benefit the NWR system. If retained, it is assumed that the Marion tract would be actively managed to benefit scrub, flatwoods, and bay swamp. If exchanged, it is assumed this would be a net benefit to priority or special status species.

Louisiana

In Alternative B, all five surface tracts in Louisiana, totaling 738 acres, would be retained by BLM and actively managed. On retained tracts, management actions would be taken to correct intrusions and unauthorized uses and to remove and control invasive species. Vegetation management activities would include prescribed burning, where feasible, in fire-adapted vegetation communities, and invasive control to meet desired future conditions (see Appendix B). Prescribed burning would be conducted in coordination with other land managing agencies to meet regional objectives. All of the vegetation communities on the Louisiana surface tracts are in fair to good condition, except for 35 acres at the Baldwin and Rocky Bayou tracts, where there have been intrusions or unauthorized uses. Resolution of the unauthorized uses is expected to be completed and restoration begun on these areas within 3 years after activity level planning is completed. These vegetation communities are expected to be moved to fair condition within the following 10 years.

These management actions would benefit 591 acres of Bottomland Hardwood, 38 acres of Mixed Hardwood-Loblolly Pine/Hardwood Slope Forest, 28 acres of Freshwater Marsh, and two acres of Cypress Swamp, plus open water acreage. BLM would coordinate with watershed-wide control efforts at Duck Lake to control aquatic invasive plants. Coordination with the adjacent Dewey W. Wills WMA might increase efficiency of invasive plant removal at Big Saline Bayou and allow more effective early detection and early response effort for emerging invasive plant issues.

Impacts from wildland fire suppression activities would be the same as those in Alternative A.

Impacts from cultural resource management would be the same as those in Alternative A.

Impacts from recreation management and travel and access management actions would be reduced in this alternative. More active management of the recreation opportunities at Big Saline Bayou SRMA would benefit vegetation. Additional signage and an increased presence should reduce the unauthorized off-road vehicle use damaging vegetation at the northwest corner of the tract. The construction of a hardened boat launch would reduce soil erosion and rutting along the bayou where boats are currently launched. Control of unauthorized off-road use in the extreme northwest corner of the tract would reduce erosion and the continuing loss of vegetation.

Virginia

Impacts on vegetation would be the same as those identified under Alternative A, except that no off-leash dog area would be established, which would provide greater flexibility in invasive species control options in these largely non-native grasslands. The designation of 92 acres as VRM Class II would not alter the vegetation treatment options or impacts.

4.5.4 Alternative C

Impacts from Energy and Minerals

All States

Impacts on vegetation from energy and mineral development are the same as those identified under Alternative B, except that some of the oil and gas lease stipulation buffers would be increased resulting exclusion of additional acres of vegetation from surface occupancy. In particular, the aquatic and wetlands buffer would be increased to 500 feet, adding 118,910 acres of NSO across all states. The red-cockaded woodpecker buffer would be increased to 0.75 miles, covering an additional 963 acres across all states, some of which is expected to be open, mature, pine forest/savanna. Other NSO lease stipulations for specific vegetation communities, including scrub, glades and barrens, native grasslands and prairie, and tropical hardwood hammock would be the same as those in Alternative B.

The potential for oil and gas development to affect the spread of invasive plant species across all states is the same as those in Alternative B, except that increasing the aquatic and wetland buffer would further reduce the potential for oil and gas development activities to promote the spread of invasive plants in adjacent wetlands or along waterways. The level of the benefit would depend on site conditions.

State-Specific Impacts from Energy and Minerals

The following provides state-specific sections, including more detail on impacts on vegetation communities and a summary of the impacts on priority plant species.

Arkansas

Arkansas Vegetation Communities

Impacts on vegetation communities would be the same as those in Alternative B, except that the aquatic and wetlands buffer would cover an additional 49,575 acres. This buffer would provide increased protection for wetland and riparian vegetation in case of erosion from well pads or in the case of accidental leaks or spills. Other impacts on vegetation communities would be the same as those in Alternative B.

Arkansas Priority Plant Species

Increasing the aquatic and wetlands buffer is most likely to benefit those priority plant species that occur in habitats adjacent to riparian zones, including Texas bergia, priority sedge and rush species, scratch daisy, hay-scented cup fern, Texas fescue, Browne’s waterleaf, yellow monkey flower, laurel oak, California bulrush, and fragrant ladies’ tresses.

Florida

Florida Vegetation Communities

The increased aquatic and wetland buffer excludes an additional 5,675 acres from surface disturbance from oil and gas development, but in most cases, the results are expected to be the same as those in Alternative B.

Although the same stipulation applies to phosphate mining on FMO, these areas are not expected to be necessarily excluded from mining but would require a combination of avoidance, onsite mitigation, and offsite compensation as part of the overall mining plan.

Florida Priority Plant Species

None of the priority plant species in Florida are expected to benefit directly from the increased aquatic and wetlands buffer. Impacts from oil and gas development are expected to be the same as those in Alternative B.

Impacts from phosphate mining would be the same as those identified under Alternative A.

Kentucky

Kentucky Vegetation Communities

Impacts on vegetation communities from oil and gas development would be the same as those in Alternative B, except that the aquatic and wetlands buffer would cover an additional 37,536 acres. This buffer would provide increased protection for wetland and riparian vegetation in case of erosion from well pads or in the case of an accidental leaks or spills. Other impacts from oil and gas development to vegetation communities would be the same as those in Alternative B.

Impacts from coal mining would be the same as those in Alternative A.

Kentucky Priority Plant Species

Related to oil and gas development, increasing the aquatic and wetlands buffer is likely to benefit those priority plant species that occur in and on the fringes of riparian zones, including blue monkshood, brook saxifrage, sweet shrub, red turtlehead, sweet fern, star tickseed, small yellow ladies'-slipper, yellow spikerush, yellow trout-lily, rockcastle wood-aster, mountain silverbell, Michaux's bluets, American pennywort, jointed rush, vetchling peavine, Canby's mountain-lover, mock orange, eastern featherbells, and northern white cedar.

Impacts from coal mining would be the same as those in Alternative A.

Louisiana

Louisiana Vegetation Communities

Impacts on vegetation communities would be the same as those in Alternative B, except that the aquatic and wetlands buffer would cover an additional 16,528 acres. This buffer would provide increased protection for wetland and riparian vegetation in case of erosion from well pads or in the case of accidental leaks or spills.

Louisiana Priority Plant Species

Increasing the aquatic and wetlands buffer is most likely to benefit those priority plant species that occur in and on the fringes of riparian zones, including flame flower, square-stemmed monkey-flower, granite gooseberry, bloodroot, heart-leaved skullcap, eared goldenrod, yellow pimpernell, reflexed trillium, Texas trillium, and downy yellow violet.

Tennessee

Tennessee Vegetation Communities

Impacts on vegetation communities would be the same as those in Alternative B, except that the aquatic and wetlands buffer would cover an additional 6,922 acres, primarily at Dale Hollow Lake. This buffer would likely encompass more Mesophytic Forest acreage on slopes above wetland and riparian vegetation and reduce impacts on these vegetation communities in case of erosion from well pads or in the case of accidental leaks or spills.

Tennessee Priority Plant Species

The known occurrences of priority plants, including Ouachita sedge, Schreber's aster, starflower false Solomon's-seal, and shining ladies'-tresses, on FMO at Dale Hollow Lake occur within the 500-foot aquatic and wetlands buffer. Although there is potential to affect these species at other locations, the likelihood of affecting this site is very low.

Virginia

Virginia Vegetation Communities

Impacts on vegetation communities would be the same as those in Alternative B, except that the aquatic and wetlands buffer would cover an additional 2,758 acres, at both John W. Flannagan Reservoir and Radford Ammunition Plant. This is expected to primarily affect areas mapped as Deciduous Forest and to provide additional protection for these forest communities, particularly on slopes above drainages at John W. Flannagan Reservoir, in case of erosion from well pads or in the case of an accidental leaks or spills.

Virginia Priority Plant Species

The increased buffer could provide additional habitat protection for nodding trillium on slopes above drainages. Impacts on river bulrush *(Schoenoplectus fluviatilis)* and small spreading pogonia would be the same as those identified under Alternative B.

Alternative C: Impacts from Resources Other Than Minerals and Energy

General Impacts on All Tracts

In Alternative C, the surface tracts retained by BLM would be actively managed to meet resource objectives (see Appendix B). Impacts would be the same as those in Alternative B, except that management would be extended to three additional surface tracts (totaling 60 acres) in Arkansas and Florida. Tracts available for exchange or transfer to another federal agency would be the same as in Alternative B.

Impacts on vegetation resources from implementing actions for VRM would be the same as those identified under Alternative B.

State-Specific Impacts

The following state sections provide additional details on impacts from management actions proposed for vegetation, fish and wildlife, special status species, wildland fire suppression, cultural resource management, recreation management, travel and access management, and land tenure adjustments.

Arkansas

Under Alternative C, the development of a vegetation and habitat management plan for the Ozark Highland HMA (950 acres) contains 60 acres more than under Alterative B. Norfolk Lake and the Gepp tracts would be retained in this alternative. Both of these tracts would require substantial work to remove intrusions at the Gepp tract and eastern red cedar that invaded the woodlands and glade at the small (10-acre) Norfolk Lake tracts. Both tracts could recover to at least fair condition within 10 years after restoration begins.

Impacts from wildland fire suppression would be similar to Alternative C, except that additional fuels reduction at the Gepp and Norfolk Lake tracts would somewhat lower the risk of wildfire at those locations.

Impacts from cultural resource management would be the same as those in Alternative B.

Impacts from recreation management, travel and access management would be the same as those in Alternative B, except that trails and other intrusions would be removed at the Gepp tract, allowing portions of this dry oak woodland to recover.

Impacts from lands and realty actions would be the same as those in Alternative B, except BLM would retain two additional tracts, as described above. The same tracts would be available for transfer to the USFS as in Alternative B.

Florida

The impacts on vegetation from resource management, wildland fire suppression, cultural resource management, and recreation management, and travel and access management would be the same as those identified under Alternative B. The only change would be the retention of the Suwannee County tract. This is a very small tract (0.21 acres) near the bank of the Suwannee River; any management of the natural pineland is likely to be overshadowed by uses on the surrounding private land.

Louisiana

The impacts on vegetation from resource management, wildland fire suppression, and cultural resource management would be the same as those in Alternative B. The only change is that the size of the Big Saline Bayou SRMA would be reduced to include only the northwest corner of the tract. This is not expected to change the impacts on vegetation. Invasive species control would continue across the entire bottomland hardwood tract. Recreation management actions proposed to reduce the impacts from off-road vehicle use and boat launching would continue in this alterative, allowing restoration of this heavily used portion of the tract. The current and expected levels of pedestrian use across the rest of the tract are not expected to affect vegetation.

Virginia

At the Meadowood SRMA, impacts on vegetation resources from resource management, wildland fire suppression, cultural resource management, recreation management, and travel and access management

would be the same as those identified under Alternative B, except that the off-leash dog area is not included in this alternative. This is expected to increase the options for controlling invasive weeds in that area, particularly sericea lespedeza *(Lespedeza cuneata)*, including use of chemical or mechanical control.

4.5.5 Alternative D

Impacts from Energy and Minerals

All States

Under this alternative, several NSO lease stipulation buffers are reduced compared with Alternative B. The overall area affected by NSO lease stipulations is 535,730 acres, or 52 percent of the FMO available for oil and gas leasing.

The aquatic and wetlands buffer would be reduced to 100 feet for all states. The buffer is expected to be sufficient to keep wetlands from being directly affected by construction activities and would be sufficient to capture most potential runoff and contaminants in cases where the buffer zone was well vegetated and the terrain was flat. In cases where the slope exceeds 10 percent, there is a provision for extending the buffer to 300 feet, which is expected to provide an adequate buffer for wetlands vegetation in most situations. There would, however, be potential for increased erosion and increased sediment loads in adjacent wetland during accidental spills and during heavy rain events before the well pad, roadways, and facilities were stabilized, and in areas with highly erosive soils or heavy clays where runoff might be excessive. Impacts on other sensitive plant communities would be the same as those in Alternative B.

There is increased potential to affect priority species that occur along these riparian zones, including those occurring in mesic and slope forests and flood plains.

State-Specific Impacts from Energy and Minerals

The following provides state-specific sections, including more detail on impacts on vegetation communities and a summary of the impacts on priority plant species.

Arkansas

Arkansas Vegetation Communities

A 100-foot aquatic and wetlands buffer would exclude surface disturbance from 109,385 acres of vegetation in Arkansas, 36,603 acres fewer than in Alternative B. Throughout much of the Fayetteville Shale region, the buffer is expected to be extended to 300 feet because of excessive slopes.

Arkansas Priority Plant Species

Impacts on priority plant species would be similar to Alternative B; however, there is increased potential to affect Texas bergia, priority sedge and rush species, scratch daisy, hay-scented cup fern, Texas fescue, Browne's waterleaf, yellow monkey flower, laurel oak, California bulrush, and fragrant ladies' tresses.

Florida

Florida Vegetation Communities

Impacts on Florida vegetation would be the same as those in Alternative B, except that there would 3,343 fewer acres covered by the aquatic and wetland lease stipulation. Flat terrain and primarily sandy soils

reduces the potential for contaminates and sediments to reach adjacent wetlands from well pads and flowlines in Florida. Coupled with the projected development of only three wells, and the preponderance of acreage in non-native communities, the potential for oil and gas drilling to affect wetland vegetation is very low.

Impacts from phosphate mining would be the same as those in Alternative A.

Florida Priority Plant Species

Although there would be a 100-foot aquatic and wetlands buffer applied to oil and gas leases, the impacts on priority plant species from both oil and gas and phosphate development are expected to be the same as those in Alterative A.

Kentucky

Kentucky Vegetation Communities

Impacts on Kentucky vegetation would be the same as those in Alternative B, except that there would be 35,145 fewer acres covered by the aquatic and wetland lease stipulation. Particularly in eastern Kentucky, the buffer is expected to be extended to 300 feet in many cases because of excessive slopes.

Impacts from coal mining would be the same as those in Alternative A.

Kentucky Priority Plant Species

Impacts on priority plant species would be the same as those identified under Alternative B, except that the following species are more likely to be affected by reducing the riparian buffer zone: blue monkshood, brook saxifrage, sweet shrub, red turtlehead, sweet fern, star tickseed, small yellow ladies'-slipper, yellow spikerush, yellow trout-lily, rockcastle wood-aster, mountain silverbell, Michaux's bluets, American pennywort, jointed rush, vetchling peavine, Canby's mountain-lover, mock orange, eastern featherbells, and northern white cedar.

Impacts from coal mining would be the same as those in Alternative A.

Louisiana

Louisiana Vegetation Communities

Impacts on Louisiana vegetation communities would be the same as in Alternative B, except that there would be 11,113 fewer acres covered by the aquatic and wetland lease stipulation. In northwestern Louisiana, the buffer is expected to be extended to 300 feet, in many cases because of excessive slopes.

Louisiana Priority Plant Species

Impacts on priority plant species would be the same as in Alternative B, except that the following species are more likely to be affected near aquatic habitats and riparian zones: flame flower, square-stemmed monkey-flower, granite gooseberry, bloodroot, heart-leaved skullcap, eared goldenrod, yellow pimpernell, reflexed trillium, Texas trillium, and downy yellow violet.

Tennessee

Tennessee Vegetation Communities

Impacts on Tennessee vegetation communities would be the same as in Alternative B, except that there would be 6,464 fewer acres covered by the aquatic and wetland lease stipulation. Most of this acreage would be located at Dale Hollow Lake. At both Dale Hollow Lake and Standing Stone State Forest, many areas where this stipulation would be applied are expected to exceed 10-percent slope, and the buffer could be extended to 300 feet; with only two wells projected in the state, the potential to affect wetland vegetation is low.

Tennessee Priority Plant Species

The known occurrences of priority plants, including Ouachita sedge, Schreber's aster, starflower false Solomon's-seal, and shining ladies'-tresses on FMO at Dale Hollow Lake would not be completely covered by even the 300-foot buffer; however, the likelihood of affecting this site remains very low.

Virginia

Virginia Vegetation Communities

Impacts on Virginia vegetation communities would be the same as in Alternative B, except that there would be 1,892 fewer acres covered by the aquatic and wetland lease stipulation. Most of this acreage would be located at John W. Flannagan Reservoir, where slopes are expected to exceed 10-percent slope and the buffer could be extended to 300 feet. At the Radford Ammunition Plant, this acreage is primarily Deciduous Forest along the New River, where slopes are not expected to exceed the 10-percent threshold.

Virginia Priority Plant Species

Nodding trillium at John W. Flannagan Reservoir is expected to be provided some protection on slopes of more than 10 percent with the riparian buffer extended to 300 feet. Impacts on small spreading pogonia and river bulrush are the same as in Alternative B.

Alternative D: Impacts from Resources Other Than Minerals and Energy

General Impacts on All Tracts

Impacts from implementing actions for vegetation, fish and wildlife, special status species, wildland fire suppression, and cultural resources would be the same as those identified under Alternative A for those tracts retained by BLM. Active management would continue at special management areas, Jupiter Inlet Lighthouse ONA, Lathrop Bayou HMA, and Meadowood SRMA. There would be no active management of other tracts retained by BLM. Impacts from recreation management, and travel and access management would be the same as Alternative A, except that Big Saline Bayou in Louisiana would not be managed as an SRMA.

A total of 594 acres would be available for disposal from federal ownership in Arkansas and Florida. A total of 543 acres would be transferred to the USFS or USFWS in Arkansas and Florida, and 22.27 acres would be available for exchange or transfer to the USFWS.

State-Specific Impacts

The following state sections provide additional detail, with emphasis on impacts from land tenure adjustments and from recreation management, and travel and access management (for Louisiana only).

Arkansas

In Alternative D, impacts from vegetation, fish and wildlife, special status species, wildland fire suppression, cultural resources, recreation management, and travel and access management would be the same as in Alternative A for the eight tracts retained by BLM, totaling 875 acres.

Twelve tracts, totaling 580 acres, would be available for disposal from federal ownership. Seventy of the 580 acres are in good condition and contain high-quality examples of forest communities that are poorly represented on conservation lands. The Campbell Hollow tract supports one of the state's largest populations of Moore's larkspur, a species restricted to five counties in the Arkansas Ozarks. The Buffalo River tract contains a good example of a mature Dry-Mesic Oak Forest with an intact herbaceous layer.

None of the 375 acres retained by BLM would be managed. Mature forested areas, including acreage at Bear Creek and Calf Creek are likely to retain resource values indefinitely, barring intrusions and unauthorized uses. Glades and woodlands are expected to continue to decline, becoming increasingly woody and losing characteristic herbaceous cover and diversity. As in Alternatives B and C, Henderson Mountain, Point Peter, and the Redland tracts, which are either contiguous with or within the Ozark National Forest, would be available for transfer to the USFS, and vegetation communities on those tracts are expected to benefit from active management.

Many of the surface tracts with existing populations of priority plant species either would be available for disposal or transferred to the USFS. Trelease's larkspur or Moore's larkspur occur on three tracts available for disposal from federal ownership. Ozark chinquapin clones are found on the retained Calf Creek and Lost Creek tracts. Populations on Middle Fork would be removed from federal ownership, and two other populations, on the Point Peter and Redland Mountain, would be transferred to the USFS.

Florida

In Alternative D, impacts from vegetation, fish and wildlife, special status species, wildland fire suppression, cultural resources, recreation management, and travel and access management would be the same as in Alternative A for the four tracts retained by BLM. Active management would continue at two special management areas, Jupiter Inlet Lighthouse ONA and Lathrop Bayou HMA. No management is proposed for the other two retained tracts, Park Key and Sugarloaf Key. Both of these tracts are expected to see increases in invasive plant species. Tidally influenced portions of the tract, including mudflats and the waterward fringe of mangroves are expected to maintain their resource values indefinitely. The upland portions of Sugarloaf Key would be particularly vulnerable to degradation by invasive plants.

Three of the smallest tracts would be available for disposal from federal ownership. Impacts on vegetation would be negligible. Two tracts are less than an acre, and the condition of the vegetation communities are overshadowed by land uses of the surrounding private land. The Citrus County tract (13 acres) contains Hardwood Hammock Forest and Hardwood Swamp in fair to good condition, which, if developed, would contribute to habitat loss at Lake Tsala Apopka.

The Egmont Key tract would be transferred to the USFWS for inclusion in the Egmont Key NWR. This would consolidate vegetation management across the island and allow continuation of invasive species management, particularly Brazilian pepper and Australian pine in the Hardwood Hammock areas. Onsite

management of public use by the refuge is also expected to provide additional protection for vegetation from vandalism and casual use.

Impacts from lands and realty management on the Lake Marion tract would be the same as under Alternative A.

Louisiana

In Alternative D, impacts from vegetation, fish and wildlife, special status species, wildland fire suppression, and cultural resources would be the same as in Alternative A for the four tracts, totaling 378 acres, retained by BLM.

The Big Saline Bayou tract would not be designated as an SRMA, and there would be no active management or addition of public access facilities. Continued boat launching on the bank of Big Saline would continue to break down the bank and accelerate erosion into the bayou. Unauthorized off-road vehicle use would continue to damage bottomland hardwoods across an estimated one to two acres in the northwest corner of the tract.

The Baldwin tract in St. Mary's Parish would be available for transfer to the USFWS for inclusion in the Bayou Teche NWR, created for management of the Louisiana black bear. The Baldwin tract is within designated critical habitat and the refuge's acquisition boundary. This is expected to consolidate vegetation management benefitting this predominately cypress swamp and restoration of unauthorized uses on the northern end of the tract.

Virginia

At the Meadowood SRMA, impacts from vegetation, fish and wildlife, special status species, wildland fire suppression, cultural resources, recreation management, and travel and access management would be the same as in Alternative B.

4.6 FISH AND WILDLIFE

This section presents potential impacts on fish and wildlife habitat from implementing management actions for each resource program. Existing conditions concerning fish and wildlife habitat are described in Chapter 3. Analysis of impacts on BLM FMO from oil, gas, and mineral development are presented at the beginning of each alternative, starting with a general *planning area* discussion, followed by state-specific analysis. Analysis of impacts from the management of other resources that occur only on BLM-owned surface tracts in Arkansas, Florida, Louisiana, and Virginia follow the energy and mineral impacts.

Impacts on fish and wildlife resources are not anticipated as a result of implementing management actions for cultural resources. The management actions for cultural resources would not affect fish and wildlife habitat.

4.6.1 Assumptions

The analysis is based on the following assumptions:

- Implementing an activity plan, including SRMA and ACEC plans, would result in increased BLM management across all resources, including protection and habitat improvement for wildlife.
- Without intervention, habitats on surface tracts would degrade, especially those vulnerable to invasive plant species and those with fire-adapted vegetation communities.
- Transferring a tract out of federal ownership would result in land uses similar to those on surrounding private lands.
- Impacts on aquatic species are anticipated if the species occurs in the AED, and there is FMO in the same drainage system upstream of suitable habitat.
- Impacts on wildlife could occur off the lease as a result of directional drilling.

The following sections include a general discussion of impacts from oil and gas development pertinent to all states, followed by state-by-state discussions of impacts from mineral development, including impacts from coal development in Kentucky and phosphate development in Florida. A discussion of impacts on surface tracts from surface resource management follows the discussion of impacts from energy and mineral development.

4.6.2 Alternative A (No Action Alternative)

Impacts from Energy and Minerals

All States

Impacts on wildlife from mineral development would vary by location, method of drilling, and the species involved. Direct impacts result from construction of the well pads, access roads, flowlines, and ancillary facilities. Habitat would be lost, larger blocks of habitat fragmented, and increased amounts of edge created along new roads and pads. Noise and increased vehicle activity, particularly during site preparation and drilling, can displace wildlife. The displacement is generally temporary, but relocation into other areas already at carrying capacity is likely to increase mortality. Aquatic habitats can be lost directly by construction activities or damaged by stream crossings and increased erosion and sedimentation in nearby drainages or wetlands. There is potential for wildlife habitat to be degraded by

contamination as a result of accidental spills and drilling pit failures. Changes in local hydrology can alter vegetation sufficiently to change wildlife utilization of the site, particularly in wetlands. In forested situations, the areas around well pads can augment forage opportunities for some species by creating and maintaining grassy openings.

Impacts on aquatic species could occur well downstream of the drilling location. This includes not only habitat loss or degradation related to pad construction and stream crossings for access roads and pipelines upstream of occupied habitat, but also increases in sedimentation from construction activities and inadequately stabilized pad locations. Increases in sediment loads can alter the function of smaller streams and drainages below well pad locations, burying less mobile species and degrading water quality for mussels, their host species, and other aquatic species. There is potential for wells to contaminate water courses below pads through chronic runoff, as well as reserve pit failures, leaching, leaks, and spills. Leaks from equipment, flowlines, and reserve pits can infiltrate the groundwater supply and leach into surface waters. The extent of the effect of these incidents, such as length of mixing zones or points where contaminants are diluted below effect thresholds cannot be predicted, but it is assumed that there is potential to affect these species and habitat downstream of FMO in the AEDs.

Aquatic species could also be affected by withdrawal of surface or groundwater for use during drilling activities, including hydraulic fracturing, and through the disposal of produced water. Conventional wells are expected to use an estimated 4,200 gallons of water during the drilling process, including hydraulic fracturing. The water required for fracturing a horizontal well in the Fayetteville Shale area in Arkansas is estimated to be 2.9 million gallons on average (EPA 2011c). Individual horizontal shale wells can use up to four to five million gallons of water per well. That water is acquired under state authorized permits. In the case of the Fayetteville Shale area, this water comes principally from non-riparian surface water (State Review of Oil and Natural Gas Environmental Regulations, Inc. 2012). ANRC issues water permits, including those for oil and gas drilling purposes. ANRC uses the Arkansas Water Plan basin reports to permit the withdrawal of up to 25 percent of the water determined to be excess to the needs of the basin, where it would "cause no significant adverse environmental impact." If stream diversions are taken during periods of low flow, there could be adverse impacts on aquatic species if instream flow requirements are not met. In other states, water use for oil and gas well drilling would also be subject to state permitting. The potential for impacts would be reduced, however, because fewer wells are expected, and hydraulic fracturing used for horizontal wells would not be as extensive as in the Fayetteville Shale.

Wildlife, especially aquatic species, could be affected by contamination of water supplies from leaks and spills associated with the use, transportation, storage, and disposal of chemicals and liquids used in drilling and production. Operators are required by Onshore Order No. 1 (see Appendix D) to have an approved surface use plan with provisions for adequate protection of surface water and groundwater, including the means for containment and disposal of all waste materials. Any accidental spill, leak, or contamination would be addressed through permitting and spill response plans in coordination with state agencies with direct responsibilities under the Clean Water and Safe Drinking Water Acts. Inspection and monitoring by BLM would provide a way to anticipate and prevent potential problems.

In addition to accidental spills, the disposal of flowback and produced water is a concern. Flowback water is water used during the drilling process and flows back to the surface. It is typically expected to be 20 percent of the water used during drilling. Produced water comes to the surface during oil and gas production, and is separated from the produced oil and gas. Produced water must be disposed in accordance with Onshore Order No. 7, and BMPs (see Appendix D). The preferred method of disposal would be underground injection into a suitable geologic formation isolated from freshwater aquifers. Underground injection would require a permit under the UIC program. Any surface discharge would require a permit under the NPDES program. In the Fayetteville Shale, produced water is not intentionally released to the surface. Produced water is either sent to a state-permitted disposal well or a commercial

treatment plant, regulated under either UIC or NPDES. It is expected that typical operations, including regulation of well construction and water disposal, would minimize potential water contamination. However, accidental spills and well casing and cement failures could occur, resulting in localized impacts.

Drilling activities in karst regions of Arkansas, Kentucky, Tennessee, and Virginia have the potential to affect cave habitats and associated species. If lost-circulation zones, either air- or water-filled, were encountered during drilling, some cement, cuttings and drilling fluids could be introduced into caves adjacent to the borehole. In the saturated zone, cementing would increase the pH of water adjacent to the wellbore. The volume of contaminants could range from a few hundred barrels to several thousand barrels of cuttings and drilling fluids in a mostly freshwater solution. The introduction of fresh water with drilling mud or organic material could have an effect on the local microbiology. Cementing the intermediate casing string through water-bearing zones could introduce cement into any cavities encountered, but the effect would be limited to the immediate vicinity of the wellbore, provided large quantities of cement were not lost in the process.

Drilling into shallow caverns might cause the collapse of cave rooms or passages. This represents a physical impact on the cave resources and a health and safety hazard to the operator. The opening of new entrances to the surface would influence or alter normal cave temperatures and change the flow of air and/or water through the cave, thus changing the cave's microclimate. This change in the constant microclimate could affect both the wildlife and mineral deposition in the cave.

Drilling into a cave, even without the impacts of drilling fluids, cement, and lost circulation materials, would adversely affect the cave. The delicate equilibrium among barometric pressure, temperature, and humidity in a cave can be altered by a bore hole, whether or not the cave has a natural entrance to the surface. Speleothems, any cave micro-organisms present, and other natural processes would be altered. The creation of a new opening to the surface would cause changes in the airflow patterns in the cave during the time that the hole was open. These airflow changes would create unnatural temperature and humidity regimes, altering the microclimate of the cave and possibly causing the reduction of speleothem growth, the drying out of speleothems, and destruction or alteration of micro-organisms.

Birds, including neotropical migratory birds, can be affected directly through habitat loss and degradation of habitat from the surface disturbance associated with oil and gas development. Increased activity can displace birds during the nesting season. In most cases, the habitats affected by mineral development are widespread, and impacts would be local and short term, with many species capable of using adjacent areas in subsequent years after the well is completed and the site is in maintenance mode. Impacts are longer term and have more potential to displace birds in more specialized habitats, such as mature forested situations, native grasslands, and wetlands. There is potential for birds and other wildlife to be soiled or drowned in open pits, particularly after active drilling is completed. Birds and bats have been killed in open vents and exhaust pipes on heater/treater, separator, and dehydrator units. As a BMP, operators would continue to be required to install vent covers and anti-perching cones on this equipment in all alternatives (see Appendix D).

Forest interior nesting birds would likely be displaced where drilling activities penetrate roadless blocks, increasing edge habitat, and providing increased access for predators and brood parasites. Native grasslands, which remain in most states as only remnants of historic acreages, support at-risk bird species across the region such as Bachman's sparrow *(Aimophila aestivalis)*, Henslow's sparrow *(Ammodramus henslowii)*, prairie warbler *(Dendroica discolor*), and loggerhead shrike (*Lanius ludovicianus*), all Breeding Birds of Conservation Concern (USFWS 2008k). Oil and gas activity in these remnant grasslands would not only further reduce this acreage and displace birds but would require rigorous efforts to restore it to original condition.

Oil and gas activity could affect birds, including neotropical migrants, in riparian zones. Studies in Virginia found that Acadian flycatcher (*Empidonax virescens*), American redstart (*Setophaga ruticilla*), hooded warbler (*Wilsonia citrina*), and Louisiana waterthrush (*Seiurus motacilla*) have strong affinities to riparian zones, but many will not use buffers less than 50 meters (Tassone 1981). In Kentucky, neotropical migrants were more abundant in riparian zones wider than 100 meters, and resident or short-distance migrants were more common in narrower zones (Triquet, et al. 1990).

There is potential to affect wading bird rookeries, roost sites, and loafing areas near lakes and wetlands, resulting in colony abandonment or reduced fledging rates. Research by Florida Fish and Wildlife Commission recommended at least a 125-meter buffer for mixed colonies of wading birds, and a minimum of 175 meters for terns (Rodgers 1991). Erwin (1989) recommended a buffer zone of 100 meters for least terns (*Sterna antillarum*) and 200 meters for black skimmers (*Rynchops niger*).

The Audubon Society recognizes 196 Important Bird Areas in the following states: Arkansas—29 sites, Florida—100 sites, Kentucky—five sites, Louisiana—13 sites (plus an additional six nominated or potential sites), Tennessee—29 sites, and Virginia—20 sites. In the AEDs, there is FMO on or near 20 sites in Arkansas, Florida, Louisiana, Tennessee, and Virginia.

Game species are expected to be affected by the loss of 4,964 acres across all states, representing less than one percent of the overall FMO in the *decision area*. In most cases, the wildlife species with stable populations regulated by state game laws, including white-tailed deer, squirrel, turkey, rabbit, bear (outside of Louisiana and Florida), and mourning dove *(Zenaida macroura)*, would be the same across all states and are not discussed in the separate state sections below. Impacts on game species with declining populations, such as American woodcock *(Scolopax minor)* and bobwhite quail *(Colinus virginianus)*, are incorporated into the relevant state sections.

In the case of the majority of game species, impacts include temporary displacement during all phases of active construction, resulting in increased local mortality and reduced short-term productivity. Most impacts are expected to be local and short term, and are unlikely to alter the game species diversity or density in any of the states. In situations where single wells are drilled, wildlife use of the surrounding area is expected to return after the well is completed and human activity tappers off. Game use patterns would likely be altered, and additional acreage of habitat rendered unusable where multiple well pads and infrastructure are clustered, and in areas where well spacing is dense. Some game species would use areas around producing well locations, taking advantage of increased forage opportunities on forest edges and restoration plantings once the well pads were stabilized and the human activity levels dropped. Well pits can pose a danger to wildlife, but these are open primarily during active drilling operations, which typically run 24 hours a day. Pits remaining open after the well was completed could pose a hazard, particularly to birds, if there were any hydrocarbons or other contaminants in the pit. Mandatory BMPs would require that any reserve pits that remain open 10 days after the well was completed would be netted or covered in some other approved method used to exclude birds.

Because much of the FMO in the *decision area* is associated with reservoirs or lakes, there is potential for oil and gas development along these shorelines to displace migratory waterfowl and for accidental spills or erosion to degrade shoreline foraging and loafing areas. In most cases, shoreline development is unlikely, but in Alternative A, there would be no standard setback from aquatic or wetland habitats. The only location where drilling is expected to occur in aquatic situations anywhere in the *decision area* is in Plaquemines Parish, in southeastern Louisiana, where drilling would occur from barges moved to the drilling location.

State-Specific Impacts from Energy and Minerals

The following state-by-state discussions provide additional information on impacts from mineral development on priority species wildlife species and Important Bird Areas. Impacts on priority species are presented in tables that rank the relative potential for these species to be affected by the projected mineral development based on proximity of known occurrences to FMO, distribution of the known occurrences in the AED, and accessibility of associated habitats. The tables also provide a reference to stipulations that provide some level of protection in Alternatives B, C, and D (see Table C-2 in Appendix C for the full text of the stipulations).

Arkansas

The projected oil and gas development is expected to disturb 2,608 acres of habitat on or near FMO in the AEDs. Map 3-13 shows the counties with projected oil and gas development, and Table 3-84 shows the number of projected wells by county.

Arkansas Priority Wildlife Species

Table 4-20 below ranks the potential in Alternative A to affect priority wildlife species in Arkansas that are known to occur on or within a mile of FMO in the AED. Also included in the table is the reference to stipulations that provide some level of protection in Alternatives B, C, and D (see Table C-2 in Appendix C for the full text of the stipulations).

Table 4-20 Potential Impacts on Arkansas Priority Wildlife Species

Common Name *Scientific Name*	Natural Heritage Rank[1]	Record Within 1 Mile of FMO	Record on FMO	Habitat/ Occurrence Record	Potential Impact	Stipulation
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.	Low—The surface tract in Pike County is outside the AED. Some potential to affect FMO in western portions of the AED, but no impacts on Mt. Magazine breeding population because of lack of FMO.	
Bowed snowfly *Allocapnia oribata*	S1	X		Aquatic, Ozark endemic known from 2 streams in Searcy and Van Buren counties.	Unlikely to affect—Searcy County is outside the AED, and record in northern Van Buren County is upstream of all but one split-estate tract.	NSO #16
Alabama shad *Alosa alabamae*	S1S2	X		Anadromous fish of the Gulf with spawning runs in Arkansas in the Meramec, Missouri,	Unlikely to affect—Only historic record in Crawford County is near FMO. More current records in	NSO #16

Common Name *Scientific Name*	Natural Heritage Rank[1]	Record Within 1 Mile of FMO	Record on FMO	Habitat/ Occurrence Record	Potential Impact	Stipulation
				and Ouachita rivers. Very depleted in the Mississippi River basin; potential in the Ouachita River.	Nevada and Ouachita counties are more than 10 miles downstream of bulk of FMO centered near Poison Springs, and only 4 BLM wells are projected in those counties.	
Great egret *Ardea alba*	S2	X		Herbaceous and wooded wetlands across state; typically associated with large bodies of water.	Moderate—Potential impact in suitable habitat across AED.	NSO #16
Alligator gar *Atractosteus spatula*	S2?	X		Major river systems, including Red, Arkansas, White, and Mississippi rivers.	Moderate—Potential to affect populations downstream of FMO across state.	NSO #16
Crayfish *Cambarus causeyi*	S1	X		Endemic crayfish in complex burrows in seeps and springs in the southern Ozarks.	Moderate—Potential impact, particularly on private inholdings in the Ozark NF.	NSO #16
Big sand tiger beetle *Cicindela formosa pigmentosignata*	S2S3	X		Occurrence records in Ouachita and Nevada counties, possibly extirpated.	Not likely to affect—Only 4 wells projected in known range.	
Beach-dune tiger beetle *Cicindela hirticollis*	S2S3	X	X	Requires sand areas near water. Three occurrences across state.	Unlikely to affect—Limited extent of habitat reduces likelihood of impacts.	NSO #16
Little white tiger beetle *Cicindela lepida*	S2S3	X		Open sandy areas. Occurrence records in the Arkansas River corridor.	Unlikely to affect—Limited extent of habitat reduces likelihood of impacts.	NSO #16
Sandy stream tiger beetle *Cicindela macra*	S2S3	X	X	Occurrence records in the Arkansas River corridor.	Unlikely to affect—Limited extent of habitat reduces likelihood of impacts.	NSO #16
Blue sucker *Cycleptus elongatus*	S2	X	X	Restricted to large deep river systems with strong currents across state.	Moderate—Particularly south of the Wattensaw SWMA and Lake	NSO #16

Common Name *Scientific Name*	Natural Heritage Rank[1]	Record Within 1 Mile of FMO	Record on FMO	Habitat/ Occurrence Record	Potential Impact	Stipulation
					Dardanelle.	
Western fanshell *Cyprogenia aberti*	S2	X		Range includes the Arkansas, White, Black, and St. Francis river basins.	Moderate—Potential to affect small populations across range.	NSO #16
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.	Low—Primary range is south of most projected drilling. Some potential to affect Little Missouri watershed from projected drilling near Poison Springs, but only 4 wells projected in Nevada and Ouachita counties.	NSO #16
Goldstripe darter *Etheostoma parvipinne*	S2	X		In or near springs, in sluggish streams, and occasionally seepages adjacent to small streams. Occurrence records in eastern and southern portions of state.	Low—No more than 2 wells per county projected in species range in the southern AED.	NSO #16
Prairie mole cricket *Gryllotalpa major*	S1S2	X		Tallgrass prairies.	Low—Clusters of occurrence records in Franklin County are outside the AED. Occurrence records in Prairie County are more than 2 miles from FMO at the Wattensaw SWMA.	NSO #18
Goldeye *Hiodon alosoides*	S2	X		Quiet turbid water in medium to large lowland rivers, small lakes, ponds, and marshes across state.	Low—Potential impact along White River, but most other records outside the AED.	NSO #16
Ouachita diving beetle *Hydroporus ouachitus*	S2		X	Ozark endemic in cool, swift-moving mountain streams in Ouachita, Red, Arkansas, and White River systems.	Low—Potential impact from drilling on small FMO inholdings in the Ozark NF.	NSO #16
Sandbank	S2	X		Small to large rivers	Moderate—	NSO #16

Common Name *Scientific Name*	Natural Heritage Rank[1]	Record Within 1 Mile of FMO	Record on FMO	Habitat/ Occurrence Record	Potential Impact	Stipulation
pocketbook *Lampsilis satura*				with moderate flows. Occurrence records in Arkansas, Ouachita, and Saline river systems.	Potential for impacts upstream of occurrence records, particularly from small split-estate FMO inholdings in the Ouachita NF and along the Little Missouri River in Ouachita County.	
Black sandshell *Ligumia recta*	S2	X		Medium to large rivers with strong currents and coarse substrates. Occurrence records across state.	Moderate—Potential impact across state.	NSO #16
Texas coral snake *Micrurus tener tener*	S2	X		In Arkansas, primarily forested areas. Occurrence records in southwestern counties.	Moderate—Potential impact, particularly on FMO near Poison Springs State Park/Forest.	
Pealip redhorse *Moxostoma pisolabrum*	S2	X		Varied river and stream habitats in Ozark and adjacent areas.	Moderate—Potential impact across range.	NSO #16
Crawford's gray shrew *Notiosorex crawfordi*	S2	X		Drier grasslands and woodlands. Occurrence records in Hempstead County, possibly extirpated from Crawford County.	Not likely to affect—Occurrence records are outside the AED.	NSO #18
Crayfish *Orconectes nana*	S2		X	Clear gravelly streams of the Arkansas River drainage in extreme northwest Arkansas.	Not likely to affect—Occurrence records are outside the AED.	NSO #16
Nearctic paduniellan caddisfly *Paduniella nearctica*	S1	X		Riverine habitats with occurrence records in Johnson and Washington counties.	Moderate—Potential impact downstream populations in Johnson County.	NSO #16
Longnose darter *Percina nasuta*	S2	X	X	Clear small to medium rivers, also reported from an impoundment. Occurrence records in Ozark and Ouachita regions.	Moderate—Potential impact throughout the Fayetteville Shale area.	NSO #16

Common Name *Scientific Name*	Natural Heritage Rank[1]	Record Within 1 Mile of FMO	Record on FMO	Habitat/ Occurrence Record	Potential Impact	Stipulation
Slenderhead darter *Percina phoxocephala*	S2	X	X	Small to medium rivers with moderate to strong flow. Few records in impoundments indicate it may do well below dams, occurrence records primarily in northwestern portions of state.	Low—Potential impact on FMO near Dardanelle Ozark and Blue Mountain lakes.	NSO #16
Suckermouth minnow *Phenacobius mirabilis*	S1	X	X	Various riverine habitats. Occurrence records primarily in western Arkansas River drainage.	Low—Potential impact on FMO near Dardanelle and Ozark lakes.	NSO #16
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.	Moderate—Saline River is outside the AED; some potential to affect Little Missouri River north of Poison Springs and throughout the Fayetteville Shale area.	NSO #16
Comanche harvester ant *Pogonomyrmex Comanche*	S1S2	X	X	Xeric sandhills and open pine woodlands. Occurrence records in Ouachita and Nevada counties.	Moderate—Potential impact from FMO on or near Poison Springs State Park/Forest.	
Paddlefish *Polyodon spathula*	S2	X	X	Occurrence records in most of the large rivers in Arkansas.	Moderate—Potential impact in the White River drainage from development of FMO at the Wattensaw SWMA and split-estate tracts.	NSO #16
Strecker's chorus frog *Pseudacris streckeri*	S2	X		Moist woods, sand prairies, along streams, and swamps. Occurrence records in Arkansas River corridor.	Moderate—Potential impact, particularly on FMO on or near Dardanelle Lake.	NSO #16
Northern crawfish frog *Rana areolata*	S2		X	Primarily associated with floodplain prairie systems and	Moderate—Potential impact in the Fayetteville	NSO #16 NSO #18

Common Name *Scientific Name*	Natural Heritage Rank[1]	Record Within 1 Mile of FMO	Record on FMO	Habitat/ Occurrence Record	Potential Impact	Stipulation
circulosa				open uplands of the Ozark and Ouachita ecoregions.	Shale region.	
Queen snake *Regina septemvittata*	S2	X		Riparian situations where streams support crayfish. Occurrence records across Boston Mountains and Arkansas Valley ecoregions.	Moderate—Potential impact in the Fayetteville Shale region.	NSO #16
Eastern harvest mouse *Reithrodontomys humulis*	S2		X	Old fields, marshes, and wet meadows. Most occurrence records in southwestern corner of state.	Moderate—Most likely impact at Fort Chaffee. Very limited FMO in southwestern counties, with occurrence records located at least 5 miles away from closest FMO.	NSO #16
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.	Moderate—Potential impact across range.	NSO #16
Ozark emerald *Somatochlora ozarkensis*	S1	X		Small forested streams. Endemic, all occurrence records from Pulaski County.	Low—Pulaski County is outside the AED, but potential impact on downstream populations from drilling on portions of Camp Joseph T. Robinson in adjacent Falkner County.	NSO #16
Diana fritillary *Speyeria diana*	S2S3	X	X	Forest habitats with access to flowers. Occurrence records in Ozark and Ouachita regions.	Moderate—Potential impact across the Fayetteville Shale area and particularly from split-estate inholdings in the Ozark and Ouachita NFs and in the northern portions of Camp Joseph T.	

Common Name *Scientific Name*	Natural Heritage Rank[1]	Record Within 1 Mile of FMO	Record on FMO	Habitat/ Occurrence Record	Potential Impact	Stipulation
					Robinson.	
Ornate box turtle *Terrapene ornata ornata*	S2		X	Prairie, grasslands and adjacent areas. Occurrence records in Benton, Boone, Franklin, Prairie and Sebastian counties.	Moderate—Potential impact at Fort Chaffee grasslands.	NSO #18
Bewick's wren *Thryomanes bewickii*	S2B–S3N	X		Old field, brushy areas, thickets, and open and riparian woodlands. Occurrence records primarily north of the Arkansas River corridor.	Moderate—Potential impact in Arkansas River corridor. Majority of records are north of the AED.	NSO #16
Purple lilliput *Toxolasma lividum*	S2	X		Widespread but uncommon, usually found in the headwaters to medium rivers. Occurrence records across state.	Moderate—Potential impact across the AED.	NSO #16
Southern cavefish *Typhlichthys subterraneus*	S1	X		Few historic records of this species from wells and caves in the eastern Ozarks of Arkansas.	Low—Only one occurrence record near (0.4 miles) small split-estate tract of FMO. Other records are outside the AED.	NSO #5
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.	Moderate—Potential impact across AED.	NSO #16
Ouachita creekshell *Villosa arkansasensis*	S2	X	X	Regional endemic in the headwater streams of the Arkansas, Ouachita, and Red river drainages.	Moderate—Potential impact on split-estate inholding in the Ouachita NF and in the Little Missouri River north of Poison Springs.	NSO #16
Rainbow *Villosa iris*	S2S3	X		Riffles on the edges of emerging vegetation. Occurrence records in Ozark and	Moderate—Potential impact from development of split-estate north of Greers Ferry	NSO #16

Common Name *Scientific Name*	Natural Heritage Rank[1]	Record Within 1 Mile of FMO	Record on FMO	Habitat/ Occurrence Record	Potential Impact	Stipulation
				Ouachita regions.	Lake and Dardanelle Lake. Buffalo River outside the AED.	

[1]S1 = Extremely rare. Typically 5 or fewer estimated occurrences in the state, or only a few remaining individuals; may be especially vulnerable to extirpation.

S2 = Very rare. Typically between 5 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.

Arkansas Important Bird Areas

Bell Slough Important Bird Area (adjacent to FMO associated with state lands at Camp Joseph T. Robinson in Faulkner County). There is no FMO in the Bell Slough Important Bird Area, so no direct impacts are anticipated on terrestrial habitats or upland birds; however, there is some potential for impacts on aquatic and wetland habitats through Grassy Lake. The potential for impacts is low because there are a total of 10 wells projected in Faulkner County, which includes only the northern portion of Camp Robinson, as well as scattered FMO split-estate throughout the rest of Faulkner County. In addition, this county is on the southern edge of the Fayetteville Shale, and most of the development is expected in the more northern portions of the county. If drilling occurred, it could affect American bittern *(Botaurus lentiginosus)*, yellow-crowned night-heron *(Nyctanassa violacea)*, hooded merganser *(Lophodytes cucullatus)*, American woodcock, sedge wren *(Cistothorus platensis)*, or wintering gadwall *(Anas strepera)*, northern shoveler *(Anas clypeata)*, ring-necked duck *(Aythya collaris)*, lesser scaup *(Aythya affinis)*, and ruddy ducks *(Oxyura jamaicensis)*.

Camp Robinson Important Bird Area (FMO associated with this state facility). There is potential to affect both terrestrial and aquatic/wetland habitats in the Camp Robinson Important Bird Area, although only the FMO in Faulkner County south of Highway 89 is in the AED. Ten wells are projected in Faulkner County, and most are expected to be in the northern portion of the county. In this Fayetteville Shale area, multiple wells are expected to be drilled from single larger pads, projected to be five to six acres in size. This would give some latitude in well placement. If wells were drilled at Camp Robinson, they would most likely to be placed in upland areas with potential habitat loss and disturbance to habitat for breeding Bachman's sparrow and Bell's vireo *(Vireo bellii)*, as well as seasonal migrants American redstart, yellow warbler *(Dendroica petechial)*, chestnut-sided warbler *(Dendroica pensylvanica)*, and black-throated green warbler *(Dendroica virens)*; and wintering sparrows, including field *(Spizella pusilla)*, fox *(Passerella iliaca)*, white-crowned *(Zonotrichia leucophrys)*, white-throated *(Zonotrichia albicollis)*, song *(Melospiza melodia)*, chipping *(Spizella passerina)*, vesper *(Pooecetes gramineus)*, savannah *(Passerculus sandwichensis)*, swamp *(Melospiza georgiana)*, Lincoln's *(Melospiza lincolnii)*, and Le Conte's *(Ammodramus leconteii)*. Nursery Pond and Lake Conway are both outside the AED, reducing the potential to affect nesting areas for ospreys *(Pandion haliaetus)* and bald eagles *(Haliaeetus leucocephalus)*, hooded mergansers, wood ducks *(Aix sponsa)*, and prothonotary warblers *(Protonotaria citrea)*, as well as migrating least tern, Virginia rail *(Rallus limicola)*, sora *(Porzana carolina)*, sedge wren, and marsh wren *(Cistothorus palustris)*.

Fort Chaffee Important Bird Area (including the FMO associated with this facility in Crawford, Franklin, and Sebastian counties). A total of 20 wells are projected in this three-county area. All are expected to be located in Sebastian County, with the bulk of the FMO associated with Fort Chaffee. Impacts could occur across prairie, shrub-scrub, and oak savanna habitats. Typically, wells at Fort Chaffee are bunkered and located along existing roads or directionally drilled from outside the facility. This tends to reduce the potential to fragment existing blocks of habitats on the facility. Oil and gas related construction activities in native prairies might be difficult to restore because of the potential for invasive plant species to become established, and the difficulty in selectively removing these non-natives from grassland situations. Impacts on birds are most likely to affect species associated with prairie, shrub-scrub, and oak savanna habitats, such as northern bobwhite, prairie warbler Bachman's sparrow, Smith's longspur *(Calcarius pictus)*, and Bewick's wren.

Lake Dardanelle Important Bird Area (including the FMO associated with this USACE facility in Franklin, Logan, Johnson, Pope, and Yell counties). No wells are projected for Franklin County, but 20 wells are projected for each of the other counties. This projection includes the FMO at Lake Dardanelle and split-estate FMO across these counties, the bulk of which is located in Pope and Yell counties. Platform drilling over water is prohibited by the USACE. Most drilling is expected to be accomplished by directional drilling, probably by drilling of multiple wells from larger central well pads in upland sites. The primary potential to affect resident and migratory birds associated with Lake Dardanelle would be impacts on backwaters and tributaries if well pad locations were not adequately stabilized, leading to erosion and sedimentation of adjacent drainages, or accidental spills from the well pad or flowlines. If well pads were located on the lake shore, the well pad construction and drilling operations are expected to displace wintering duck, pelican, and wading bird use for the duration of the operation. Damage to shoreline wetlands would be unlikely and would typically require onsite or offsite compensation. No disturbance is expected on or near Dardanelle Rock Natural Area; there is no FMO underlying the area, and terrain would preclude it.

Florida

The projected oil and gas development in Florida could disturb up to 21 acres of habitat on or near FMO in portions of southwestern Florida over the next 10 years (see Map 3-14). Existing oil and gas lease stipulations would preclude surface disturbance from aquatic areas, wetlands, coastal habitats, and Florida scrub, which increases the potential for disturbance to be shifted to previously disturbed sites.

Florida phosphate mining is expected to disturb 802 acres of FMO in Hardee, Polk, and Manatee counties over the next 10 years on already leased FMO, and future mining is expected on an additional 1,083 acres projected to be leased over the next 10 years (see Map 1-3). Table 4-14 shows the habitat and acres of expected disturbance from phosphate mining in Florida on FMO that has already been leased, and Table 4-15 shows the habitat and acres of possible disturbance from future phosphate mining on FMO expected to be leased over the next 10 years. Seventy-one percent of that acreage is classified as Agriculture, Pasture, or Disturbed areas. There are 141 acres mapped as Dry Prairie. The loss of these areas would displace grassland species and could increase mortality and reduce recruitment of resident and migratory birds. Although there are no records of rookeries on the FMO expected to be mined, there are more than 300 acres of marsh, shrub, and forested wetlands that provide foraging habitat for wading birds.

Florida Priority Wildlife Species

Table 4-21 ranks the potential for affecting the priority wildlife species known to occur on or within a mile of FMO in the AED and lists stipulations that would provide some level of protection for the species in Alternatives B, C, and D. In Florida, the existing RMP provides similar stipulations that protect sensitive habitats and species in Alternative A, the No Action Alternative.

Table 4-21. Potential Impacts on Florida Priority Wildlife Species

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Record Within 1 Mile of FMO	Record on FMO	Habitat/ Occurrence Records	Potential Impact	Stipulation
Snowy plover *Charadrius alexandrinus*	S1	T	X		Coastal strand and beaches along Gulf Coast.	Not likely to affect—Beach habitats are stipulated as NSO in the Florida RMP.	NSO #6
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.	Low—Likelihood of drilling is low, and no records near FMO in the oil and gas AED. Moderate—Potential impact in the phosphate AED, particularly in southeastern Polk County.	
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.	Low—Likelihood of drilling is low, and most coastal habitats are stipulated as NSO in the Florida RMP.	NSO #6
American oystercatcher *Haematopus palliatus*	S2	S	X		Beaches, coastal strand, and tidal flats on Gulf and Atlantic coasts.	Not likely to affect—Beach habitats are stipulated as NSO in the Florida RMP.	NSO #6
Roseate spoonbill *Platalea ajaja*	S2	S	X		Marshes, swamps, ponds, rivers, and lagoons in southern coastal areas.	Not likely to affect—wetland habitats are stipulated as NSO in the Florida RMP.	NSO #6 NSO #16

[1]S1 = Extremely rare. Typically 5 or fewer estimated occurrences in the state, or only a few remaining individuals; may be especially vulnerable to extirpation.

S2 = Very rare. Typically between 5 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

Cayo Costa State Park Important Bird Area. No impacts are anticipated. BLM-authorized drilling in Cayo Costa State Park is considered unlikely. Beach habitats, wetlands, and aquatic habitats are all covered by NSO lease stipulations in accordance with the Florida RMP, which excludes surface occupancy from these habitats.

Corkscrew Swamp Sanctuary Important Bird Area (4.5 acres of FMO are located within this National Audubon Society owned sanctuary). No impacts are anticipated. Aquatic and wetland habitats are both covered by NSO lease stipulations in accordance with the Florida RMP, which excludes surface occupancy from these habitats

Lower Tampa Bay Important Bird Area (54 acres at the northern tip of Egmont Key are public domain). No impacts are anticipated. BLM-authorized drilling on Egmont Key is considered very unlikely. Beach habitats, wetlands, and scrub communities are all covered by NSO lease stipulations in accordance with the Florida RMP, which excludes surface occupancy from these habitats.

Rookery Bay National Estuarine Research Reserve Important Bird Area (338 acres of FMO are within the Research Reserve boundary). No impacts are anticipated. BLM-authorized drilling in Rookery Bay National Research Reserve is considered unlikely. Wetlands, aquatic habitats, and scrub communities are all covered by NSO lease stipulations that exclude surface occupancy from these habitats.

Kentucky

The projected oil and gas development is expected to disturb 139 acres of habitat on or near FMO associated with 14 USACE reservoirs/lakes (see list of facilities in Appendix L), as well as two state-owned facilities, Kentucky Ridge State Forest and Pennyrile State Forest. Map 3-16 show the counties with projected oil and gas development, and Table 3-85 shows the number of projected wells by county.

Coal development of FMO in Kentucky is projected to be limited to underground mining in eastern Kentucky with no new surface disturbance. Facilities in the area with high potential for development include Dewey Lake, Fishtrap Lake, plus one additional mine. There has been previous mining at Kentucky Ridge State Forest, and it is in an area of moderate potential for future mining. Impacts on wildlife are expected to result from an extension of the use of existing surface facilities with no additional habitat loss or changes in habitat utilization. Impacts could occur through use of these surface facilities, including settling ponds, with established discharge points operated under state-issued NPDES permits. There is potential to affect aquatic habitats at or below mine discharge points. Water quality standards are monitored and water release schedules established as part of the state permit. One of the water quality issues in eastern Kentucky of particular concern to aquatic ecosystems relative to coal mining is selenium (USEPA 2011d). Selenium is released into the environment from coal ash and coal mine waste, and enters aquatic ecosystems where aquatic organisms are exposed. Selenium can reach toxic concentration in aquatic ecosystems associated with coal mining and can essentially bio-accumulate through food chain transfer (Orr et al. 2006).

Kentucky Priority Wildlife Species

Table 4-22 ranks the potential for affecting the priority wildlife species in Kentucky that are known to occur on or within a mile of FMO in the oil and gas AEDs. Also included in the table is the reference to stipulations that provide some level of protection in Alternatives B, C, and D (see Table C-2 in Appendix C for the full text of the stipulations).

Table 4-22. Potential Impacts on Kentucky Priority Wildlife Species

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Record Within 1 Mile of FMO	Record on FMO	Habitat/ Occurrence Records	Potential Impact	Stipulation
Lake sturgeon *Acipenser fulvescens*	S1	E		X	Large, freshwater lakes and rivers. Historic occurrence record associated with Lake Barkley. Reintroduced in Lake Cumberland upstream to Cumberland Falls.	Moderate—Potential impact through development of FMO at Lake Cumberland, although only 4 wells planned in Russell and Clinton counties.	NSO #16
Virginia stone *Acroneuria kosztarabi*	S1	S	X		Endemic stonefly in lotic system with records in Lawrence County.	Not likely to affect—Occurrence records upstream of FMO associated with Yatesville Lake.	NSO #16
Pine mountain tigersnail *Anguispira rugoderma*	S2	E	X		Terrestrial snail associated with mature forests, dead trees. Occurrences in Bell, Clay, Harlan, Leslie, and Powell counties.	Moderate—Potential impact populations near FMO east of Kentucky Ridge State Forest.	
Elktoe *Alasmidonta marginata*	S2	T		X	Sporadic in eastern Kentucky.	Moderate—Occurrence records in Laurel Creek are at upper reaches of FMO associated with Grayson Lake.	NSO #16
Great egret *Ardea alba*	S1B	E		X	Marshes, lake edges, and wetlands. Occurrence records associated with Lake Barkley.	Low—Most habitat associated with edges of reservoirs where setbacks are typical to protect water quality.	NSO #16
Cattle egret *Bubulcus ibis*	S1S2 B	S		X	Wet pastureland, marshes, and dry fields. Occurrence	Moderate—Potential impact primarily on foraging habitat	NSO #16

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Record Within 1 Mile of FMO	Record on FMO	Habitat/ Occurrence Records	Potential Impact	Stipulation
					records associated with Kentucky Ridge State Forest and Dewey Lake.	at Kentucky Ridge State Forest and Dewey Lake.	
Northern harrier *Circus cyaneus*	S1S2 B,S4N	T	X		Marshes and grasslands. Breeding has been confirmed in only a few counties.	Low—Occurrence record outside the AED, but impacts possible in suitable habitat in central Kentucky.	NSO #16
Sparkling jewelwing *Calopteryx dimidiata*	S1	S		X	Damselfly in lotic systems. Occurrence records associated with Kentucky Ridge State Forest and Dewey Lake.	Moderate—Potential impact at Kentucky Ridge State Forest and Dewey Lake.	NSO #16
Mountain midget crayfish *Cambarus parvoculus*	S2	T		X	Aquatic, preferring small headwater streams with hemlock and rhododendron cover. In AED, occurrence record associated with Kentucky Ridge State Forest.	Moderate—Potential impact at eastern end of Kentucky Ridge State Forest.	NSO #16
Common raven *Corvus corax*	S1S2	T		X	Various habitats. Occurrence record on FMO at Paintsville Lake.	Low—Impacts from 1 projected well are expected to be localized, not likely to occur in or near important roosting or nesting sites.	
Little blue heron *Egretta caerulea*	S1B	E		X	Swamps, lake edges, rivers, and ponds. Occurrence records associated with Lake Barkley.	Moderate—Impacts possible in suitable habitat across state.	NSO #16
Snowy egret	S1B	E		X	Swamps, lake edges, rivers,	Moderate—Impacts	NSO #16

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Record Within 1 Mile of FMO	Record on FMO	Habitat/ Occurrence Records	Potential Impact	Stipulation
Egretta thula					and ponds. Occurrence records associated with Lake Barkley.	possible in suitable habitat across state.	
Least flycatcher *Empidonax minimus*	S1B	E	X		Migrant, using riparian zones, open woodland, and brushy areas. Occurrence record near Kentucky Ridge State Forest.	Moderate—Impacts possible in suitable habitat across state.	NSO #16
Spotted darter *Etheostoma maculatum*	S2	T		X	Swift deep riffles. Currently known to occur only in the Upper Green and Barren River watersheds.	Moderate—Potential impact on FMO at Nolin, Barren, and Green River lakes.	NSO #16
Smallscale darter *Eheostoma microlepidum*	S1	E		X	Occurs only in the Lower Cumberland and Red River drainages.	Moderate—Potential impact at Lake Barkley.	NSO #16
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	Moderate—Potential impact at Lake Barkley.	NSO #16
Coal skink *Eumeces anthracinus*	S2	T	X		Typically found in moist forests and stream edges. Occurrence records associated with Nolin and Laurel River lakes.	Moderate—Potential impact across range, particularly at Nolin and Laurel River lakes.	NSO #16
Clifty covert *Fumonelix wetherbyi*	S2	S	X	X	A terrestrial snail found in high-quality forests on wooded hillsides and ravines in south central	Low—Most occurrence records outside the AED, and only 1 well projected for	

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Record Within 1 Mile of FMO	Record on FMO	Habitat/ Occurrence Records	Potential Impact	Stipulation
					Kentucky.	Bell County near occurrences at Kentucky Ridge State Forest.	
Chestnut lamprey *Ichthyomyzon castaneus*	S2	S	X	X	Medium to large rivers. Occurrence records in western Kentucky	Low—Wells projected upstream of Lake Barkley Dam, with no drilling expected near dam in accordance with USACE requirements.	NSO #16
Northern brook lamprey *Ichthyomyzon fossor*	S2	T	X	X	Small rivers with moderately warm waters. Occurrence records in eastern Kentucky.	Moderate—Potential impact at Grayson, Yatesville, and Dewey lakes.	NSO #16
Pocketbook *Lampsilis ovata*	S1	E	X		Various habitats, including big rivers, small streams, and can tolerate impoundments. Occurrence records across state.	Moderate—Potential impact across western and central AEDs.	NSO #16
Creek heelsplitter *Lasmigona compressa*	S1	E		X	Various big, moderate size rivers and streams. Occurrence records in northeastern part of state.	Moderate—Potential impact at Grayson Lake.	NSO #16
A geometrid moth *Lytrosis permagnaria*	S1	E	X	X	Probably mixed and mesic forests. Occurrence records in central Kentucky.	Unlikely to affect—No FMO below Grayson Lake in Edmonson, Hart, and Barren counties.	
A caddisfly *Manophylax butleri*	S2	S	X	X	Aquatic, with occurrence records associated with Lake Cumberland and Grayson lakes.	Moderate—Potential impact at Lake Cumberland and Grayson Lake.	NSO #16

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Record Within 1 Mile of FMO	Record on FMO	Habitat/ Occurrence Records	Potential Impact	Stipulation
Inland silverside *Menidia beryllina*	S2	T	X	X	Wide range of streams and small rivers. Occurrence records associated with Lake Barkley and Kentucky Lake	Moderate—Potential impact at Lake Barkley.	NSO #16
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.	Moderate—Potential impact across AED, particularly at Cumberland and Dale Hollow lakes.	NSO #3 NSO # 5 NSO #16 CSU #3 CSU #7
Slender madtom *Notus exilis*	S1	E	X	X	Currently known to occur in only in the Lower Cumberland and South Fork Licking River drainages.	Low—Only 1 well projected in Trigg County reduces the chance for affecting suitable smaller tributaries.	NSO #16
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.	Moderate—Potential impact in Morgan, Perry, and Pike counties.	NSO #16
Black-crowned Night-Heron *Nycticorax nycticorax*	S1, S2B	T		X	Marshes, lake and pond shorelines, and swampy woodlands. Occurrence records at Lake Barkley.	Moderate—Potential impact in suitable habitat across AED.	NSO #16
Eastern slender glass lizard *Ophisaurus attenuatus longicaudus*	S2	T	X		Grasslands and dry open woodlands. Occurrence records associated with Nolin Lake.	Unlikely to affect—Occurrence records are generally outside the AED. Records in Hart and Hardin counties are upstream of	NSO #18

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Record Within 1 Mile of FMO	Record on FMO	Habitat/ Occurrence Records	Potential Impact	Stipulation
						FMO and outside the AED.	
Osprey *Pandion haliaetus*	S2B	T		X	Large water bodies. Occurrence records associated with Lake Barkley.	Moderate—Potential impact in suitable habitat across AED.	NSO #16
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.	Low—Occurrence records generally outside the AED, expect for record 0.3 miles east of FMO at Kentucky Ridge State Forest.	
Northern pinesnake *Pituophis melanoleucus melanoleucus*	S2	T	X	X	Restricted to sandy pinelands. Occurrence records associated with Lake Barkley and Nolin Lake.	Moderate—Potential impact in suitable habitat across AED.	
Pied-billed grebe *Podilymbus podiceps*	S1B, S4N	E		X	Marshy inlets, edges of reservoirs, ponds, and sloughs. Occurrence records associated with Lake Barkley.	Moderate—Potential impact in suitable habitat across AED.	NSO #16
King Rail *Rallus elegans*	S1B	E		X	Marshes and wetlands. Occurrence record associated with Nolin Lake.	Moderate—Potential impact in suitable habitat across AED, most likely at Nolin Lake.	NSO #16
Northern oak hairstreak *Satyrium favonius ontario*	S2	S	X		Open woodlands and oak groves across state. Occurrence record associated with Lake Barkley.	Low—Most occurrence records outside AED. Only 1 well projected in Trigg County, reducing potential impact to suitable habitat at Lake Barkley. Unlikely	

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Record Within 1 Mile of FMO	Record on FMO	Habitat/ Occurrence Records	Potential Impact	Stipulation
						to drill in LBTL National Recreation Area.	
Salamander mussel *Simpsonaias ambigua*	S2S3	T		X	Streams, smaller rivers, and lakes. Sporadic in the upper Green River and eastward.	Moderate—Potential impact in Carter county below Grayson Lake.	NSO #16
Western pygmy rattlesnake *Sistrurus miliarius streckeri*	S2	T		X	Woodland habitats and edges, and glades. Occurrence records associated with Lake Barkley.	Low—Most occurrence records outside AED. Only 1 well projected in Trigg County, reducing potential impact to suitable habitat at Lake Barkley. Unlikely to drill in LBTL National Recreation Area.	NSO #4
Eastern spotted skunk *Spilogale putorius*	S2S3	S		X	Forested areas, and brushy areas in woodlands and prairies in eastern portion of state. Occurrence record associated with Kentucky Ridge State Forest.	Moderate—Potential impact in suitable habitat across AED.	NSO #18
Golden-winged Warbler *Vermivora chrysoptera*	S2B	T		X	Nests in deciduous forest edges and openings. Occurrence record associated with Kentucky Ridge State Forest.	Low—Most occurrence records not on FMO, some potential for the 1 well projected for Bell County to be located in suitable habitat.	

[1]S1 = Extremely rare. Typically 5 or fewer estimated occurrences in the state, or only a few remaining individuals; may be especially vulnerable to extirpation.

S2 = Very rare. Typically between 5 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 no Important Bird Areas in Kentucky on or near FMO in the AEDs, and no impacts are expected.

Louisiana

The projected oil and gas development in Louisiana is expected to disturb 2,082 acres of habitat on or near FMO in the AEDs. Map 3-18 shows the parishes with projected oil and gas development, and Table 3-86 shows the number of expected wells by parish.

Louisiana Priority Wildlife Species

Table 4-23 ranks the potential for affecting the priority wildlife species in Louisiana that are known to occur on or within a mile of FMO in the AED. Also included in the table is the reference to stipulations that provide some level of protection in Alternatives B, C, and D (see Table C-2 in Appendix C for the full text of the stipulations).

Table 4-23 Potential Impacts on Louisiana Priority Wildlife Species

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Record Within 1 Mile of FMO	Record on FMO	Habitat/ Occurrence Record	Potential Impact	Stipulation
Rayed creekshell *Anodontoides radiatus*	S2	-	X		Large rivers, to small and medium creeks. Occurrence records in the Florida parishes.	Moderate—Potential impact downstream of most scattered split-estate in region.	NSO #16
Eastern diamondback rattlesnake *Crotalus adamanteus*	S1	-	X		Pine/wiregrass flatwoods, mixed pine woodlands, grasslands, and wet prairies. Occurrence records in the Florida parishes.	Moderate—Potential impact in most upland habitats, particularly in Washington Parish.	NSO #18
Blue sucker *Cycleptus elongatus*	S2 S3	-	X		Largest rivers and lower parts of major tributaries. Occurrence records near split-estate in Rapides Parish.	Moderate—Potential impact from drilling on split-estate or surface tracts in Rapides Parish.	NSO #16
Spike *Elliptio dilatata*	S2 S3	-	X		Medium streams to large rivers in	Moderate—Potential impact populations downstream of split-	NSO #16

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Record Within 1 Mile of FMO	Record on FMO	Habitat/ Occurrence Record	Potential Impact	Stipulation
					shoal habitat of unimpounded streams, but occasionally in tailwaters of dams and certain lake conditions. Occurrence records near split-estate in Richland Parish.	estate tracts in Richland Parish.	
Silverjaw minnow *Ericymba buccata*	S2 S4	-	X		Headwater streams with moderate flow and clean sand or gravel bottoms. Occurrence records in Washington Parish.	Moderate—Potential to impact populations downstream of split-estate tracts in Pushepatapa and Bogue Chitto creeks.	NSO #16
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.	Low—All but 1 occurrence record are above FMO in the watersheds in De Soto Parish. Potential impact on unrecorded populations from development on split-estate in De Soto Parish.	NSO #16
Broadside topminnow *Fundulus euryzonus*	S2	-	X		Quiet pools, backwaters of creeks and small rivers, but not headwaters. Occurrence records in Florida parishes.	Moderate—Potential impact on populations particularly in the Amite River in southern East Feliciana/St. Helena parishes.	NSO #16
Black sandshell *Ligumia recta*	S1	-	X		Medium to large rivers with strong currents. Occurrence record near FMO split-estate in Richland Parish.	Moderate—Potential impact on populations downstream of FMO in Richland Parish.	NSO #16

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Record Within 1 Mile of FMO	Record on FMO	Habitat/ Occurrence Record	Potential Impact	Stipulation
River redhorse *Moxostoma carinatum*	S1S3	-	X		Clearer large creeks and rivers, and occasionally natural lakes and reservoirs. Occurrence records in Florida parishes.	Moderate—Potential impact on populations downstream of FMO in Bogue Chitto Creek in Washington Parish.	NSO #16
Frecklebelly madtom *Noturus munitus*	S2S3	-	X		Chiefly in rocky riffles, rapids, and runs of medium to large rivers. Occurrence records in Florida parishes.	Moderate—Potential impact on populations downstream of FMO in Bogue Chitto and Pushepatapa creeks in Washington Parish.	NSO #16
Osprey *Pandion haliaetus*	S2B, S3N	--	X		Occurrence records across state in coastal areas and associated with large lakes. Expected to occur on surface tracts at Black Lake, Baldwin, and Duck Lake tracts.	Moderate—Potential impact across AED near suitable large bodies of water and coastal areas.	NSO #16
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.	Moderate—Potential impact from drilling on split-estate or the Rapides Parish tract in northern Rapides Parish.	
Pyramid pigtoe *Pleurobema rubrum*	S2	-	X		Large rivers, but may occur in medium-size lotic conditions. Occurrence records near split-estate in	Moderate—Most occurrence records outside AED; some potential impact from drilling on split-estate in Richland Parish.	NSO #16

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Record Within 1 Mile of FMO	Record on FMO	Habitat/ Occurrence Record	Potential Impact	Stipulation
					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.	Moderate—Potential impact from drilling up to 15 wells in Washington Parish.	NSO #16
Javelin crayfish *Procambarus jaculus*	S1S2	-	X		Seasonal, temporary lentic situations. Occurrence records near split-estate in Rapides Parish.	Moderate—Potential impact from drilling on split-estate and a surface tract in northeastern Rapides Parish.	NSO #16
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.	Low—Occurrence record is above FMO in the watershed. Species possibly extirpated.	NSO #16

[1]S1 = Extremely rare. Typically 5 or fewer estimated occurrences in the state, or only a few remaining individuals; may be especially vulnerable to extirpation.

S2 = Very rare. Typically between 5 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

Active Delta (Mississippi River Delta) Important Bird Area (includes split-estate FMO and FMO in the Delta NWR currently under lease in Plaquemines Parish). A total of 48 wells are projected on FMO in Plaquemines Parish, and the bulk of the FMO is associated with the Delta NWR and this Important Bird Area. The projected drilling would occur in existing oil fields, and there is potential for drilling some wells from the same locations into different oil-bearing zones. This drilling is typically done from a barge. There is a system of maintenance canals in place, but additional dredging would likely be required to

access new drilling locations. The refuge has required compensation in the past to offset the damage to wetlands. The dredged material has been used to create or extend existing marshes/uplands in this active delta zone. Depending on the timing of drilling activity, it would displace wintering waterfowl and shorebirds, or breeding wading and marsh birds.

Atchafalaya Basin Important Bird Area (includes split-estate FMO Lafourche Parish and the Duck Lake surface tract in St. Martin Parish). No impacts are expected in the Atchafalaya Basin Important Bird Area; only a small section of Lafourche is in the AED, and there is no FMO in that area of the parish.

Atchafalaya Delta Important Bird Area (near the Baldwin surface tract). No impacts are expected in the Atchafalaya Delta Important Bird Area because it is outside the area of expected mineral development.

Barataria Terrebonne Important Bird Area (includes FMO in LaFourche, Plaquemines, and St. Charles parishes, including FMO associated with the USACE Bonnet Carre Spillway). A total of 27 wells are projected in LaFourche and St. Charles parishes over the next 10 years; most would likely be associated with the Bonnet Carre Spillway. These wells are expected to be directionally drilled from outside the spillway's guide levees, reducing impacts on important freshwater swamps and bottomland hardwood forests.

Catahoula-Dewey Wills-Three Rivers Important Bird Area (includes La Salle, Rapides, and West Feliciana in the AEDs). There are 11 wells projected in these parishes over the next 10 years; however, none are expected in the Catahoula-Dewey Wills-Three Rivers Important Bird Area, except possibly the very northeastern portion of Rapides Parish at the Big Saline Bayou surface tract. There are existing oil and gas wells on the tract with potential for additional development. Because of seasonal flooding, any wells would require an elevated pad, typically with an associated borrow pit. This is expected to affect primarily breeding passerines and foraging habitat for resident wading birds; there are no rookeries on the tract.

Chenier Plain Important Bird Area (includes split-estate FMO in Cameron Parish). There are several tracts of FMO in the Chenier Plain Important Bird Area that, if developed, would affect wetlands and aquatic habitats near Sabine Lake and Monkey Island.

East Kisatchie Important Bird Area (includes split-estate FMO in Natchitoches and Rapides parishes). A total of 10 wells are projected in Natchitoches and Rapides parishes. Red River Parish is not within the AED. These wells could affect native grasslands, forests, and creek bottoms, and many of the species found in this Important Bird Area. It is unlikely that BLM-authorized oil and gas development would adversely affect red-cockaded woodpeckers.

Lake Pontchartrain Important Bird Area (includes split-estate in St. Charles, Tangipahoa, including the USACE Bonne Carre Spillway). A total of four wells are projected in these parishes over the next 10 years, and there is potential for disturbance on the shores of Lake Pontchartrain or in adjacent wetlands. These wells are expected to be directionally drilled from outside of the Bonnet Carre Spillway's guide levees, reducing impacts on important freshwater swamps and bottomland hardwood forests.

West Kisatchie Important Bird Area (includes split-estate in Natchitoches and Rapides parishes outside the Kisatchie National Forest). This area is near the Black Lake tract, which is predominately bottomland hardwood and has no suitable red-cockaded woodpecker habitat. It is unlikely that BLM-authorized oil and gas development would adversely affect red-cockaded woodpeckers within the national forest. Any BLM-permitted development on private inholdings in the forest would be required to follow survey

guidelines and would implement conditions to avoid adverse effects. There is potential for oil and gas drilling on private inholdings to affect other birds of conservation concern.

Tennessee

The projected oil and gas development is expected to disturb 14 acres of habitat on or near FMO associated with Dale Hollow Lake and Standing Stone State Park/Forest over the next 10 years. Map 3-19 shows the counties with expected oil and gas development, and Table 3-87 shows the number of projected wells by county.

Tennessee Priority Wildlife Species

Table 4-24 below table ranks the potential for affecting the priority wildlife species in Tennessee that are known to occur on or within a mile of FMO in the AED. Also included in the table is the reference to stipulations that provide some level of protection in Alternatives B, C, and D (see Table C-2 in Appendix C for the full text of the stipulations).

Table 4-24. Potential Impacts on Tennessee Priority Wildlife Species

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Record Within 1 Mile of FMO	Record on FMO	Habitat/ Occurrence Record	Potential Impact	Stipulation
Highfin carpsucker *Carpiodes velifer*	S2S3	D		X	Large rivers, mostly in the Tennessee River drainage. Historic occurrence records associated with Dale Hollow Lake.	Low—Potential impact at Dale Hollow Lake, but only 2 wells projected.	NSO #16
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.	Low—Current records limited to an eastern arm of Dale Hollow Lake, and only 2 wells are projected in Tennessee.	NSO #16
A cave obligate pseudoscorpion *Kleptochthonius rex*	S1	-	X		Terrestrial cave obligate. Occurrence record east of Dale Hollow Lake.	Not likely to affect—Occurrence record is 0.5 miles upstream from nearest FMO at Dale Hollow	NSO #5 CSU #7

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Record Within 1 Mile of FMO	Record on FMO	Habitat/ Occurrence Record	Potential Impact	Stipulation
						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.	Not likely to affect—Only 2 wells projected in Tennessee.	NSO #16
Blotchside logperch *Percina burtoni*	S2	D		X	Large creeks and small-medium rivers with low turbidity and gravel-cobble substrates; Tennessee and Cumberland watersheds. Occurrence record associated with Dale Hollow Lake.	Not likely to affect—Historic records in Eagle Creek, now part of Dale Hollow Lake.	NSO #16
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	Not likely to affect—Historic records in Eagle Creek, now part of Dale Hollow Lake.	NSO #16

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Record Within 1 Mile of FMO	Record on FMO	Habitat/ Occurrence Record	Potential Impact	Stipulation
					Hollow Lake.		
A cave springtail *Pseudosinella orba*	S2	-	X		Terrestrial cave obligate; reported from 3 caves. Occurrence record east of Dale Hollow Lake.	Not likely to affect—Occurrence record is 0.5 miles upstream from FMO at Dale Hollow Lake.	NSO #5 CSU #7
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.	Not likely to affect—Occurrence record is 0.5 miles upstream from FMO at Dale Hollow Lake.	NSO #5 CSU #7
A cave obligate pseudoscorpion *Tyrannochtho-nius steevesi*	S1	-	X		Terrestrial cave obligate; known from 1 cave in Pickett County. Occurrence record in northwestern Picket County.	Not likely to affect—Occurrence record is 0.5 miles upstream from FMO at Dale Hollow Lake.	NSO #5 CSU #7

1. S1 = Extremely rare. Typically 5 or fewer estimated occurrences in the state, or only a few remaining individuals; may be especially vulnerable to extirpation.

S2 = Very rare. Typically between 5 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

Dale Hollow Lake Important Bird Area (includes FMO at Dale Hollow Lake in Tennessee). Up to 14 acres could be disturbed on or near the Dale Hollow Lake Important Bird Area. Construction activities in the rugged uplands would require extensive pads and fragment existing blocks of mature hardwood forests, degrading habitat for interior forest nesting birds. The loss of habitat would be long term because structure is not likely to return for many decades. Development along the shorelines and wetlands would degrade habitat for wading birds and foraging habitat for a large population of wintering bald eagles, although implementation of the National Bald Eagle Management Guidelines would reduce the potential to affect communal roosting locations and nesting locations.

Virginia

The projected oil and gas development is expected to disturb 100 acres of habitat on or near FMO associated with John W. Flannagan Dam and Reservoir and Radford Ammunition Plant over the next 10 years. Map 3-20 shows the counties with expected oil and gas development, and Table 3-88 shows the number of expected wells by county.

Virginia Priority Wildlife Species

Table 4-25 ranks the potential for affecting the priority wildlife species in Virginia that are known to occur on or within a mile of FMO in the AED. Also included in the table is the reference to stipulations that provide some level of protection in Alternatives B, C, and D (see Table C-2 in Appendix C for the full text of the stipulations).

Table 4-25 Potential Impacts on Virginia Priority Wildlife Species

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Record Within 1 Mile of FMO	Record on FMO	Habitat/ Occurrence Record	Potential Impact	Stipulation
Big sandy crayfish *Cambarus veteranus*	S1S2	E	X	X	Moderately sized streams with bedrock, cobble, or boulders and permanent, fast-flowing water. Occurrence records in Buchanan, Dickenson, Giles, and Wise counties. Occurrence record associated with the John W. Flannagan Reservoir.	Low—Most occurrences upstream from FMO associated with John W. Flannagan Reservoir.	NSO #16
Eastern hellbender *Cryptobranchus alleganiensis*	S2S3	SC	X	X	Cool, clear streams, fast moving streams. Occurrence records associated with the New River at the Radford Ammunition Plant.	Moderate—Potential impact in New River at the Radford Ammunition Plant.	NSO #16
Mottled duskywing *Erynnis martialis*	S1S3	-		X	Grasslands and open woodlands, often with oak, glades. Occurrence record associated with Radford Ammunition Plant.	Moderate—Potential impact in southern portion of the Radford Ammunition Plant.	NSO #4 NSO #18
Green-faced clubtail	S2	-	X		Clean, free-flowing water.	Low—Occurrence	NSO #16

Common Name *Scientific Name*	Natural Heritage Rank[1]	State Listing	Record Within 1 Mile of FMO	Record on FMO	Habitat/ Occurrence Record	Potential Impact	Stipulation
Gomphus viridifrons					Occurrence record located in Pound River associated with John W. Flannagan Reservoir.	record is upstream from FMO associated with John W. Flannagan Reservoir. Potential impact on unrecorded population on or downstream of FMO.	
Swainson's warbler *Limnothlypis swainsonii*	S2B	-	X		Deciduous floodplain and swamp forests. Occurrence record associated John W. Flannagan Dam.	Moderate—Potential impact in suitable habitat in Dickenson County.	NSO #16
Regal fritillary *Speyeria idalia*	S1	-		X	Grasslands and wet meadow with warm season bunch grasses. Occurrence record associated with Radford Ammunition Plant.	Moderate—Potential impact in suitable habitat at Radford Ammunition Plant.	NSO #18

[1]S1 = Extremely rare. Typically 5 or fewer estimated occurrences in the state, or only a few remaining individuals; may be especially vulnerable to extirpation.

S2 = Very rare. Typically between 5 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

Radford Army Ammunition Plant Important Bird Area (near FMO in Montgomery County). No impacts are expected in the Radford Army Ammunition Plant Important Bird Area; all development is projected to occur in Montgomery County.

Pine Mountain Important Bird Area (includes FMO associated with John W. Flannagan Reservoir). The bulk of the Pine Mountain Important Bird Area lies west of FMO associated with Flannagan Dam. If oil and gas wells were located in riparian zones or larger forest blocks, it would degrade habitat for Swainson's warbler, Kentucky warbler *(Oporornis formosus)*, worm-eating warbler *(Helmitheros vermivorus)*, wood thrush *(Hylocichla mustelina)*, and cerulean warbler *(Dendroica cerulean)*, all species on the list of Breeding Birds of Conservation Concern. Impacts on nesting birds in these habitats would

be long term. These species are very sensitive to forest fragmentation, and it would require many decades for forest structure to recover after the well is successfully abandoned.

Lower Potomac River Important Bird Area (includes the Meadowood surface tract). This area is outside the oil and gas AED, but is discussed below under Impacts from Resources Other Than Energy and Minerals under the Virginia state discussion.

Alternative A: Impacts from Resources Other Than Energy and Minerals

General Impacts on All Tracts

Conducting vegetation treatments, including invasive species control and prescribed burning in fire-adapted habitats would maintain and improve conditions for wildlife at BLM-designated special management areas. These include the Jupiter Inlet Lighthouse ONA, Lathrop Bayou HMA, and Meadowood SRMA, totaling 1,075 acres. While most actions focus on specific habitats that require intervention, other habitats in these special management areas would benefit from monitoring of habitat conditions and early intervention as needed to curtail situations that would degrade habitat. Over the long term, actions are expected to improve or maintain habitat and support diverse endemic wildlife populations.

In Alternative A, 31 other surface tracts, totaling 1,755 acres, would be retained by BLM without active site management. Habitat at these tracts is expected to be increasingly degraded by encroachment of invasive plant species and unauthorized uses. The lack of appropriate burning in fire-adapted communities eventually reduces the ability of these habitats to support associated species, many of which are priority species. These areas also accumulate excess fuels, and habitats can be severely damaged or lost in the event of catastrophic wildfire.

Suppressing wildland fires in fire-adapted habitats can result in the accumulation of excessive shrub layers and closed canopy stands, which exclude wildlife species adapted to early scrubs, savannas, and flatwoods. In the long term, fire suppression could alter the fire regime and increase the chance of catastrophic wildfire and damage to adjacent habitats.

Cultural resource management actions (e.g., capping and restoring) to conserve sensitive cultural resource sites would generally have negligible impacts on wildlife. These activities are expected primarily at Jupiter Lighthouse ONA and Meadowood SRMA in areas that receive significant numbers of visitors. Impacts on wildlife in these locations are generally temporary and affect only the immediate site. Additional environmental review would be completed before these actions were undertaken, and sensitive wildlife features would be identified as part of that process and the project modified or mitigated, as necessary, to avoid or reduce impacts.

Managing 185 acres as VRM Class II would limit the type and extent of construction projects to retain the existing character of the landscape. This would reduce the potential for projects to intrude on natural habitats and affect wildlife. In most cases, this is not expected to affect wildlife management actions in any state.

Other than in SRMAs, there is very little evidence of dispersed recreational use on most BLM surface tracts. However, where it does occur, there can be increased disturbance to wildlife. Recreational use could result in minor vegetation removal and loss of cover along the shoreline and on trails, leading to sedimentation of wetlands and aquatic habitats and lost productivity in upland areas.

Based on historic activities, requests for ROWs on BLM-administered surface tracts are anticipated to be few. However, fish and wildlife habitat could be affected if any ROWs were developed. This would involve land-clearing activities to make way for communication towers and linear features, such as roads, pipelines, and transmission lines. This would result in the disturbance and displacement of species and degradation of wildlife habitat by removing vegetation, increasing erosion and runoff into riparian habitats, and increasing the potential for the introduction of invasive plant species.

Land tenure adjustments in Alternative A would result in BLM retaining 2,830 acres across Arkansas, Florida, Louisiana, and Virginia. A total of 55 acres would be available for disposal from federal ownership in Arkansas, and 106 acres available for transfer to the USFS or USFWS or for exchange to benefit the NWR system.

State-Specific Impacts

The following state sections present more detailed information for each state, particularly with regard to impacts from habitat management and impacts from potential land disposal and transfer actions. Additional detail is also provided for the individual tracts identified as special management areas.

Arkansas

Under Alternative A (No Action), no active resource management is proposed for the 18 surface tracts (940 acres) in Arkansas. Wildlife habitat would continue to deteriorate from lack of management, continuing unauthorized use, lack of prescribed fire, and increasing invasive species coverage on most of these tracts.

Of the 18 retained tracts, 16 are in the Ozark Highlands Ecoregion, which, according the Arkansas state WAP, supports the highest species priority score in the state and is in the greatest need of conservation actions. Retention of these surface tracts without management, while it would exclude development, would not address habitat improvement and the restoration needed to meet regional conservation goals. Glades tend to be in the most need of management on the BLM surface tracts. Consequently, the species associated with glades would be most affected; these include scrubland tiger beetle *(Cicindela sp.)*, whip-poor-will *(Caprimulgus vociferous)*, rufous-crowned sparrow, ground snake *(Sonora semiannulata)*, western diamondback rattlesnake (Crotalus atrox), great plains skink *(Eumeces obsoletus)*, eastern collared lizard *(Crotaphytus collaris)*, western slender glass lizard *(Ophisaurus attenuatus)* and desert shrew *(Notiosorex crawfordi)*. Woodlands at two tracts located in the Boston Mountains Ecoregion (Dry Creek and Rattlesnake Hollow) would continue to be degraded by unauthorized uses and would not meet regional wildlife conservation needs.

Wildland fire suppression would contribute to the decline of habitat on retained tracts in Arkansas, particularly as excess fuels accumulate in woodlands and glades.

No cultural resources management is planned for Arkansas, and no impacts on wildlife are expected.

There is very little evidence of dispersed recreation use on most of the BLM surface tracts in Arkansas. However, unauthorized trails and uses have degraded habitat. Without intervention, these activities are expected to continue and are particularly prevalent in woodlands and glades.

Under this alternative, the Point Peter and Redland Mountain tracts would be transferred to the USFS. It is assumed that these tracts would be incorporated into ongoing management, including 16 acres of glades already in good condition. The Drasco, Middle Fork, and West Fork tracts (a total of 55 acres) would be available for disposal from federal ownership. It is assumed that new land use could include timber

harvest, conversion to pasture, and construction of access roads and possibly home sites. The Drasco tract (5 acres), which is in poor condition, would require extensive restoration, and the transfer to private ownership is expected to have a negligible impact on wildlife. The glade on the Middle Fork tract would continue to decline. The West Fork tract is also small (10 acres), although it benefits from being adjacent to a state WMA. The pine-oak woodland is a widespread habitat, but transfer to private ownership would likely to result in some level of development and an incremental loss of this habitat.

Florida

Under Alternative A, active management would continue to support wildlife and priority species at the Jupiter Inlet Lighthouse ONA and Lathrop Bayou HMA. An additional six tracts would be retained by BLM with no active management. Wildlife habitats at these tracts are expected to be degraded primarily by unauthorized uses and lack of invasive species control.

Egmont Key, where an ongoing management program would be curtailed, would be substantially damaged by any lapse in management. Wildlife habitat would be degraded by the abandonment of invasive species control and unmanaged public use. This island off Tampa Bay receives thousands of visitors each year attracted by the beaches, lighthouse, and historic Fort Dade. It is also a regionally important nesting location for thousands of terns, gulls, black skimmers, and American oystercatchers, and is critical habitat for wintering piping plover *(Charadrius melodus)*. Although much of the nesting occurs on the southern portion of the island managed by the USFWS, any lapse in management would likely have negative impacts on foraging and loafing birds.

Wetlands habitats would continue to be degraded on the Citrus County tract, from both aquatic and terrestrial invasive plant species. Coastal habitats at Gasparilla, and Park Key would be degraded by terrestrial invasive plant species and unauthorized or unmanaged public use. Two small tracts, Freeport and Suwanee, are too small to be effectively managed, but impacts on wildlife from the lack of management would be very local and negligible.

Wildland fire suppression on the tracts retained but not managed would be coordinated with local entities. Lake Marion tract has fire-adapted habitats where excessive fuels degrade habitat, and it would not be retained by BLM. Fire suppression on the other tracts is not expected to negatively affect wildlife.

Cultural resource management is expected to occur only at Jupiter Inlet Lighthouse ONA, see below.

The Lake Marion tract (22.27 acres) would be available for a land exchange to acquire land within either the Lake Wales Ridge or the Everglades Headwaters NWR, or for transfer to the USFWS for inclusion in the Everglades Headwaters NWR. In addition, the Sugarloaf Key tracts (3.57 acres) would be available for transfer to the USFWS for inclusion in a nearby refuge. If retained in those refuges, habitat protection and improvement actions would benefit wildlife. If exchanged out of federal ownership, the Lake Marion tract would likely be incorporated into the surrounding residential development. It is assumed, however, that potential exchange of the tract from federal ownership would be conducted only to meet overall habitat conservation objectives to benefit wildlife.

At Jupiter Inlet Lighthouse ONA, ongoing vegetation management, including prescribed fire, exotic species control, and habitat treatments, would maintain and restore scrub, mangrove, and tropical hardwood hammock, benefitting endemic wildlife species. While the focus is on supporting the many special status species found in these specialized habitats, other wildlife would benefit and the site would continue to support an exceptionally diverse array of wildlife given its urban setting. These include Birds of Conservation Concern, such as common ground dove *(Columbina passerine)*, common nighthawk *(Chordeiles minor)*, wintering and potentially breeding loggerhead shrike, prairie warbler, and painted

bunting *(Passerina ciris)*. Nesting habitat for mottled duck *(Anas fulvigula)* would continue to be maintained along the Loxahatchee River, as well as osprey and wading birds along the river shorelines and tidal lagoon.

At Jupiter Inlet Lighthouse ONA, an active fuel reduction and prescribed fire program would continue to be used to remove excess fuels and improve fire-adapted habitats. Fire suppression would be coordinated with local municipalities or counties.

Cultural resource management at Jupiter Inlet Lighthouse ONA is expected to have limited impacts on wildlife. Most activities are expected in areas already heavily used by visitors. Minor inventories and excavations outside these areas are not expected to affect wildlife use.

Recreation at the Jupiter Inlet Lighthouse ONA would continue to be managed under the existing activity plan, which includes trails, overlook, and interpretive signage. Existing facilities funnel most use through sensitive habitats, and most public use is concentrated around developed facilities on the south side of the tract. Areas opened for public use without developed facilities could result in trampling damage to sensitive habitats and reduce wildlife use.

Travel management decisions at Jupiter Inlet Lighthouse ONA would not change. No off-road use is permitted. No impacts are expected from the continuing public use of established, paved roads at Jupiter Inlet Lighthouse ONA.

Mature longleaf/slash pine flatwoods and freshwater marsh would continue to be maintained at Lathrop Bayou through frequent prescribed burns and fuel reduction benefitting species associated with open, pine flatwoods. This would support not only state conservation goals but also national goals, with longleaf pine and savannas ranked third on a list of the 21 most imperiled ecosystems in the nation (Noss and Peters 1995). Longleaf pine flatwoods, although best known for their high diversity of herbaceous plants and special status species, also support a suite of priority wildlife species, including Bachman's warbler *(Vermivora bachmani)*, brown-headed nuthatch *(Sitta pusilla)*, and reticulated salamander *(Ambystoma bishopi)*, as well as the state-protected black bear.

Wildland fire suppression on BLM land at Lathrop Bayou, which is basically an island, is likely to be managed through containment, particularly if the fire is within prescription. Aerial suppression, hand crews, and firebreaks on private forest lands on the mainland would be an option for controlling the spread of wildfire across the marsh to the mainland.

Recreational use at Lathrop Bayou is very limited, with access primarily by boat and by hunters coming cross-county over the marsh. Impacts on wildlife at the current levels are negligible.

Travel management decisions at Lathrop Bayou HMA would not change. No public vehicle use is permitted at Lathrop Bayou, and that restriction would remain in place in this alternative.

Louisiana

Under Alternative A, all six surface tracts (738 acres) in Louisiana would be retained by BLM. Resource management actions, however, are planned only at the Big Saline Bayou tract in Rapides Parish. The other tracts would receive no active management. Wildlife habitats at these unmanaged tracts are expected to be degraded primarily by unauthorized uses and lack of invasive species control. There would be no restoration of disturbed portions of the Baldwin tract, with a loss of potential bottomland hardwood habitats. The Black Lake tract is expected to retain most of the bottomland hardwood values despite the lack of management. Duck Lake is also likely to remain relatively stable, except that BLM would not

contribute to the overall control of aquatic invasive plants that affect vast areas of this extensive wetland. At the Rocky Bayou tract, there would be no restoration or management of young pine stands that have resulted from unauthorized logging on the tract.

Wildland fire suppression on the Louisiana surface tracts would be coordinated with local counties and municipalities. Most of the tracts are seasonally inundated bottomlands at low risk for wildland fire.

No cultural resource management is proposed in Louisiana in this alternative.

No recreation management or transportation management actions are proposed outside Big Saline Bayou SRMA. On other Louisiana surface tracts, unauthorized trails would continue to be used, resulting in loss of wildlife habitats.

At Big Saline Bayou, no specific wildlife management actions are planned under Alternative A. However, exotic species management, particularly of Chinese tallow trees, Japanese climbing fern, alligator weed *(Alternanthera philoxeroides)*, Johnson grass, and chinaberry, would continue as part of the SRMA implementation.

Wildland fire suppression is unlikely to affect the bottomland hardwood at Big Saline Bayou. The site is not fire-adapted and typically floods for several months each year. Any fire suppression activities would likely be coordinated with the county and adjacent Dewey W. Wills State WMA.

No recreation facilities are proposed for Big Saline Bayou SRMA in Alternative A. This would result in the continued casual launching of boats on the bayou in the northwest corner of the tract. This is resulting in deep rutting and gullying along the bayou and accelerating erosion of the bank, particularly when the ground is saturated. Unauthorized “mudding” is occurring in the same area and should be curtailed with increased management as an SRMA. Travel and access management on the rest of the tract would not change. Although the entire tract is open for foot traffic, there is no vehicle access by the public outside the northwest corner.

Virginia

The Meadowood SRMA (804 acres) would be retained, and management would continue to support general wildlife habitat, including invasive species control, native plantings to stabilize riparian areas, maintenance of trails and public use facilities, and coordination with other local land managers on resource issues, including population management of the deer population.

Surface tract management at Meadowood would benefit the Lower Potomac River Important Bird Area. Hardwood forests are retained in large blocks, and efforts are being made to manage the deer population to ensure sufficient hardwood recruitment, which would benefit a host of forest interior neotropical migrants, such as wood thrush, worm-eating warbler, and Louisiana waterthrush. Exotic species control and restoration of native grasses and forbs in grasslands supports habitat goals for prairie warbler, grasshopper sparrow *(Ammodramus savannarum)*, and field sparrow. Meadowood’s shoreline contributes to supporting some of the state’s densest populations of great blue heron *(Ardea herodias)* and great egret *(Ardea alba)*, as well as nesting and foraging habitat for bald eagle.

Wildland fire suppression activities would likely be coordinated with the county and local land managers. Outside the grasslands, most of the tract is not expected to be affected by wildland fire suppression.

Cultural resource management, including stabilization and restoration of cultural sites and historic sites could result in some temporary displacement of wildlife and minor loss of habitat. This could include

protection of segments of the Washington-Rochambeau Revolutionary Route National Historic Trail and Potomac National Heritage Scenic Trail. These activities would affect only the immediate area, and capping or restoration efforts are expected to include native plantings on all exposed soils. These activities would have negligible effect on wildlife.

Recreation management and travel and access management at Meadowood in this alternative would remain unchanged. The current level of trail and facility use is not expected to have adverse impacts on wildlife.

4.6.3 Alternative B (Preferred Alternative)

Impacts from Energy and Minerals

All States

Acres of habitat lost as a result of mineral development would not change by alternative, but the surface disturbing activities would be shifted away from sensitive habitats, reducing the overall impacts on wildlife. NSO lease stipulations applied in Alternative B would reduce impacts on wildlife species by excluding surface disturbing activities within wetland and aquatic habitats, near caves and karst features, and certain habitats associated with high numbers of priority species. These stipulations would be applied across 610,927 acres, or 59 percent of the FMO available for oil and gas leasing.

The most broadly applied stipulation would exclude surface disturbing activities from a 250-foot buffer of aquatic and wetland habitats. This would affect 389,816 acres of wetlands, riparian zones, lakes and ponds, vernal pools, and seepage slopes across the six states. This buffer could be increased to 600 feet in areas where the slope exceeded 10 percent (see Table C-2 in Appendix C for the full text of the stipulation). This is expected to provide adequate protection for aquatic species and most riparian species, including many of the priority species found on or near FMO.

Oil and gas surface lease stipulations would also exclude oil and gas development from a 1,000-foot buffer around cave and karst features. This stipulation would be attached to all leases in the mapped karst regions. This would provide protection for known and identifiable surface features, but does not prevent the possibility of drilling into unknown karst features. Caves that serve as hibernacula or summer roost sites for priority bat species would receive additional protection. Caves with records of Indiana bat *(Myotis sodalis)*, Ozark big-eared bat *(Corynorhinus townsendii ingens)*, Virginia big-eared bat (*Corynorhinus (Plecotus) townsendii virginianus)*, or gray bat *(Myotis grisescens)* would be buffered 0.5 miles, and the buffer would be extended to 10 miles in Kentucky for Indiana bat hibernacula and 5 miles for maternity habitat. These stipulations would apply on almost 42,000 acres, all but 708 acres of which is in Kentucky. In addition, in karst regions, produced and flowback water would not be injected into karst structures or at any point connected to a karst network. This stipulation would be applied across all alternatives and would protect karst features from inadvertent contamination and flooding from this aspect of oil and gas drilling. A CSU stipulation would restrict the removal of trees within 1.5 miles of bat summer nursery roosts and winter hibernacula affecting 299 acres.

Buffers to protect wading bird rookeries and colonial nesting bird locations are increased in Alternative B to 650 feet for terns, gulls, and skimmers; 1,000 feet for wading bird rookeries and 2,000 feet for brown pelicans *(Pelecanus occidentalis)*. Flushing distances for nesting terns and black skimmers, which tend to have the longest flushing distances, have been documented at between 500 and 600 feet (Rodgers and Smith 1995). These buffers meet or exceed most published recommended minimum buffers for these species and are expected to avoid impacts on these breeding colonies.

NSO stipulations in Alternative B would protect certain rare upland habitats that support high numbers of priority species. NSO stipulations protect glades and barrens, and native grasslands, providing habitat protection for grassland birds such as Henslow's sparrow, Bachman's sparrow, and loggerhead shrike, all listed as Breeding Birds of Conservation Concern. Several priority insects would also be protected by this stipulation. These habitats could not always be accurately distinguished from non-native grasslands and pasture during the mapping process, so that acreage is not provided. Most lease stipulations developed to protect special status species would reduce potential impacts on other wildlife values. Coastal shoreline habitats would be excluded from oil and gas development on 6,671 acres across all alternatives, protecting resident and migratory shorebirds and potentially reducing impacts on migrating songbirds. NSO lease stipulations for endangered Louisiana black bear would be applied on 10,691 acres in counties with black bear critical habitat. This would exclude oil and gas development in bottomland hardwoods in portions of the important Mississippi flyway, as well as productive habitat for fur bearers and other game species, including a major wintering ground for American woodcock, a declining game birds.

BLM would require that reserve pits not closed within 10 days after the well was completed be covered by a net or other method to exclude migratory birds, and would require the installation of wildlife escape ramps to reduce entrapment.

State-Specific Impacts from Energy and Minerals

The following state-by-state discussions provide additional information on impacts from mineral development on priority species wildlife species and Important Bird Areas. Impacts on priority species are presented in tables that rank the relative potential for these species to be affected by the projected mineral development based on proximity of known occurrences to FMO, distribution of the known occurrences in the AED, and accessibility of associated habitats. The tables also provide a reference to stipulations that provide some level of protection in Alternatives B, C, and D (see Table C-2 in Appendix C for the full text of the stipulations). Impact from coal development (Kentucky) and phosphate development (Florida) would be the same as under Alternative A.

Arkansas

Arkansas Priority Wildlife Species

Of the 44 priority wildlife species with occurrence records on or near FMO in the AEDs, all but five would receive some level of protection from lease stipulations in Alternative B (see Table 4-20 for list of priority species and reference to lease stipulations). Thirty-five of these species would be protected by a stipulation that excludes surface occupancy from a 250-foot buffer around wetlands and aquatic habitats. This is expected to provide adequate protection for aquatic and wetland habitats from increased sedimentation and contamination, particularly given that the buffer could be extended up to 600 feet if the slope is more than 10 percent. This stipulation would not be sufficient to protect some amphibians using uplands during their life cycle or forest interior nesting birds and some riparian nesting birds.

An additional three priority species would be protected by excluding development from native grasslands in this alternative. One priority species, southern crayfish, would benefit from excluding development within 1,000 feet of caves and karst features.

Three priority species in Ouachita and Nevada counties have a low potential to be affected, primarily because only four wells are proposed in those counties over the next 10 years. These include the Texas coral snake, Comanche harvester ant, and big sand tiger beetle.

There would continue to be moderate potential to affect Diana fritillary in the Ozark and Ouachita regions.

Arkansas Important Bird Areas

The Important Bird Areas potentially affected by BLM oil and gas development were established primarily for wetland and grassland birds. Impacts on both groups would be reduced in Alternative B. The wetland and aquatic habitat buffer of 250 feet and the 1,000 foot buffer for wading bird rookeries would prevent most impacts at Bell Slough and Lake Dardanelle Important Bird Areas. The NSO stipulation covering native grasslands would avoid most impacts at Camp Robinson and Fort Chaffee Important Bird Areas but would not provide protection for improved, non-native grasslands.

Florida

Florida Priority Wildlife Species

Four of the five priority wildlife species with occurrence records on or near FMO in the oil and gas AED would receive some level of protection in Alternative B and would not likely be affected (see Table 4-21 for list of priority species and reference to lease stipulations). Snowy plover, peregrine falcon, American oystercatcher, and roseate spoonbill are all associated with coastal habitats and wetlands, which are all excluded from development in Alternative B. Swallow-tailed kite has a wider range of habitats, but even then, the potential to affect foraging or nesting habitat is low, with only three wells projected in the state.

Impacts from phosphate mining would be the same as Alternative A.

Florida Important Bird Areas

Impacts would be the same as in Alternative A.

Kentucky

Kentucky Priority Wildlife Species

Of the 40 priority wildlife species with occurrence records on or within a mile of FMO in the oil and gas AEDs, 32 would receive some level of protection in Alternative B (see Table 4-22 for list of priority species and reference to lease stipulations). Of these, 28 species are primarily aquatic or strongly associated with wetlands. Under Alternative B, lease stipulations would exclude surface occupancy from a 250-foot buffer around wetlands and aquatic habitats. This is expected to provide adequate protection for aquatic and wetland habitats from increased sedimentation and contamination, particularly given that the buffer could be extended up to 600 feet if the slope is more than 10 percent. This stipulation would not be sufficient to protect some amphibians using uplands during their life cycle or forest interior nesting birds and some riparian nesting birds.

Eastern small-footed myotis would benefit from lease stipulations that protect federally listed bats, and cave obligates, which include exclusion within 1,000 feet of caves and karst features, and up to a 10-mile buffer for Indiana bat hibernacula.

Western pygmy rattlesnake would benefit from the protection of glades in western Kentucky.

Priority species with moderate potential to be affected by oil and gas development in Kentucky are Pine Mountain tigersnail and northern pinesnake.

Impacts from coal mining would be the same as in Alternative A.

Kentucky Important Bird Areas

Impacts would be the same as Alternative A.

Louisiana

Louisiana Priority Wildlife Species

Of the 16 priority wildlife species with occurrence records on or within a mile of FMO in the AEDs, all but one is aquatic or strongly associated with wetlands habitats. These species would be protected by a stipulation that excludes surface occupancy from a 250-foot buffer around wetlands and aquatic habitats (see Table 4-23 for list of priority species and reference to lease stipulations). This buffer is expected to provide adequate protection for aquatic and wetland habitats from increased sedimentation and contamination, particularly given that the buffer could be extended up to 600 feet if the slope is more than 10 percent. Sabine fencing crawfish and javelin crayfish could be affected outside identified wetlands.

Eastern diamondback rattlesnake would benefit from protection of native grasslands on FMO in the Florida parishes.

Louisiana Important Bird Areas

Impacts on specific Important Bird Areas are presented below. For those areas not listed, impacts would be the same as Alternative A.

Active Delta (Mississippi River Delta) Important Bird Area (includes split-estate FMO and FMO in the Delta NWR currently under lease in Plaquemines Parish). A total of 48 wells are projected on FMO in Plaquemines Parish, and the bulk of the FMO is associated with the Delta NWR and this Important Bird Area. The projected wells within the refuge would be expected to be drilled on existing leases, which do not have a stipulation for protection of aquatic habitat and wetlands, so impacts are expected to be the same as in Alternative A. All new leases would include a lease stipulation excluding surface occupancy within 250 feet of aquatic and wetland habitats, which would include virtually all of the FMO in Plaquemines Parish and would require approval of an exception, modification, or waiver of the lease stipulation to proceed with drilling.

Barataria Terrebonne Important Bird Area (includes FMO in LaFourche, Plaquemines, and St. Charles parishes, including FMO associated with the USACE Bonnet Carre Spillway). Impacts are expected to be the same as in Alternative A, except that a 250-foot buffer around aquatic and wetland habitats would provide additional protection for these habitats and would reduce the potential for affecting wading birds and riparian nesting passerines in the areas surrounding this Important Bird Area.

Catahoula-Dewey Wills-Three Rivers Important Bird Area (includes La Salle, Rapides, and West Feliciana in the AEDs). Under Alternative B, a lease stipulation would exclude surface occupancy within 250 feet of aquatic and wetland habitats; on FMO, this is expected to primarily benefit wading birds through protection foraging habitat along waterways.

Chenier Plain Important Bird Area (includes split-estate FMO in Cameron Parish). Under Alternative B, a lease stipulation would exclude surface occupancy within 250 feet of aquatic and wetland habitats and coastal habitats. These stipulations are expected to avoid impacts on these important Chenier habitats.

East Kisatchie Important Bird Area (includes split-estate FMO in La Salle, Natchitoches, Rapides, and Red River parishes). Aquatic and wetland buffers would be sufficient to protect foraging habitat for wading birds, after drilling is completed. Native grasslands would be excluded from surface occupancy in Alternative B, providing protection for Henslow's and Bachman's sparrow, bobwhite, and other grassland birds. Surface occupancy would be excluded within 0.5 miles of red-cockaded woodpecker clusters, which is expected to be sufficient to safeguard active clusters.

Lake Pontchartrain Important Bird Area (includes split-estate in St. Charles, Tangipahoa, including the USACE Bonne Carre Spillway). A total of four wells are projected in these parishes over the next 10 years, and there is potential for disturbance on the shores of Lake Pontchartrain or in adjacent wetlands. These wells are expected to be directionally drilled from outside of the Bonnet Carre Spillway's guide levees, reducing impacts on important freshwater swamps and bottomland hardwood forests.

West Kisatchie Important Bird Area (includes split-estate in Natchitoches and Rapides parishes outside the Kisatchie National Forest. The area is near the Black Lake tract, which is predominately a bottomland hardwood and has no suitable red-cockaded woodpecker habitat). It is unlikely that BLM-authorized oil and gas development would negatively affect red-cockaded woodpeckers in the national forest. Any BLM-permitted development on private inholdings in the forest would be required to follow survey protocols and would implement conditions to avoid adverse effects. Lease stipulations would exclude surface disturbing activities within 0.5 miles of occupied clusters. There is potential for oil and gas drilling on private inholdings to affect other birds of conservation concern.

Tennessee

Tennessee Priority Wildlife Species

Of the nine priority wildlife species with occurrence records on or within a mile of FMO in the AEDs, all would be provided some level of protection under this alternative. Five species are aquatic and would be protected by a stipulation that excludes surface occupancy from a 250-foot buffer around wetlands and aquatic habitats (see Table 4-24 for list of priority species and reference to lease stipulations). This buffer is expected to provide adequate protection for aquatic and wetland habitats from increased sedimentation and contamination, particularly given that the buffer could be extended up to 600 feet if the slope is more than 10 percent. Four of the priority species are cave obligates and would be protected by a lease stipulation requiring a 1,000-foot setback from all caves and karst features, plus a lease stipulation that prohibits the reinjection of produced waters into any karst formation or at any point connected to karst formations. These stipulations are expected to avoid impacts on these species.

Tennessee Important Bird Areas

The acreage of disturbance is not expected to change, and impacts on uplands would be the same as in Alternative A. Lease stipulations would exclude surface disturbing activities within 250 feet of shorelines and wetlands. This would avoid direct impacts on wetlands habitats but could displace foraging wading birds, waterfowl, and foraging habitat for both wintering and resident bald eagles at Dale Hollow Lake. Implementation of the National Bald Eagle Management Guidelines would reduce the potential to affect communal roosting locations and nesting locations.

Virginia

Virginia Priority Wildlife Species

Of the six priority wildlife species with occurrence records on or within a mile of FMO in the AEDs, all would be provided some level of protection under this alternative. Four species are aquatic or strongly

associated with aquatic or wetland habitats and would be protected by a stipulation that excludes surface occupancy from a 250-foot buffer around wetlands and aquatic habitats (see Table 4-25 for list of priority species and reference to lease stipulations). This leasing stipulations would benefit riparian nesters, includes Swainson's warbler. This buffer is expected to provide adequate protection for aquatic and wetland habitats from increased sedimentation and contamination, particularly given that the buffer could be extended up to 600 feet if the slopes are more than 10 percent. Habitat for two butterflies, with occurrence records at Radford Ammunition Plant, would be protected by lease stipulations excluding surface disturbing activities from glades and native grasslands, but these species are not found exclusively in these habitats.

Virginia Important Bird Areas

Establishing a 250-foot buffer around wetlands and aquatic habitats would provide some protection for riparian nesting birds, particularly short-distance migrants and resident birds at the Pine Mountain Important Bird Area (see Table 4-25 for list of priority species and reference to lease stipulations). The potential remains to affect forest interior nesting birds if pads are placed in larger forest blocks.

The Lower Potomac River Important Bird Area is outside the AED but is discussed under the Meadowood surface tract.

Alternative B: Impacts from Resources Other Than Minerals and Energy

General Impacts on All Tracts

In Alternative B, 28 surface tracts (2,776 acres) would be retained by BLM and actively managed to meet habitat objectives and contribute toward regional conservation needs. A total of five tracts (127 acres) would be available for transfer to USFS or USFWS in Arkansas and Florida. One tract would be available for transfer or exchange to benefit the NWR system. Five tracts (66 acres) would be available for disposal from federal ownership.

Across all tracts, impacts from VRM would be similar to those identified in Alternative A, except only 92 acres would be managed as VRM Class II (50% decrease compared with Alternative A). This would reduce the amount of area subject to restrictions on surface disturbance for the purposes of protecting visual resources. This VRM Class change by itself would not likely lead to actions that would increase impacts on vegetation.

State-Specific Impacts

The following state sections present more detailed information for each state, particularly with regard to impacts from habitat management and impacts from potential land disposal and transfer actions. Additional detail is also provided for the individual tracts identified as special management areas.

Arkansas

In Alternative B, 17 surface tracts would be retained by BLM and managed as the Ozark Highlands HMA. On retained tracts, resource management would include invasive species control, prescribed burning in fire-adapted habitats, and resolution of unauthorized uses, which would result in habitat improvement across these tracts. Species associated with glades would benefit from removal of non-natives and invasive eastern red cedar. Prescribed burns would be conducted where feasible in coordination with other land management agencies. Most glades are expected to improve to at least fair

condition with active management within five years. Woodland and forested habitats damaged by unauthorized uses would require several decades to recover after restoration activities are initiated.

Impacts from wildland fire suppression activities would be less than in Alternative A. Fuel reduction and use of prescribed fire is expected to reduce the potential for wildland fire.

Cultural resource management would typically have a negligible impact on wildlife, but in karst regions of the Ozarks, inventory, assessment, monitoring, and excavation of cultural sites at rock shelters has the potential to disrupt roosting bats.

Recreation use is expected to continue without specific public access or use facilities. Current levels of public use would have negligible impacts on wildlife. No new travel routes or access points are proposed on the Arkansas surface tracts. There are areas where unauthorized trails would be restored, reducing intrusions and eventually consolidating habitat blocks. No designated roads, new routes, or trails are proposed.

Three surface tracts adjacent to national forests would be transferred to the USFS. Habitats on these tracts range from fair to good and would be expected to be maintained or improved through incorporation into the national forests. The Redland Mountain tract includes 16 acres of glades in good condition that would be retained in federal ownership. Three additional tracts would be available for disposal from federal ownership—Drasco, Gepp, and Norfolk Lake. This would result in the loss of 65 acres of habitat, most of which is in poor condition. Wildlife use of these areas, particularly by priority species, is low. The Drasco and Norfolk Lake tracts, at five and 20 acres, respectively, are small and isolated from other public land. The Gepp tract site has been heavily affected and current value for wildlife is low.

Florida

In addition to Jupiter Inlet Lighthouse ONA and Lathrop Bayou ACEC, four other surface tracts would be retained by BLM in Florida and managed to meet resource objectives. Planned management actions would focus on control of invasive plant species and use of prescribed fire in fire-adapted habitats.

Wildlife at the Citrus County tract, particularly wading birds and waterfowl, would benefit from control of invasive plant species. Coordination with Southwest Florida Water Management District and other surface management agencies would leverage these efforts.

At Park Key and Sugarloaf Key, invasive species management would benefit wading birds, neotropical migrants, and a suite of West Indian birds restricted to extreme southern Florida, such as mangrove cuckoo *(Coccyzus minor)*, gray kingbird *(Tyrannus dominicensis)*, black-whiskered vireo *(Vireo altiloquus)*, "Florida" prairie warbler *(Dendroica discolor paludicola)*, and "Cuban" yellow warbler *(Dendroica petechia gundlachi)*. Monitoring of these tracts, particularly for special status species, would benefit general wildlife through early detection and resolution of management issues.

Management at Egmont Key would continue invasive species control and maintenance, benefitting species hammock and coastal strand species. Coordination with the Egmont Key NWR would contribute to predator control across the island, benefitting nesting shorebirds and wading birds. Fuel reduction activities would be coordinated with the refuge to allow the reintroduction of fire, where feasible and needed to support resource objectives. Designation as an ACEC would provide additional emphasis on habitat protection and management of public use, diverting use away from the most sensitive wildlife use areas, and hardening heavily used public areas to avoid deterioration. There is potential for wildlife to be affected by restoration and stabilization of historic Fort Dade and the lighthouse at Egmont Key. Depending on how extensive the work is and the timing, there is potential to displace wildlife in the area.

On the Key and Citrus County tracts, recreation use is expected to continue without specific public access or use facilities. Current levels of public use would have negligible impacts on wildlife. No new travel routes or access points are proposed on the Florida surface tracts.

Impacts on wildlife at Jupiter Inlet Lighthouse ONA from wildland fire suppression, cultural resource management, and recreation and travel management would be the same as in Alternative A. However, in Alternative B, the site would be designated as a SRMA, with additional focus on providing the visiting public with enhanced recreation opportunities where compatible with natural and cultural resource protection. This may result in increased visitation as public use facilities are improved; however, most improvements are expected to be located in areas already used by the public on the south side of the tract. Additional trails, boardwalks, or interpretive facilities could result in minor habitat loss but would reduce overall trampling habitat degradation that can occur from unmanaged public access.

Impacts on wildlife at Lathrop Bayou from wildland fire suppression, cultural resource management, recreation management, and travel and access management would be the same as in Alternative A, except that the tract would be designated as an ACEC. This designation would increase the level of protection for the site but is not expected to alter the management actions or anticipated impacts on wildlife.

Louisiana

In Alternative B, all four surface tracts, totaling 738 acres, would be retained by BLM and actively managed to meet resource objectives through invasive species control, prescribed burning, where appropriate, and resolution of unauthorized uses. Wetland species, including wading birds and wintering waterfowl would benefit at the Baldwin, Black Lake, and Duck Lake tracts. Thinning of a young pine stand and invasive species control would increase species diversity at the Rocky Bayou tract and improve habitat for Birds of Conservation Concern.

Impacts from wildland fire suppression activities for all tracts would be the same as Alternative A.

Cultural resources management actions on surface tracts in Louisiana are not expected to result in actions that would affect wildlife.

Recreation use on tracts other than the Big Saline Bayou SRMA is expected to continue without specific public access or use facilities. Current levels of public use would have negligible impacts on wildlife. No new travel routes or access points are proposed on the Louisiana surface tracts. There are unauthorized trails that would be restored, reducing intrusions and eventually consolidating habitat blocks at Baldwin, Rocky Bayou, and Black Lake.

At Big Saline Bayou, there would be more proactive habitat management, inventory, and monitoring. Inventories for bluehead shiner *(Notropis hubbsi)* and Ouachita fencing crawfish *(Faxonella creaseri)* and bottomland bat species would be conducted. Additional habitat improvement, protection measures, and monitoring may be needed if public use of the site increases.

Construction of public use facilities at Big Saline Bayou, particularly a hardened boat launch and parking area is likely to increase use of the adjacent bayou. Overall, these facilities would improve wildlife habitat by reducing bank erosion and damage that is occurring from casual boat launches. Although the entire tract is open to foot traffic, use is limited. Public vehicle access is currently permitted only in the northwest corner of the tract, and there would be no change in the travel management or vehicular use in this alternative. Unauthorized “mudding” occurring in the northwest corner of the track is expected to be curtailed with increased management as an SRMA.

Virginia

At Meadowood SRMA, impacts from vegetation, wildlife, special status species management, and wildland fire suppression would be the same as Alternative A. There would be increased trail construction, public access, and interpretive facilities related to the establishment of the historic trail corridor of the Potomac National Heritage Trail and Washington-Rochambeau National Historic Trail. This and the stabilization of other cultural sites could involve the removal of vegetation, but impacts are expected to be very local, and with proper construction and erosion control measures, would have negligible impacts on wildlife.

An off-leash dog area may be established in a non-native pasture, mowed regularly to control reseeding by invasive lespedeza. This area has limited value to ground nesting birds and other wildlife, but public use might limit the options for controlling this invasive plant.

4.6.4 Alternative C

Impacts from Energy and Minerals

All States

Under this alternative, several NSO and CSU stipulation buffers are increased to provide additional protection for sensitive resources. These stipulations would be applied to 692,192 acres, or 68 percent of the FMO available for oil and gas leasing.

The wetlands and aquatic habitats buffer is increased to 500 feet, covering an additional 118,910 acres of FMO. Increasing the buffer extends protection of riparian habitat to the benefit of more forest interior birds, more neotropical migrants, and amphibians that spend part of their life cycle in habitats bordering riparian zones and wetlands.

In karst regions, the buffer around caves and karst features would be extended to 1,000 feet, which might reduce the potential for drilling activities to affect these important habitat features, but even this buffer does not guarantee that drilling would not affect unknown or unmapped caves or karst features. The buffer for caves in Kentucky supporting Indiana bats would not change, but buffers around caves supporting other bat species would increase to 0.75 miles and cover an additional 653 acres. The CSU stipulation prohibiting the reinjection of produced water in karst regions would be the same as Alternative A. The CSU stipulation restricting the removal of trees near bat summer nursery roosts and winter hibernacula would be increased to two miles, adding an additional 501 acres to that buffer zone.

In Alternative C, the buffers for colonial nesting and wading bird rookeries would be increased to 1,000 feet for terns, gulls, and black skimmers; 2,000 feet for colonial nesting birds; and 3,000 feet for brown pelicans. These buffers exceed most published buffer recommendations, particularly for brown pelican, and are not expected to result in increases in productivity.

The impacts on specific upland habitats protected by NSO stipulations are the same as in Alternative A.

State-Specific Impacts from Energy and Minerals

The following state-by-state discussions provide additional information on impacts from fluid mineral development on priority wildlife species and Important Bird Areas. Impacts from coal development in Kentucky and phosphate development in Florida would be the same as in Alternative A.

Arkansas

Arkansas Priority Wildlife Species

Thirty-five priority species would be provided additional protection by increasing the aquatic and wetlands buffer to 500 feet. Other impacts would be the same as Alternative B.

Arkansas Important Bird Areas

Impacts on Important Bird Areas would be the same as Alternative B, except that the wetlands buffer would be extended to 500 feet, providing additional protection to shoreline habitats at Bell Slough and at Lake Dardanelle. Extending the colonial nesting bird buffer to 2,000 feet is expected to increase protection of foraging habitat near rookeries but is not expected to increase site fidelity. Impacts on grassland birds at Camp Robinson and Fort Chaffee are expected to be the same as Alternative B.

Florida

Florida Priority Wildlife Species

Overall, the potential for oil and gas development affecting priority wildlife species is low. Extending the aquatic and wetlands buffer could potentially reduce impacts on foraging wading birds. The buffer for wading bird rookeries would be increased to 2,000 feet in this alternative, which exceeds most recommended buffer distances. Otherwise, impacts from oil and gas development on other species would be the same as Alternative B.

Impacts from phosphate development would be the same as Alternative A.

Florida Important Bird Areas

Overall, the potential to affect these Important Bird Areas is very low. Extending the buffer would provide additional protection in the case of an accidental spill or leak.

Kentucky

Kentucky Priority Wildlife Species

Impacts from oil and gas development would be similar to Alternative B, except that the standard aquatic and wetlands buffer would be extended to 500 feet, providing additional protection in the case of an accident during oil and gas drilling or production. In areas where the slope is more than 10 percent, which is likely at many sites in Kentucky, this buffer could be extended to 600 feet. This extended buffer would provide additional protection for 18 aquatic priority species, and reduce the chances for displacement of foraging great egret, little blue heron, and snowy egret. The increased buffer zone would also retain a greater diversity of riparian nesting birds, including least flycatcher.

Impacts from coal development would be the same as in Alternative A.

Kentucky Important Bird Areas

No impacts are expected.

Louisiana

Louisiana Priority Wildlife Species

Extending the aquatic and wetlands buffer to 500 feet provides additional protection in the case of an accident during oil and gas drilling or production. It also provides habitat protection for species that use more ephemeral situations, such as the javelin crawfish and Sabine fencing crawfish. Extending the buffer around wading bird nesting colonies would encompass an additional 2,814 acres over Alternative B but is not expected to increase site fidelity or productivity. Otherwise, impacts are the same as in Alternative B.

Louisiana Important Bird Areas

Impacts on specific Important Bird Areas are presented below. For those areas not listed, impacts would be the same as in Alternative A.

Atchafalaya Basin Important Bird Area (includes split-estate FMO in Lafourche Parish and the Duck Lake surface tract in St. Martin Parish). Increasing the riparian buffer to 500 feet further reduces the potential for contamination of marshes and open water areas from accidental spills.

Barataria Terrebonne Important Bird Area (includes FMO in LaFourche, Plaquemines, and St. Charles parishes, including FMO associated with the USACE Bonnet Carre Spillway). Increasing the riparian buffer to 500 feet further reduces the potential for contamination of marshes and open water areas from accidental spills and the potential to disturb foraging wading birds and riparian nesting passerines in the areas surrounding this important bird area.

Catahoula-Dewey Wills-Three Rivers Important Bird Area (includes La Salle, Rapides, and West Feliciana in the AEDs). Increasing the riparian buffer to 500 feet further reduces the potential for contamination of waterways by accidental spills and disturbance of foraging wading birds.

Chenier Plain Important Bird Area (includes split-estate FMO in Cameron Parish). Increasing the riparian buffer to 500 feet further reduces the potential for contamination of marshes and open water areas from accidental spills and further reduces the potential to disturb foraging wading birds in the vicinity of Sabine Lake and Monkey Island.

East Kisatchie Important Bird Area (includes split-estate FMO in La Salle, Natchitoches, Rapides, and Red River parishes). Extending the riparian buffer to 500 feet would provide protection for a wider diversity of riparian nesting birds. Increasing the red-cockaded woodpecker buffer to 0.75 miles might provide additional protection for active clusters but is not expected to increase productivity. Impacts on grassland birds are expected to be the same as Alternative B.

Lake Pontchartrain Important Bird Area (includes split-estate in St. Charles, Tangipahoa, including the USACE Bonne Carre Spillway). Increasing the riparian buffer to 500 feet further reduces the potential for contamination of marshes and open water areas from accidental spills and further reduces the potential to disturb foraging wading birds in areas around this Important Bird Area.

West Kisatchie Important Bird Area (includes split-estate in Natchitoches and Rapides parishes outside of 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). Increasing the red-cockaded woodpecker buffer to 0.75 miles might provide additional protection for active clusters but is not expected to increase productivity. Impacts on grassland birds are expected to be the same as Alternative B.

Tennessee

Tennessee Priority Wildlife Species

Increasing the aquatic buffer to 500 feet increases the protection from accidental spills for five aquatic species found in the vicinity of Dale Hollow Lake. Potential impacts on cave obligates are the same as Alternative B.

Tennessee Important Bird Areas

The acreage of disturbance is not expected to change and impacts on uplands would be the same as in Alternative A. Lease stipulations would exclude surface disturbing activities within 500 feet of shorelines, riparian zones, and wetlands surrounding Lake Dardanelle. This would further reduce the potential for contamination of marshes and open water areas from accidental spills and the potential to disturb foraging wading birds and bald eagles. The buffer around bald eagle communal roost and nest sites would be extended to 1,000 feet, which would further reduce the potential for displacing foraging birds during drilling activities.

Virginia

Virginia Priority Wildlife Species

The 500-foot buffer provides additional protection for three aquatic species, particularly the eastern hellbender, which has potential to be affected at the Radford Ammunition Plant. The extended buffer also increases protection for riparian thickets and nesting Swainson's warblers at John W. Flannagan Dam. Impacts on native grasslands and the two priority butterflies at Radford Ammunition Plant would be the same as Alternative B.

Virginia Important Bird Areas

The Lower Potomac River Important Bird Area is outside the oil and gas AED and is expected to be the same as in Alternative A.

Alternative C: Impacts from Resources Other Than Minerals and Energy

General Impacts on All Tracts

In most cases, the surface tract management and associated impacts are the same as Alternative B; however, that management is extended to additional three surface tracts retained by BLM in Arkansas (50 acres) Gepp, and Norfolk Lake tracts and the small Suwannee tract (0.21 acres) in Florida.

VRM and cultural resource management would be the same as in Alternative B for all states.

State-Specific Impacts

The following state sections present more detailed information for each state, particularly with regard to impacts from habitat management, and impacts from potential land disposal and transfer actions. Additional detail is also provided for the individual tracts identified as special management areas.

Arkansas

In Alternative C, impacts from vegetation, fish and wildlife, and special status species management would be the same as in Alternative B, except that both the Gepp and Norfolk Lake tracts would be retained by BLM and managed as part of the Ozark Highland HMA. Resolution of the unauthorized uses is expected and restoration begun on these areas within three years after activity level planning is completed. Habitat conditions are expected to improve over the following 10 years, benefitting species associated with woodlands and glades, and retaining the habitat values associated with the mesic hardwood slope at the Norfolk Lake tract. None of these areas meet the minimum patch size recommended in the Arkansas state WAP, and the regional habitat value of these tracts is influenced by the surrounding private land uses.

Impacts from wildland fire would be the same as B, except that some fuel reduction is expected as part of the restoration of the woodland and glade habitats on the Gepp and Norfolk Lake tracts.

Impacts from recreation management and travel and access management would be the same, except that casual use trails at the Gepp tracts would be closed and reclaimed. It would be several decades before the woodland structure would be reestablished.

Florida

In Alternative C, the Suwanee tract would be retained by BLM. This tiny tract (0.21 acres) would retain an area of natural pine woodland along the Suwanee River, but management of the tract is likely to be overshadowed by adjacent land uses.

Impacts on all other surface tracts, including the Jupiter Inlet Lighthouse ONA and Lathrop Bayou ACEC, would be the same as Alternative B.

Louisiana

Impacts on all surface tracts in Louisiana would be the same as Alternative B, except that the SRMA at Big Saline Bayou would be reduced to 23 acres in the northwest corner of the tract. This change in acreage is not expected to change impacts on wildlife. The entire tract would continue to be treated for invasive plants, benefitting this hardwood bottom habitat. Most of the habitat damage occurring from public use is in the northwest corner, and construction of a hardened boat launch and curtailment of “mudding” would allow these areas to recover, safeguarding a high value fishery.

Virginia

Impacts would be similar to Alternative B, except that control line fields and the off-leash dog area would be eliminated. Both of these uses occur in open, primarily non-native, grasslands. Grassland birds in particular would benefit from curtailment of these uses and restoration activities, and invasive species management scheduled outside of the breeding season.

4.6.5 Alternative D

Impacts from Energy and Minerals

All States

Under this alternative, several NSO and CSU stipulation buffers are reduced. The overall area affected by NSO stipulations is 535,730 or 52 percent of the FMO available for oil and gas leasing.

The wetlands and aquatic habitats buffer would be decreased to 100 feet. This buffer is considered to be adequate in most cases where development occurs in flat terrain and where the buffer zone is well vegetated. However, this buffer is not expected to be adequate to protect aquatic and wetland habitats where there is no well-established riparian zone, in areas that are not flat, or in areas with erosive soils. Accidental spills or heavy runoff may exceed the capacity of the riparian buffer, particularly in heavy clay soils.

Cave and karst NSO buffers are decreased to 500 feet, which increases the potential for affecting these features during oil and gas drilling operations. The buffer on caves that serve as hibernacula or summer roost sites for priority bat species would be reduced to 0.25 miles, which may avoid direct impacts on bats using the caves, but could degrade foraging and potential maternity roosting sites, and increase the potential of affecting karst features associated with hibernacula and summer roost caves. The CSU stipulation prohibiting the reinjection of produced water in karst regions would be the same as Alternative A. The CSU stipulation restricting the removal of trees near bat summer nursery roosts and winter hibernacula would be decreased to 1.5 miles and would be applied to 236 acres, 472 fewer acres than Alternative B.

The buffers for colonial nesting and wading bird rookeries would be decreased to 250 feet for terns, gulls, and black skimmers, and decreased to 500 feet for wading birds and pelicans. The acreage affected by the stipulation is reduced to 766 acres across all states. These reductions are expected to reduce productivity in colonial nesting sites used by terns, gulls, and black skimmers found on or near FMO.

The impacts on specific upland habitats protected by NSO stipulations outside Florida are the same as in Alternative B. The Louisiana black bear stipulation would be applied only to suitable habitat within the designated critical habitat boundary, reducing the area affected by the stipulation by 4,897 acres.

State-Specific Impacts from Energy and Minerals

The following state-by-state discussions provide additional information on impacts from fluid mineral development on priority species, wildlife, and Important Bird Areas. Impacts from coal development in Kentucky and phosphate development in Florida would be the same as in Alternative A.

Arkansas

Arkansas Priority Wildlife Species

Reducing the aquatic and wetlands buffer to 100 feet in Arkansas is expected to elevate the risk of increased sedimentation in aquatic habitats downstream of well pads, and increase the risk of contamination of wetlands and aquatic habitats, in case of accidental spills. This would be most likely in areas where larger pads are placed in rugged terrain requiring extensive cut and fill slopes. Priority species at risk would include longnose darter and rainbow mussel in the Fayetteville Shale region.

Arkansas Important Bird Areas

The reduction wetland and aquatic habitats buffer to 100 feet and wading bird rookery buffer to 500 feet could reduce productivity and site fidelity for wading birds and wetland birds at Bell Slough and Lake Dardanelle. Impacts on grassland birds at Camp Robinson and Fort Chaffee are expected to be the same as Alternative B.

Florida

Florida Priority Wildlife Species

For oil and gas development, reducing the aquatic species and wetlands stipulation would increase the risk to wetland birds, such as roseate spoonbill; however, the likelihood of impacts from oil and gas drilling would continue to be very low. The potential for oil and gas development to affect coastal priority species would be the same as in Alternative B.

Impacts from phosphate development would be the same as in Alternative A.

Florida Important Bird Areas

In this alternative, the wetlands and aquatic habitats buffer is reduced to 100 feet; however, oil and gas drilling in any of these locations is considered unlikely, and impacts are expected to be the same as in Alternative A.

Kentucky

Kentucky Priority Wildlife Species

For oil and gas development, reducing the aquatic and wetlands buffer to 100 feet would increase chances of affecting up to 18 aquatic priority species. However, the buffer could be extended to 300 feet in areas with steeper terrain where cut and fill slopes are required. The 100-foot buffer would increase the chances of displacing foraging birds, such as king rail, pied-grebe, great egret, little blue heron, and snowy egret along shorelines and marshes during construction activities, and the potential for contamination in the case of accidental spills. This buffer would not be sufficient to support most neotropical riparian nesting birds, including least flycatcher, or species that use uplands adjacent to wetlands, including coal skink.

Impacts from coal would be the same as in Alternative A.

Kentucky Important Bird Areas

No impacts are expected.

Louisiana

Louisiana Priority Wildlife Species

Reducing the aquatic and wetlands buffer to 100 feet would increase chances of affecting up to 10 aquatic priority species. However, the buffer could be extended to 300 feet in steeper terrain to reduce the potential for impacts from accidental spills. The reduced buffer would also increase the chances of displacing foraging wading birds. The 100-foot buffer would not be sufficient to support most neotropical riparian nesting birds.

Louisiana Important Bird Areas

Active Delta (Mississippi River Delta) Important Bird Area (includes split-estate FMO and FMO in the Delta NWR currently under lease in Plaquemines Parish). Impacts would be the same as Alternative A.

Atchafalaya Basin Important Bird Area (includes split-estate FMO Lafourche Parish and the Duck Lake surface tract in St. Martin Parish). Impacts are expected to be the same as in Alternative A.

Atchafalaya Delta Important Bird Area (near the St. Mary surface tract outside of the AED). Impacts would be the same as in Alternative A.

Barataria Terrebonne Important Bird Area (includes FMO in LaFourche, Plaquemines, and St. Charles parishes, including FMO associated with the USACE Bonnet Carre Spillway). Reducing the aquatic and wetland buffer to 100 feet increases the potential for contamination of waterways by accidental spills and the disturbance of foraging wading birds during construction activities.

Catahoula-Dewey Wills-Three Rivers Important Bird Area (includes La Salle, Rapides, and West Feliciana in the AEDs). Reducing the aquatic and wetland buffer to 100 feet increases the potential for contamination of waterways by accidental spills and the disturbance of foraging wading birds during construction activities.

Chenier Plain Important Bird Area (includes split-estate FMO in Cameron Parish). Decreasing the buffer to 100 feet increases the potential for contamination of marshes and open water areas from accidental spills and the potential to disturb foraging wading birds in the vicinity of Sabine Lake and Monkey Island. Coastal habitats would continue to be excluded from oil and gas development.

East Kisatchie Important Bird Area (includes split-estate FMO in La Salle, Natchitoches, Rapides, and Red River parishes). Decreasing the aquatic and wetlands buffer to 100 feet could affect riparian nesting birds. Impacts on other birds are expected to be the same as Alternative B.

Lake Pontchartrain Important Bird Area (includes split-estate in St. Charles, Tangipahoa, including the USACE Bonne Carre Spillway). Decreasing the riparian buffer to 100 feet increases the potential for contamination of marshes and open water areas from accidental spills and increases the potential to disturb foraging wading birds in areas around this Important Bird Area.

West Kisatchie Important Bird Area (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). Impacts would be the same as Alternative B.

Tennessee

Tennessee Priority Wildlife Species

Aquatic priority species would be at increased risk, particularly in areas with steeper slopes, although the aquatic and wetland buffer would be extended to 300 feet in those locations. Impacts on cave obligates would be the same as Alternative B.

Tennessee Important Bird Areas

The potential to affect the Dale Hollow Important Bird Area is increased by reducing the aquatic and wetland buffer to 100 feet. There would be increased potential to displace foraging wading birds along the lake shore during well pad construction, and well pads, access roads, and other facilities placed in riparian zones could decrease the local diversity of riparian nesting birds.

Virginia

Virginia Priority Wildlife Species

There is increased potential to affect the wildlife along shorelines of John W. Flannagan Reservoir and the New River at the Radford Ammunition Plant by reducing the aquatic and wetland buffer to 100 feet. This could displace foraging wading birds along the lake and river shorelines during well pad construction, and increase the chance of contamination in the case of accidental spills. Well pads, access roads, and other facilities placed in riparian zones along these water bodies or in adjacent drainages could decrease the local diversity of riparian nesting birds.

Virginia Important Bird Areas

Reducing the wetlands and aquatic habitats buffer to 100 feet would not provide a sufficient buffer for most riparian nesting birds at the Pine Mountain Important Bird Area.

Alternative D: Impacts from Resources Other than Energy and Minerals

General Impacts on All Tracts

Outside designated special management areas, there would be no active management of 17 tracts (1,833 acres) retained by BLM across all states. A total of 15 tracts (594 acres) would be available for disposal to increase management efficiency, and 542 acres would be available for transfer to other federal or state agencies. Two additional tracts, Egmont Key in Florida and the Baldwin tract in Louisiana, would be available for transfer the USFWS for inclusion in the refuge system.

Impacts from VRM would be the same as B.

State-Specific Impacts

Arkansas

Surface tracts retained in Arkansas would not receive active management, and all impacts, except VRM, would be the same as Alternative A.

Twelve surface tracts, totaling 580 acres, would be available for disposal from federal ownership. This would include 82 acres of glades, 273 acres of dry-mesic oak forest, 190 acres of dry oak woodland, 24 acres of mesic hardwood, 10 acres of pine-oak woodland, and less than one acre of pine bluestem. In most cases, these habitats are widespread across the Ozarks, and the disposal of these tracts would not affect the overall distribution of most wildlife species. None of the habitats on these tracts meets the minimum patch size for these habitat types recommended in the Arkansas Wildlife Action Plan and are surrounded by private land, leaving them vulnerable to further surrounding lands uses. However, some of the tracts being disposed include good examples of mature and intact dry mesic forests, dry oak woodlands, mesic hardwood forests, which could contribute to the primary conservation goal of this region, habitat restoration.

Wildlife is expected to benefit from more active management on the three tracts (120 acres) transferred to the USFS. These tracts are contiguous with, or within the boundaries of national forests. They include good quality glades and woodlands on the Henderson Mountain, Point Peter, and Redland Mountain tracts.

Florida

Impacts on the four surface tracts in retained in Florida would be the same as in Alternative A, except that VRM would be the same as Alternative B, and there would be no ACEC designation at Lathrop Bayou.

Lack of ACEC designation would reduce the visibility of Lathrop Bayou and potential funding, but would not alter the overall management objectives for the tract.

The Citrus, Freeport, and Suwannee tracts would be available for disposal. The loss of the small Citrus County tracts is expected to result in their development and loss of minor acreage of shrub islands with hardwood uplands at Lake Tsala Apopka. There is substantial development of the shoreline along the 19,000 acre braided lake. The Citrus County tract is on an undeveloped shrub island, which would require new access and utilities to be developed. The loss of the small Freeport and Suwannee tracts is expected to have negligible impacts on wildlife.

The transfer of the Egmont Key tract to the USFWS is expected to result in its being incorporated into the Egmont Key NWR, with increased protection for colonial nesting shorebirds and wading birds and other wildlife. Upland habitats would benefit from the unified management across the island, particularly the prescribed fire program, control of exotic plant species, and oversight of visitor use.

Louisiana

Impacts on retained surface tracts in Louisiana would be the same as Alternative A, except that the Big Saline Bayou tract would not be designated as an SRMA, and no active management is proposed.

At the Big Saline Bayou tract, curtailing invasive species management would result in increasing coverage by invasive plants, particularly Chinese tallow, common along the roadways in the area and adept at invading seasonally inundated areas. Off-road vehicle use of a “mudding area” in the northwest corner is likely to continue to spread. This use, combined with the lack of a hardened boat launch, would cause erosion to spread along the bayou and increasingly add sediments to the adjacent bayou and degrading potential habitat for the bluehead shiner.

The Baldwin tract would be transferred to the Bayou Teche NWR, established for the protection of the Louisiana black bear. The tract is within the boundary of designated critical habits. Inclusion in the refuge would extend habitat protection to this 360-acre tract and is expected to result in habitat restoration on the north side of the tract, increasing the acreage of bottomland hardwood.

Virginia

All impacts on the Meadowood SRMA would be the same as Alternative B, except for the establishment of an off-leash dog area in non-native grasslands and establishment of primitive campsites.

The off-leash dog area is likely to curtail restoration activities of an area of non-native grasslands. Herbicide use may be problematic and reseeding less successful in areas with higher public use. Impacts on wildlife from the establishment of primitive campgrounds would depend on the numbers and duration of camping, but in most cases, impacts are expected to be very local, with negligible effect on wildlife diversity or use patterns.

4.7 SPECIAL STATUS SPECIES

This section addresses potential impacts from energy and mineral development, and surface tract management on special status species, specifically those federally listed, proposed, or candidate species with known or suspected ranges, as well as designated and proposed critical habitat, in the *decision area*.

Impacts from mineral development are based on the RFD scenarios (BLM 2012a) for oil and gas development, and projected coal and phosphate development on FMO in Kentucky and Florida, respectively. Impacts from surface tract management are based on Allowable Uses and Management Actions described by surface tract in Appendix B, and are limited to those states where BLM manages surface tracts: Arkansas, Florida, Louisiana, and Virginia. On surface tracts, special status species would be potentially affected by management actions for vegetation/fish and wildlife and special status species management, wildland fire suppression, cultural resource management, VRM, recreation management, travel and access management, and lands/realty actions.

The potential to affect individual species is presented in the tables in the following state sections. A “likely to adversely affect" determination indicates that the species is likely to be exposed to the environmental consequences of BLM-approved mineral development on FMO or surface tract management and would respond in a negative manner to the exposure. A determination of “may affect, but not likely to adversely affect" indicates that the anticipated effects are beneficial, insignificant, or discountable. Beneficial effects are defined as having positive effects without any adverse effects on the species or habitat. Insignificant effects relate to the size of the impact and include those effects that are undetectable, not measurable, or cannot be evaluated. Discountable effects are those extremely unlikely to occur. There are a few cases where “no effect” is expected; these are situations where, although the species occurs in the *decision area*, its range very defined, with no FMO in the area potentially affected by planned actions. For example, a species limited to a single watershed where there is no FMO or surface tracts.

For Alternative A, Florida is the only state with mineral leasing stipulations based on an existing RMP. Stipulations from the Florida RMP provide protection for sensitive habitats and special status species in the No Action Alternative. In other states, where there is no RMP, the analysis assumes mineral leases would be issued under standard terms. This would include implementation of national policies, such as compliance with the Bald Eagle Protection Act, and the inclusion of a standard mineral leasing stipulation for species listed under the ESA, stating that BLM “will not approve any ground-disturbing activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the Endangered Species Act as amended, 16 U.S.C. 1531 et seq., including completion of any required procedure for conference or consultation.”

Discussions of general impacts on vegetation (see Section 4.5 Vegetation), and wildlife (see Section 4.6 Wildlife) are relevant regarding the types of potential effects on special status species and provide a discussion of how impacts from mineral leasing stipulations and surface management actions would vary by alternative. The following state sections provide a summary of the potential to affect special status species followed by a table that provides an “effects” determination, by species, for each alternative based on the application of varying mineral leasing stipulations and surface management actions. These mineral leasing stipulations would be applied, as appropriate, after site-specific evaluation and prior to lease issuance. The total acreages of FMO expected to be affected by these mineral leasing stipulations and the full text of the stipulations are provided in Appendix C (oil and gas) and Appendix D (solid minerals). In addition, BMPs (see Appendix D) would be applied across all alternatives and further reduce the potential to affect all biological resources, including special statu species.

BLM has coordinated with the USFWS through the various ecological services offices in each state, as well as the Region 4 office, in the development of this plan. This coordination has included development of the species lists, information on range and occurrence records, and the development of the draft lease stipulations and best management practices. The goal has been to ensure that implementation of the plan avoids potential adverse effects to special status species and critical habitat through effective lease stipulations and best management practices. Based on this previous coordination BLM is requesting concurrence from USFWS that this plan will either not affect or will affect but is not likely to adversely affect special status species or proposed or critical habitat.

4.7.1 Assumptions

The analysis is based on the following:

- It is BLM policy to ensure that all actions comply with the ESA, its implementing regulations and other directives associated with ESA-listed and proposed species, including compliance with Section 7 consultations and conferences with USFWS and/or National Marine Fisheries Service (NMFS).

- The ESA requires BLM to conference with USFWS and/or NMFS on actions that are likely to jeopardize a proposed species or cause destruction or adverse modification to proposed critical habitat.

- While ESA does not require federal agencies to consult or confer on candidate species, BLM typically requests technical assistance from USFWS and/or NMFS when it is determined to be advantageous to the species' conservation or BLM management options.

- The mineral leasing stipulations proposed in this RMP would apply to new leases. Energy and solid mineral activity on existing mineral leases, where BLM determines a potential to adversely affect a federally listed or proposed species or designated or proposed critical habitat, would require a project-specific biological assessment, and concurrence from the USFWS that the action would not affect or would not adversely affect. Otherwise the project would require a formal Section 7 consultation. Incidental take provisions, and reasonable and prudent alternatives may be applied to permits as conditions of approval.

4.7.2 Arkansas

In Arkansas, there is potential for oil and gas development to adversely affect gray bat, Indiana bat, northern long-eared bat, bald eagle, interior least tern, yellowcheek darter, pink mucket, rabbitsfoot, spectaclecase, winged mapleleaf, American burying beetle, and harperella in one or more of the alternatives. Management of BLM surface tracts is likely to affect, but not adversely affect grey bat, Indiana bat, northern long-eared bat, Ozark big-eared bat and yellowcheek darter.

- In Alternatives A, there is potential to adversely affect gray bat hibernacula in Stone County and near Lake Dardanelle in Pope County and foraging habitat in the northern portion of the state. Mineral leasing stipulations are expected to avoid those impacts in Alternatives B and C, and D. In Alternatives B, C and D, respectively, 250-foot, 500-foot and 100-foot wetland and riparian buffers, would reduce the potential to affect riparian foraging areas, particularly with the provision to extend the buffers to 500 feet or 1,000 feet, respectively, where the slope exceeded 10 percent. In Alternatives B, C, and D, no surface occupancy would be permitted within 10 miles of winter hibernacula, 5 miles of summer roost and maternity caves, and 2.5 miles of other records. Setbacks (1,000 feet) from karst features and restrictions on the reinjection of produced

waters in karst regions would avoid the potential to affect hibernacula in Alternatives B, C, and D.

- In Alternative A, there is potential to adversely affect Indiana bat hibernacula in northern Stone County and foraging habitat in the northern portion of the state. Mineral leasing stipulations are expected to reduce those impacts. In Alternatives B, C, and D, respectively, 250-foot, 500-foot, and 100-foot wetland and riparian buffers would reduce the potential to affect riparian foraging areas, particularly with the provision to extend the buffers to 500 feet or 1,000 feet, respectively, where the slope exceeds 10 percent. In Alternatives B, C, and D, no surface occupany would be permitted within 10 miles of winter hibernacula, 5 miles of maternity roosts, and 2.5 of other records, and there would be a restriction on removing trees over 5" in diameter between March 16 and November 30 in known or potential range of the Indiana bat. Setbacks (1,000 feet) from karst features and prohibition on the reinjection of produced waters in karst regions would avoid the potential to affect hibernacula in Alternatives B, C, and D.
- In Alternative A, there is potential to adversely affect northern long-eared bat. In Alternatives B, C, and D, northern long-eared bat, where they occur with other federally listed bat species, would be protected by those lease stipulations that exclude surface disturbance within 10 miles of hibernacula, 5 miles of maternity roosts, and 2.5 of other records. If listed, these lease stipulations would also apply specifically to northern long-eared bats.
- National Bald Eagle Management Guidelines would be implemented across all alternatives, but in Alternatives A and D, the aquatic and wetland buffer is not considered sufficient to protect foraging habitat, in the case of an oil- or gas-related spill or leak.
- Nesting interior least tern and migrating piping plover have the potential to be adversely affected by oil and gas development along major rivers and reservoirs in Alternatives A and D. Leasing stipulations would require setbacks from sand bars and shorelines to avoid impacts in Alternatives B and C.
- There is potential to adversely affect yellowcheek darter and four mussels (pink mucket, rabbitsfoot, spectaclecase, and winged mapleleat) in Alternatives A and D. In Alternatives B and C, respectively, 250-foot and 500-foot aquatic and wetland buffers, would reduce the potential to affect, particularly with the provision to extend the buffers to 500 feet or 1,000 feet, respectively, where the slope exceeded 10 percent.
- The American burying beetle has the potential to be adversely affected across all alternatives. However, all oil and gas development within the known or suspected range of this species would be conducted in compliance with a biological opinion, dated December 19, 2006, and any subsequent modifications. The projected oil and gas development is expected to stay within the current incidental take permit threshold of 25 wells per year with a total of 60 wells projected in Logan, Sebastian, and Yell counties over the next 10 years.
- There is potential to adversely affect harperella in Alternatives A and D, but in Alternatives B and C, respectively, 250-foot and 500-foot aquatic and wetland buffers would reduce the potential to affect, particularly with the provision to extend the buffers to 500 feet or 1,000 feet, respectively, where the slope exceeded 10 percent.
- There are no known occurrence records of special status species on the surface tracts in Arkansas. There is potential for occasional use by foraging special status bat species. While there are suitable roost trees for Indiana bat and northern long-eared bat on the surface tracts, the distance from known hibernacula reduces the potential for impacts from surface tract management to negligible.

Table 4-26 lists those special status species that occur or are suspected to occur in the *decision area* and provides a determination of affect by alternative with a reference to the stipulations that could reduce that affect, or surface management actions that could affect the species.

Table 4-26. Arkansas Impacts on Special Status Species from Energy and Mineral Development and Surface Tract Management

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
Mammals								
Gray bat *Myotis grisescens*	E	Foraging habitat in forested riparian areas. Roosting habitat in caves year-round; however, migration occurs between subterranean caves used in the winter as hibernacula and caves used in the summer as maternal roosts. Cave roosts are often close to water bodies, within 1 km of rivers or lakes.	Most occurrence records are north of the AEDs. One confirmed record on FMO at Lake Dardanelle in the AED in Pope County. Two others within a mile of FMO in northern Stone County. There is potential for roosting in any caves and foraging occurrences within 135 km of cave roosts in the following counties: Cleburne, Conway, Johnson, Pope, Stone, and Van Buren.	No known hibernacula or maternal cave sites; however there is potential for foraging habitat on tracts near roost cave sites. (None are currently known near surface tracts.)	Oil and gas development is likely to adversely affect foraging habitat in Cleburne, Conway, Johnson, Pope, Stone, and Van Buren counties directly through loss of foraging habitat. A total of 200 wells are projected in these counties. Some potential to affect roosting or hibernacula caves, particularly at Lake Dardanelle or Stone County. Surface tract management would not adversely	Oil and gas development is not likely to adversely affect. NSO #3 within 10 miles of hibernacula, 5 miles of summer roost caves, and 2.5 miles of other records. NSO #5 within 1,000 feet of cave or karst feature. NSO #16 within 250 feet of wetland and aquatic habitats. CSU #7 prohibits reinjection of produced or flowback waters into karst formations.	Oil and gas development is not likely to adversely affect. NSO #3 same as Alternative B NSO #5 buffer increased to 1,500 feet. NSO #16 buffer increased to 500 feet. CSU #7 same as Alternative B. Surface tract management would not adversely affect.	Oil and gas development is not likely to adversely affect. NSO #3 same as Alternative B. NSO #5 same as Alternative B. NSO #16 buffer decreased to 100 feet. CSU #7 same as Alternative B. Surface tract management would not adversely affect.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
					affect.	Surface tract management would not adversely affect.		
Indiana bat *Myotis sodalist*	E	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.	The only occurrence records in the AED 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 no FMO in the northern part of that county. No projected development in Newton County.	Potential to occur in suitable habitat on surface tracts, but no occurrence records closer than 6 miles (northern Searcy County).	Oil and gas development could adversely affect summer foraging habitat, but most of the 10 wells projected in Stone County are expected to be located in southern portion of county outside expected summer range. Surface tract management would not adversely affect.	Oil and gas development is not likely to adversely affect. NSO #3 within 10 miles of hibernacula, 5 miles of maternity roosts, and 2.5 miles of other records. NSO #5 within 1,000 feet of cave or karst feature. NSO #16 within 250 feet of wetland and aquatic habitats. CSU #3 prohibits removal of trees or snags over 5 inches dbh	Oil and gas development is not likely to adversely affect. NSO #3 same as Alternative B. NSO #5 buffer increased to 1,500 feet. NSO #16 buffer increased to 500 feet. CSU #3 same as Alternative B. CSU #7 same as Alternative B. Surface tract management would not adversely affect.	Oil and gas development is not likely to adversely affect. NSO #3 same as Alternative B. NSO #5 same as Alternative B. NSO #16 buffer decreased to 100 feet. CSU #3 same as Alternative B. CSU #7 same as Alternative B. Surface tract management would not adversely affect.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
						between March 16 within 1.5 miles of nursery roosts or hibernacula. CSU #7 prohibits reinjection of produced or flowback waters into karst formations. Surface tract management would not adversely affect.		
Ozark big-eared bat *Corynorhinus townsendii ingens*	E	Foraging habitat in riparian hardwood forests and woodlands. Hibernacula and maternal roosts in caves, particularly in limestone karst areas. Records in northwest and north central part of the state.	Occurrence records are all north of the AED.	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	Oil and gas development is not likely to adversely affect. Activities are outside the known range of this species. Surface tract management would not adversely affect.	Oil and gas development is not likely to adversely affect. NSO #3 within 10 miles of hibernacula, 5 miles of maternity roosts, and 2.5 miles of other records. NSO #5 within 1,000	Oil and gas development is not likely to adversely affect. NSO #3 same as Alternative B. NSO #5 buffer increased to 1,500 feet. CSU #7 same as Alternative B.	Oil and gas development is not likely to adversely affect. NSO #3 same as Alternative B. NSO #5 same as Alternative B. CSU #7 same as Alternative B. Surface tract

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
				counties.		feet of cave or karst feature. CSU #7 prohibits reinjection of produced or flowback waters into karst formations. Surface tract management would not adversely affect.	Surface tract management would not adversely affect.	management would not adversely affect.
Northern long-eared bat (*Myotis septentrionalis*)	P	Generally associated with old-growth intact, interior forest. A variety of cave overhangs, tunnels, and mines used as hibernacula and roosts.	Potential to occur in suitable habitat throughout the AED.	Virtually all of the surface tracts provide suitable foraging habitat and may provide suitable summer and maternity roosting habitat.	Oil and gas development is likely to adversely affect foraging and summer and maternity roosting sites particularly in Johnson, Pope, Van Buren, Cleburne, and Stone counties where 210 BLM wells are projected over the next 10 years.	Oil and gas development is not likely to adversely affect. NSO #3 within 10 miles of hibernacula, 5 miles of maternity roosts, and 2.5 miles of other records. NSO #5 within 1,000 feet of cave or karst features.	Oil and gas development is not likely to adversely affect. NSO #3 same as Alternative B NSO #5 buffer increased to 1,500 feet. NSO #16 buffer increased to 500 feet. CSU #3 same as Alternative B	Oil and gas development is likely to adversely affect. NSO #3 same as Alternative B NSO #5 same as Alternative B. NSO #16 buffer decreased to 100 feet. CSU #3 same as Alternative B CSU #7

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
						NSO #16 within 250 feet of wetland and aquatic habitats. CSU #3 prohibits removal of trees or snags over 5 inches dbh between March 16 and November 30 in known or potential habitat. CSU #7 prohibits reinjection of produced or flowback waters into karst formations. Surface tract management would not adversely affect.	CSU #7 same as Alternative B. Surface tract management would not adversely affect.	same as Alternative B. Surface tract management would not adversely affect.
Birds								
Bald eagle *Haliaeetus*	D	Varied, typically associated with	Likely to occur in suitable habitat	Not likely to occur because of the	Projected oil and gas	Oil and gas development	Oil and gas development	Projected oil and gas

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
leucocephalus		large water bodies, nests in tall trees with clear flight paths.	throughout AED, particularly at reservoirs, lakes, and major rivers. Multiple records at Lake Dardanelle, Blue Mountain Lake, Greers Ferry Lake, and Poison Springs State Park/Forest.	lack of large water bodies on or near surface tracts.	development is not likely to adversely affect bald eagles' nesting sites, but foraging habitat could be adversely affected in the event of an accidental spill or leak. National Bald Eagle Management Guidelines would be applied with NSO excluding mineral development within 660 feet of active and inactive bald eagle nests and communal roost sites, and removal of trees within 0.5 miles of project. CSU #2 restricts removal of suitable nest trees within	is not likely to adversely affect. NSO #2 implements National Bald Eagle Management Guidelines with a 660-foot buffer around active and inactive bald eagle nests and communal roost sites. NSO #16 within 250 feet of wetlands and aquatic habitats. CSU #2 same as Alternative A. Surface tract management would have no effect.	is not likely to adversely affect. NSO #2 buffer increased to 1,000 feet. NSO #16 buffer increased to 500 feet. CSU #2 buffer increased to 1 mile. Surface tract management would have no effect.	development is not likely to adversely affect bald eagles' nesting sites, but foraging habitat could be adversely affected in the event of an accidental spill or leak. NSO #2 same as Alternative B. NSO #16 buffer decreased to 100 feet. CSU #2 same as Alternative A. Surface tract management would have no effect.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
					0.5 miles. Surface tract management would have no effect.			
Interior least tern *Sterna antillarum athalassos*	E	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 occurrences on Red River.	No suitable habitat on or near surface tracts.	Sand bar habitats are not static; species could be affected by any oil and gas development near major river systems in Arkansas. Direct loss of habitat is unlikely, but there is potential for breeding and foraging birds to be displaced by oil and gas activity in the vicinity of develop-ment. Not likely to adversely affect in Miller and Lafayette counties, with only 4 wells projected in	Oil and gas development is not likely to adversely affect. NSO #11 within 1,000 feet of riverine sand bars. NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #11 buffer increased to 1,500 feet. NSO #16 buffer increased to 500 feet. Surface tract management would have no effect.	Oil and gas development is likely to adversely affect. NSO #11 buffer decreased to 500 feet. NSO #16 buffer decreased to 100 feet. Surface tract management would have no effect.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
					those counties. Likely to adversely affect at Lake Dardanelle and along the Arkansas River in Sebastian, Logan, Johnson, Pope, Yell, Conway, and Faulkner counties. Not likely to adversely affect in St. Francis County. Surface tract management would have no effect.			
Ivory-billed woodpecker *Campephilus principalis*	E	Historically described as large blocks of contiguous forest with numerous large trees. Potential to occur in Arkansas, Desha, Monroe, Phillips, Prairie, and Woodruff	Not likely to occur, but there is FMO in the AED in Monroe, Phillips, and Prairie counties.	No surface tracts in current suspected range.	Oil and gas development is not likely to adversely affect. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		counties.						
Piping plover *Charadrius melodus*	T	Migrant using sandy upper beaches and shores of lakes, ponds, rivers, and impoundments.	Not likely, but there is potential to occur on FMO along major rivers.	No suitable habitat on or near surface tracts.	Oil and gas development is not likely to adversely affect. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #11 within 1,000 feet of riverine sand bars. NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #11 buffer increased to 1,500 feet. NSO #16 buffer increased to 500 feet. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #11 buffer decreased to 500 feet. NSO #16 buffer decreased to 100 feet. Surface tract management would have no effect.
Red-cockaded woodpecker *Picoides borealis*	E	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 NF) are more than 6 miles from FMO in the AED at Nimrod Lake in Yell County. Occurrence records in Monroe County are almost 15 miles southeast of scattered FMO. Scattered records	No suitable habitat on the surface tracts.	Projected mineral development is not likely to adversely affect. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #13 buffer within 0.5 miles of cluster. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #13 buffer increased to 0.75 miles. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #13 same as Alternative B. Surface tract management would have no effect.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
			in southern counties are more than 6 miles from split-estate FMO.					
Wood stork *Mycteria americana*	E	Forages in flooded areas, freshwater wetlands, marshes, and depressions. Nests in cypress, mangrove, or dead hardwoods over water.	Not likely to occur, vagrant occurrences only.	No suitable habitat on the surface tracts.	Oil and gas development is not likely to adversely affect. Surface tract management would have no effect.	Not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management would have no effect.	Not likely to adversely affect. NSO #16 buffer increased to 500 feet. Surface tract management would have no effect.	Not likely to adversely affect. NSO #16 buffer decreased to 100 feet. Surface tract management would have no effect.
Amphibians								
Ozark hellbender *Cryptobranchus alleganiensis bishop*	E	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 AED. Baxter County occurrence records are the closest to the AED. 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.	Oil and gas development is not likely to adversely affect. Surface tract management would have no effect.	Not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management would have no effect.	Not likely to adversely affect. NSO #16 buffer increased to 500 feet. Surface tract management would have no effect.	Not likely to adversely affect. NSO #16 buffer decreased to 100 feet. Surface tract management would have no effect.
Fish								
Arkansas darter	C	Prefers shallow,	Occurrence record	No surface tracts	Oil and gas	Oil and gas	Oil and gas	Oil and gas

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
Etheostoma cragini *Stipulation*		clear, cool water streams with sand or silt bottoms with spring-fed pools and rooted aquatic vegetation. Records only in Benton and Washington counties.	on FMO associated with the Savoy Research and Extension Complex in Washington County Range, outside the AED.	within species range.	development is not likely to adversely affect. Surface tract management would have no effect.	development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management would have no effect.	development is not likely to adversely affect. NSO #16 buffer increased to 500 feet. Surface tract management would have no effect.	development is not likely to adversely affect. NSO #16 buffer decreased to 100 feet. Surface tract management would have no effect.
Arkansas river shiner *Notropis girardi*	T	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 historic range.	Oil and gas development is not likely to adversely affect. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 buffer increased to 500 feet. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 buffer decreased to 100 feet. Surface tract management would have no effect.
Leopard darter *Percina pantherina*	T	Prefers 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	No surface tracts within species range.	Oil and gas development is not likely to adversely affect. Surface tract	Oil and gas development is not likely to adversely affect. NSO #16	Oil and gas development is not likely to adversely affect. NSO #16	Oil and gas development is not likely to adversely affect. NSO #16

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		outside the AED.	Gilham Lake, but all records are outside the AED.		management would have no effect.	within 250 feet of wetlands and aquatic habitats. Surface tract management would have no effect.	buffer increased to 500 feet. Surface tract management would have no effect.	buffer decreased to 100 feet. Surface tract management would have no effect.
Ozark cavefish *Amblyopsis rosae*	T	Restricted to caves and subterranean streams, pools, and springs in Benton and Madison counties in extreme northwestern corner of state.	Occurrence records near scattered FMO associated with Spavinaw Creek and Beaver Lake, but range is outside the AED.	No surface tracts within species range.	Oil and gas development is not likely to adversely affect. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. NSO # 5 within 1,000 feet of cave opening or karst feature. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 buffer increased to 500 feet. NSO # 5 buffer increased to 1,500. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 buffer decreased to 100 feet. NSO #5 same as Alternative B. Surface tract management would have no effect.
Pallid sturgeon *Scaphirhynchus albus*	E	Occupies large, turbid, free-flowing rivers, including Missouri River and Mississippi River south of its junction	Closest FMO in the AED is associated with the Pine Tree Research Station in western St. Francis County.	No surface tracts within species range.	Oil and gas development is not likely to adversely affect. Surface tract	Oil and gas development is not likely to adversely affect. NSO #16	Oil and gas development is not likely to adversely affect. NSO #16	Oil and gas development is not likely to adversely affect. NSO #16

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		with the Missouri. In Arkansas, occurrences in Phillips and St. Francis counties.			management would have no effect.	within 250 feet of wetlands and aquatic habitats. Surface tract management would have no effect.	buffer increased to 500 feet. Surface tract management would have no effect.	buffer decreased to 100 feet. Surface tract management would have no effect.
Yellowcheek darter *Etheostoma moorei*	E	Occurs in small to medium-size, high gradient rivers depths of 10–20 inches. Extant in upper Little Red River drainage above Greer's Ferry Lake in Cleburne, Searcy, Stone, and Van Buren counties.	Likely to occur on scattered split-estate FMO bordering tributaries north of Greer's Ferry Lake.	The only surface tract with potential habitat is Rattlesnake Hollow trac, located on Archey Creek, above designated critical habitat in the South Fork of Little Red River.	Projected mineral development is likely to adversely affect the species and designated critical habitat with a total of 170 wells projected in Cleburne, Stone, and Van Buren counties. Surface tract management would have adverse no effect.	Oil and gas development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management would have no adverse effect.	Oil and gas development is not likely to adversely affect. NSO #16 buffer increased to 500 feet. Surface tract management would have no adverse effect.	Likely to adversely affect NSO #16 buffer decreased to 100 feet. Surface tract management would have no adverse effect.
Mussels								
Arkansas fatmucket *Lampsilis powellii*	T	Deep pools and backwater areas in small to medium rivers with sandy	Range is outside the AED.	No surface tracts within species range.	Oil and gas development is not likely to adversely	Oil and gas development is not likely to adversely	Oil and gas development is not likely to adversely	Oil and gas development is not likely to adversely

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		bottoms. Currently known from the headwaters of the Saline, Ouachita, and Caddo rivers in Clark, Grant, Hot Springs, Montgomery, Pike, Polk, and Saline counties.			affect. Surface tract management would have no effect.	affect. NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management would have no effect.	affect. NSO #16 buffer increased to 500 feet. Surface tract management would have no effect.	affect. NSO #16 buffer decreased to 100 feet. Surface tract management would have no effect.
Curtis pearlymussel *Epioblasma florentina curtisi*	E	Stream segments between headwaters and lowland streams, typically 4–30 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 AED.	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.	Oil and gas development is not likely to adversely affect. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 buffer increased to 500 feet. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 buffer decreased to 100 feet. Surface tract management would have no effect.
Fat pocketbook *Potamilus capax*	E	Tolerates river-like reservoirs and lakes, occurs in St. Francis River basin with records in Craighead, Crittenden, Cross, Lee, Mississippi, Poinsett, and St.	Occurrences in the St. Francis River in the AED. FMO in the L'Anguilla River drainage primarily associated with the Pine Tree Research Station in western part of	No surface tracts within species range.	Oil and gas development is not likely to adversely affect. Surface tract management would have no	Oil and gas development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and	Oil and gas development is not likely to adversely affect. NSO #16 buffer increased to	Oil and gas development is not likely to adversely affect. NSO #16 buffer decreased to

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		Francis counties. Possibly extirpated in Prairie County.	county. Single occurrence within 3 miles of split-estate FMO on White River tributary north of Cache River Refuge.		effect.	aquatic habitats. Surface tract management would have no effect.	500 feet. Surface tract management would have no effect.	100 feet. Surface tract management would have no effect.
Louisiana pearlshell *Margaritifera hembeli*	T	Occurred in 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 AED. No occurrence records available.	No surface tracts within species range.	Oil and gas development is not likely to adversely affect. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 buffer increased to 500 feet. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 buffer decreased to 100 feet. Surface tract management would have no effect.
Neosho mucket *Lampsilis rafinesqueana*	P	Shallow riffles and runs in streams and small rivers. Occurs in the Illinois River in Washington and Benton counties.	Range outside AED.	No surface tracts within species range. Henderson Mountain tract is in extreme southern Washington County with no hydrologic connection to known occurrence records.	Oil and gas development is not likely to adversely affect. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management	Oil and gas development is not likely to adversely affect. NSO #16 buffer increased to 500 feet. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 buffer decreased to 100 feet. Surface tract management would have no effect.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
						would have no effect.		
Ouachita rock pocketbook *Arkansia wheeleri*	E	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 AED. No direct hydrological connections.	No surface tracts within species range.	Oil and gas development is not likely to adversely affect. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 buffer increased to 500 feet. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 buffer decreased to 100 feet. Surface tract management would have no effect.
Pink mucket *Lampsilis abrupta*	E	Occurs in large, fast-flowing rivers; can tolerate river-like impoundments, but not standing water. In Arkansas, known to occur in portions of the Black, Ouachita, White, and Spring rivers.	In the AED, occurrences are located along the White River where FMO is associated with Wattensaw SWMA in Prairie County, and the Ouachita River in Ouachita County.	No surface tracts within species range.	Projected mineral development is likely to adversely affect in Prairie and Ouachita counties where a total of 12 wells are projected. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 buffer increased to 500 feet. Surface tract management would have no effect.	Projected oil and gas development is likely to adversely affect. NSO #16 buffer decreased to 100 feet. Surface tract management would have no effect.
Rabbitsfoot	P	Inhabits small to	There are	The Searcy	Projected	Oil and gas	Oil and gas	Likely to

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
Quadrula cylindrical ssp. cylindrical		medium-size streams and larger rivers, usually in shallow areas in areas where velocity is reduced. Occurs in numerous river systems across state.	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 Wattensaw SWMA, and the Ouachita River in Ouachita County.	County Buffalo River tract is the closest to occurrence records at 8 miles above 1995 occurrence records. The Buffalo River tract is an upland tract with no perennial streams.	mineral development is likely to adversely affect, particularly in Van Buren County where 100 wells are projected.	development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management would have no effect.	development is not likely to adversely affect. NSO #16 buffer increased to 500 feet. Surface tract management would have no effect.	adversely affect. NSO #16 buffer decreased to 100 feet. Surface tract management would have no effect.
Scaleshell *Leptodea leptodon*	E	Occupies a range of gradients in medium to large rivers. In Arkansas, occurs in disjunct populations across the state.	There is potential for the species to occur in suitable habitat in Jackson, White, St. Francis, Monroe, Franklin, and Crawford counties. In the AED, 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.	Surface tracts in Baxter, Fulton, and Marion counties have no perennial streams.	Oil and gas development is not likely to adversely affect. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 buffer increased to 500 feet. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 buffer decreased to 100 feet. Surface tract management would have no effect.
Speckled	E	Inhabits clear,	Likely to occur on	West Fork, Dry	Oil and gas	Oil and gas	Oil and gas	Oil and gas

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
pocketbook *Lampsilis streckeri*		constantly flowing sections of river with depths approximately 0.5 meters. Remnant population occurs in few reaches of the upper Little Red River basin in Van Buren and Stone counties.	FMO associated with tributaries on the north side of Greers Ferry Lake and Big Creek in Cleburne and White counties.	Creek, and Lost Creek tracts are within the species' range, but all are upland tracts with no perennial streams. Rattlesnake Hollow tract is located on Archey Creek which has documented occurrence of speckled pocketbook.	development is not likely to adversely affect. Surface tract management would have adverse no effect.	development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management would have no adverse effect.	development is not likely to adversely affect. NSO #16 buffer increased to 500 feet. Surface tract management would have no adverse effect.	development is not likely to adversely affect. NSO #16 buffer decreased to 100 feet. Surface tract management would have no adverse effect.
Spectaclecase *Cumberlandia monodonta*	E	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.	Projected oil and gas development is likely to adversely affect. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 buffer increased to 500 feet. Surface tract management would have no effect.	Oil and gas development is likely to adversely affect. NSO #16 buffer decreased to 100 feet. Surface tract management would have no effect.
Turgid blossom *Epioblasma turgidula*	E	Required clean, moving water with low silt levels and stable substrate. Historically known	Historic range outside AED; presumed extinct.	No surface tracts in the Spring River drainage.	Oil and gas development is not likely to adversely affect.	Oil and gas development is not likely to adversely affect.	Oil and gas development is not likely to adversely affect.	Oil and gas development is not likely to adversely affect.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		from Spring River. Presumed extinct.			Surface tract management would have no effect.	NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management would have no effect.	NSO #16 buffer increased to 500 feet. Surface tract management would have no effect.	NSO #16 buffer decreased to 100 feet. Surface tract management would have no effect.
Winged mapleleaf *Quadrula fragosa*	E	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 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.	Projected oil and gas development is likely to adversely affect. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 buffer increased to 500 feet. Surface tract management would have no effect.	Oil and gas development is likely to adversely affect. NSO #16 buffer decreased to 100 feet. Surface tract management would have no effect.
Snails								
Magazine Mountain shagreen *Inflectarius magazinensis*	T	A terrestrial snail known from a small area of talus slope on the north side of Magazine Mountain. Within AED, but entire range is within the Mount Magazine	Range outside AED and no FMO in known range.	No surface tracts within species range.	Oil and gas development would have no effect. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		District of the Ozark NF.						
Crayfish								
Crayfish *Cambarus aculabrum*	E	A cave obligate known from 4 caves in Benton County.	Range outside AED. There are scattered split-estate tracts in Benton County, all more than 2.5 miles from the occurrence record and in different drainages.	No surface tracts in range of species.	Oil and gas development is not likely to adversely affect. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO # 5 within 1,000 feet of cave opening or karst feature. NSO #16 within 250 feet of wetlands and aquatic habitats. CSU #7 prohibits reinjection of produced or flowback waters into karst formations. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO # 5 buffer increased to 1,500. NSO #16 buffer increased to 500 feet. CSU #7 same as Alternative B. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #5 same as Alternative B. NSO #16 buffer decreased to 100 feet. CSU #7 same as Alternative B. Surface tract management would have no effect.
Hell Creek crayfish *Cambarus zophonastes*	E	A cave obligate known from 2 locations in Stone	Stone County is in the AED. Nearest FMO (80-acre	No surface tracts in range of species.	Oil and gas development is not likely to	Oil and gas development is not likely to	Oil and gas development is not likely	Oil and gas development is not likely

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		County.	tract) is 2.3 miles west of occurrence record.		adversely affect. Surface tract management would have no effect.	adversely affect. NSO # 5 within 1,000 feet of cave opening or karst feature. NSO #16 within 250 feet of wetlands and aquatic habitats. CSU #7 prohibits reinjection of produced or flowback waters into karst formations. Surface tract management would have no effect.	to adversely affect. NSO # 5 buffer increased to 1,500. NSO #16 buffer increased to 500 feet. CSU #7 same as Alternative B. Surface tract management would have no effect.	to adversely affect. NSO #5 same as Alternative B. NSO #16 buffer decreased to 100 feet. CSU #7 same as Alternative B. Surface tract management would have no effect.
Insects								
American burying beetle *Nicrophorus americanus*	E	Various, recorded in grassland, old fields, and hardwood forests. Occurs in Franklin, Little River, Logan, Polk, Scott, Sebastian, and Yell counties, with	Confirmed on FMO at Fort Chaffee; likely to occur on FMO throughout its range.	No surface tracts in range of species.	Projected mineral development is likely to adversely affect, particularly in Logan, Sebastian, and	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		potential to occur in adjacent counties.			Yell counties, where a total of 60 wells are projected over the next 10 years. Oil and gas development would continue to be conducted under a Program-matic Biological Opinion dated December 19, 2006 (and any subsequent modifica-tions), and is expected to remain within the Incidental Take Permit limit of 25 wells per year. Surface tract management would have no effect.			
Plants								
Harperella *Ptilimnium nodosum*	E	Occurs in saturated rocky covered margins of streams and pools In the Ouachita	Potential to occur in suitable habitat in AED in Scott and Yell counties.	No surface tracts in range of species.	Projected mineral development is likely to adversely	Oil and gas development is not likely to adversely affect.	Oil and gas development is not likely to adversely affect.	Likely to adversely affect through potential

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		Mountains. Known or suspected to occur in Garland, Montgomery, Perry, Polk, Scott, and Yell counties.			affect in Yell County, where 20 wells are projected. Species is vulnerable to increased sediment loads from upstream develop-ment, stream crossing activities, and degradation to water quality. Surface tract management would have no effect.	NSO #16 within 250 feet of wetlands or aquatic habitats. CSU #9 requires survey of all suitable habitat and no disturbances where plants may be affected. Surface tract management would have no effect.	NSO #16 buffer increased to 500 feet. CSU #9 same as Alternative B.	increases in sedimenta-tion. NSO #16 buffer decreased to 100 feet. CSU #9 same as Alternative B. Surface tract management would have no effect.
Missouri bladderpod *Physaria filiformis*	T	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 AED.	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.	Oil and gas development is not likely to adversely affect.	Not likely to adversely affect. NSO #4 in glades, fens, or salt barrens. CSU #9 requires all suitable habitat be surveyed and no disturbances where plants may be	Not likely to adversely affect. NSO #4 same as in Alternative B. CSU #9 same as Alternative B.	Not likely to adversely affect. NSO #4 same as in Alternative B. CSU #9 same as Alternative B.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
						affected.		
Running buffalo clover *Trifolium stoloniferum*	E	Limestone areas with mesic woodland and river terraces, where there is periodic disturbances. Possibly extinct in Arkansas; records in Independence and Pulaski counties.	Range outside the AED. No occurrence records.	No surface tracts in range of species.	Oil and gas development is not likely to adversely affect. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 within 250 feet of wetlands or aquatic habitats. CSU #9 requires survey of all suitable habitat, and no disturbances where plants may be affected. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 buffer increased to 500 feet. CSU #9 same as Alternative B. Surface tract management would have no effect.	Not likely to adversely affect. NSO #16 buffer decreased to 100 feet. CSU #9 same as Alternative B. Surface tract management would have no effect.
Earth star *Geocarpon minimum*	T	Grows in salt prairies and salt slicks in Bradley, Cleveland, Drew, and Franklin counties.	Occurrence records are outside the AED, except a 1988 record in Franklin County outside the AED but just over 5 miles northeast of FMO associated	No surface tracts in range of species.	Not likely to adversely affect with no FMO in the Warren Prairie Natural Area and no occurrence records at Fort	Oil and gas development is not likely to adversely affect. NSO #4 in glades, fens, or salt barrens.	Not likely to adversely affect. NSO #4 same as Alternative B. CSU #9 same as	Not likely to adversely affect. NSO #4 same as Alternative B. CSU #9 CSU #9 same as

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
			with Fort Chaffee.		Chaffee. Surface tract management would have no effect.	CSU #9 requires survey of all suitable habitat, and no disturbances where plants may be affected. Surface tract management would have no effect.	Alternative B. Surface tract management would have no effect.	Alternative B. Surface tract management would have no effect.

4.7.3 Florida

In Florida, projected oil and gas development is not expected to adversely affect special status species. No more than three wells are expected over the next 10 years in Collier, Hendry, and Lee counties (see Map 3-14). Two-thirds of the land cover on FMO in this area has been previously disturbed or is something other than native plant communities. In addition, mineral leasing stipulations exclude coastal and Florida scrub habitats from surface occupancy, further avoiding the potential to affect special status species.

Phosphate development has the potential to adversely affect special status species in southern Polk County, northern Hardee County, and northeastern Manatee County (see Map 3-15). There are no occurrence records of special status species on or within a mile of FMO identified to be mined over the next 10 years; however, there is suitable habitat for several species on this FMO, and it is prudent to assume that these species could occur and that suitable habitat would be lost as a result of projected phosphate mining. Despite lease stipulations (see Appendix M) that would be applied to all new leases, it is expected that, as a result of future coordination on these large mines, all of the interspersed FMO would be mined with offsite compensation.

- There is potential to adversely affect wood stork through loss of foraging habitat on FMO expected to be mined.
- There is potential to adversely affect Audubon's crested caracara *(Polyborus plancus audubonii)* and Florida grasshopper sparrow *(Ammodramus savannarum)* through loss of foraging and potential nesting habitat on FMO expected to be mined.
- There is potential for indigo snake *(Drymarchon couperi)* and gopher tortoise (*Gopherus polyphemus*) to be killed during mining operations and habitat lost.

Surface tract management in Florida has the potential to adversely affect or to benefit special status species depending on the alternative.

- Across all alternatives, ongoing habitat and population management at Jupiter Inlet Lighthouse ONA and Lathrop Bayou HMA would improve habitat and support recovery of the following special status species: West Indian manatee *(Trichechus manatus)* (including critical habitat), bald eagle, Florida scrub jay *(Aphelocoma coerulescens)*, red-cockaded woodpecker, gopher tortoise, reticulated flatwoods salamander, Florida perforate lichen *(Cladonia perforate)*, Florida skullcap *(Scutellaria floridana)*, four-petal pawpaw *(Asminia tetramera)*, Godfrey's butterwort *(Pinguicula ionantha)*, and Johnson's seagrass *(Halophila johnsonii)*.
- In Alternatives A and D, retention without active management by BLM, or transfer to the USFWS or Florida Parks Service would adversely affect piping plover, red knot (*Calidris canutus)*, roseate tern *(Sterna dougallii dougallii)*, gopher tortoise, green sea turtle *(Gopherus polyphemus)*, hawksbill sea turtle *(Eretmochelys imbricata)*, loggerhead sea turtle *(Caretta caretta)*, Key deer *(Odocoileus virginianus clavium)*, Lower Florida Keys rice rat *(Oryzomys palustris natator)*, and Lower Keys marsh rabbit *(Sylvilagus palustris hefneri)*.
- In Alternatives B and C, BLM retention and management of two small Florida Key tracts would affect, but not adversely affect (benefit) Key deer, Lower Florida Keys rice rat, and Lower Keys marsh rabbit.
- In Alternatives B and C, BLM retention and management of Egmont Key would affect, but not adversely affect (benefit) piping plover, red knot, roseate tern, gopher tortoise, green sea turtle, hawksbill sea turtle, and loggerhead sea turtle. Transfer of Egmont Key in Alternative D would benefit the same species.

- In Alternatives B and C, BLM retention or transfer of the Gasparilla tract to the State of Florida is likely to affect, but not adversely affect (negligible) the occasional use of the tract by piping plover, red knot, gopher tortoise, and loggerhead turtle, as well as potential habitat for aboriginal prickly-apple (*Harrisia aboriginum*).
- In Alternatives B and C, BLM retention of the Citrus tract would affect but not adversely affect (benefit) bald eagle and wood stork *(Mycteria americana)*.
- Transfer or exchange of the Lake Marion tract has the potential to affect, but not adversely affect (benefit) gopher tortoise, wood stork, eastern indigo snake, sand skink *(Neoseps reynoldsi)*, and Carter's mustard *(Warea carteri)*, if the tract is retained by the USFWS. If the Lake Marion tract is exchanged to benefit the NWR system, it is assumed that the action would be in support of the regional recovery of these species.

Table 4-27 lists those special status species that occur or are suspected to occur in the *decision area* and provides a determination of affect by alternative with a reference to the stipulations that could reduce that affect, or surface management actions that could affect the species.

Table 4-27 Florida Impacts on Special Status Species from Energy and Mineral Development and Surface Tract Management

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
Mammals								
Choctaw-hatchee beach mouse *Peromyscus polionotus allophrys*	E	Inhabits 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 AEDs.	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.	Projected mineral development would have no effect. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Florida bonneted bat *Eumops floridanus*	E	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 AEDs in Collier and Lee counties, and phosphate AED in Polk County. Closest records in area are between phosphate and oil and gas AEDs, and in adjacent Dade County. No FMO associated with known occurrence	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, but is	Projected oil and gas development is not likely to adversely affect because of the low number of wells (3) projected in state and a 550-foot buffer from wetland and aquatic habitats. Phosphate mining has potential to adversely affect habitat, particularly in forested wetland areas mined in Collier and Lee counties.	Same as Alternative A, except: NSO #16 within 250 feet of wetlands and aquatic habitats.	Same as Alternative A, except: NSO #16 buffer increased to 500 feet.	Same as Alternative A, except: NSO #16 buffer decreased to 100 feet.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
			records at Kicco WMA.	more than 30 miles from the only known population in Polk County at the Kicco WMA.	Surface tract management would have no effect.			
Florida panther *Puma (=Felis) concolor coryi*	E	Uses a variety of habitats, but most typically heavily forested lowlands and swamps. Current range from Polk and Osceola counties southward.	Potential to occur in suitable habitat in all of the oil and gas AED. 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 AED.	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.	Not likely to adversely affect. Existing oil and gas CSU #5 would require gating of all new or improved roads longer than 0.25 miles in panther range to reduce unauthorized traffic. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative B.	Same as Alternative B.
Key deer *Odocoileus virginianus clavium*	E	Prefers pinelands, then hardwood hammocks and mangroves. Uses grassy areas (subdivisions and	Range is outside the AEDs.	Likely to occur on Sugarloaf and Park Key tracts, all of which provide suitable habitat.	Projected mineral development would have no effect. Suitable habitat on	Projected mineral development would have no effect.	Same as Alternative B.	Same as Alternative B, except surface tract management could

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		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, with highest numbers on Big Pine and No Name Keys.		Closest occurrence record is a 1981 record 0.3 miles from Sugarloaf Key tract.	Sugarloaf Key tracts would be available for transfer to USFWS and is expected to benefit species recovery through increased site management. Retention of the Park Key tract without active management could result in unauthorized use with the potential for adverse but negligible effects.	NSO #9 excludes oil and gas development in the Keys. All Florida Key tracts would be retained and actively managed to improve habitat.		adversely affect Key tracts retained by BLM with no active manage-ment.
Key Largo cotton mouse *Peromyscus gossypinus allapaticola*	E	Mature tropical hardwood hammock, trunks of dominant trees with dbh of 10 inches or more; more mice in more mature hammocks. Currently occurs only on Key Largo and has been introduced on Lignumvitae Key in Monroe County.	Range is outside the AEDs.	No surface tracts in known range.	Projected mineral development would have no effect. Surface tract management would have no effect.	Projected mineral development would have no effect. NSO #9 excludes oil and gas development in the Keys. Surface tract management would have no effect.	Same as Alternative B.	Same as Alternative B.
Key Largo woodrat	E	Inhabits mature hardwood	Range is outside the AEDs.	No surface tracts in known	Projected mineral development	Projected mineral	Same as Alternative B.	Same as Alternative B.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
Neotoma floridana smalli		hammocks. Currently occurs only in North Key Largo and has been introduced on Lignumvitae Key in Monroe County.		range.	would have no effect. Surface tract management would have no effect.	development would have no effect. NSO #9 excludes oil and gas development in the Keys. Surface tract management would have no effect.		
Lower Florida Keys rice rat *Oryzomys palustris natator*	E	Inhabits brackish and salt marshes. Occurs in lower Florida Keys.	Range is outside the AEDs.	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, 3 miles southwest of the Sugarloaf Key tracts in the saltmarsh mangrove ecotone.	Projected mineral development would have no effect. Suitable habitat on Sugarloaf Key tracts would be available for transfer to USFWS and is expected to benefit species recovery through increased site management. Retention of the Park Key tract without active management could result in unauthorized use with the potential for adverse but	Projected mineral development would have no effect. NSO #9 excludes oil and gas development in the Florida Keys. All Key tracts would be retained and actively managed to improve habitat.	Same as Alternative B.	Same as Alternative B, except surface tract management could adversely affect Key tracts retained by BLM with no active manage-ment.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
					negligible effects.			
Lower Keys marsh rabbit *Sylvilagus palustris hefneri*	E	Inhabits 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 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.	Range is outside the AEDs.	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 mangroves.	Projected mineral development would have no effect. Suitable habitat on Sugarloaf Key tracts would be available for transfer to USFWS and is expected to benefit species recovery through increased site management. Retention of the Park Key tract without active management could result in unauthorized use with the potential for adverse but negligible effects.	Projected mineral development would have no effect. NSO #9 excludes oil and gas development in the Florida Keys. All Key tracts would be retained and actively managed to improve habitat.	Same as Alternative B.	Same as Alternative B, except surface tract management could adversely effect on Key tracts retained by BLM with no active manage-ment.
Southeastern beach mouse *Peromyscus polionotus niveiventris*	T	Inhabits coastal primary and secondary dunes and adjacent scrub habitats. Current range is from Volusia County	Range is outside the AEDs.	Palm Beach County is in the historic range of the species, but the Jupiter Inlet Lighthouse ONA is 0.5 miles	Mineral development would have no effect. Surface tract management would not affect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

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		(Smyrna Dunes Park), Federal lands in Brevard County (Canaveral National Seashore, Merritt Island National Wildlife Refuge, and Cape Canaveral Air Force Station), and in Indian River County (Sebastian Inlet State Recreation Area).		inland with no suitable habitat.				
St. Andrew beach mouse *Peromyscus polionotus peninsularis*	E	Inhabits 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 the oil and gas and phosphate AEDs.	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.	Mineral development would have no effect. Surface tract management would not affect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
West Indian manatee *Trichechus manatus*	E	Inhabits coastal and inland waterways in southeastern United States.	Occupied critical habitat occurs in the vicinity of the western fringe of the oil and gas AED, including Cayo Costa State Park, and along the Caloosahatchee River in western	The portions of the Loxahatchee River and Indian River Lagoon adjacent to the Jupiter Inlet Lighthouse ONA are designated critical habitat. The Gasparilla,	Projected mineral development not likely to adversely affect with existing 550-foot buffers stipulated for aquatic habitats. Shoreline stabilization on the Indian River	Projected mineral development not likely to adversely affect. NSO #6 prohibits surface occupancy in	Projected mineral development not likely to adversely affect. NSO #6 same as Alternative B. NSO #16 for	Projected mineral development not likely to adversely affect. NSO #6 same as Alternative B. NSO #16 for

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			Lee county. All of the FMO in the phosphate AED is outside the manatee range.	Sugarloaf Key, and Park Key tracts are also adjacent to designated critical habitat.	Lagoon and the Loxahatchee River would enhance sea grasses and provide a protected near shore corridor for travel. Other surface tract management is not expected to affect manatee.	coastal shoreline habitats. NSO #16 for 250-foot buffer of designated critical habitat. Surface tract management is same as Alternative A.	600-foot buffer of designated critical habitat. Surface tract management is same as Alternative A.	100-foot buffer of designated critical habitat. Surface tract management is same as Alternative A.
Birds								
Audubon's crested caracara FL pop. *Polyborus plancus audubonii*	T	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	Likely to occur in suitable habitat in both the oil and gas AED and the phosphate AED. Closest occurrence record to the oil and gas FMO is a 1989 record 4 miles away. Closest occurrence record to phosphate FMO is a 1993 record 8.5 miles in extreme northern Hardee County.	The Lake Marion tract is in the range of caracara, but the scrubby flatwoods provide only marginal habitat. The 120-acre Jupiter Inlet Lighthouse ONA is an urban situation, and habitat is not considered suitable.	Oil and gas development is not likely to adversely affect. Phosphate development is likely to adversely affect, where much of the FMO is considered suitable habitat. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. Phosphate development is likely to adversely affect nesting and foraging habitat, particularly in the phosphate AED. NSO #1 prohibits surface occupancy within 500 feet of active nest.	Oil and gas development is not likely to adversely affect. Phosphate development is not likely to adversely affect nesting habitat, but there is potential to affect foraging habitat, particularly in the phosphate AED. NSO #1 prohibits	Oil and gas development is not likely to adversely affect. Phosphate development is likely to adversely affect nesting and foraging habitat. NSO #1 prohibits surface occupancy within 250`feet of active nest.

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		Osceola counties.					surface occupancy within 1,000 feet of active nest.	
Bachman's warbler *Vermivora bachmanii*	E	Primarily a migrant using open woodland, pine, and scrub. No known extant records.	Presumed extirpated from state.	Presumed extirpated from state.	Mineral development is not likely to adversely affect. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Bald eagle *Haliaeetus leucocephalus*	D	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 AED and the phosphate AED. 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.	Oil and gas development is not likely to adversely affect bald eagle. Florida RMP leasing NSO stipulation requires 1,500 foot-buffer from bald eagle nests and communal roost sites and 550 feet NSO buffer from aquatic habitats and wetlands. Phosphate mining is likely to adversely affect, particularly near larger bodies of water in Polk	Not likely to adversely affect. NSO #2 implements National Bald Eagle Management Guidelines with 660-foot buffer around active and inactive bald eagle nests and communal roost sites. NSO #16 within 250 feet of wetlands and aquatic habitats.	Not likely to adversely affect. NSO #2 exceeds National Bald Eagle Management Guidelines with 1,000-foot buffer around active and inactive bald eagle nests and communal roost sites. NSO #16 buffer increased to 500 feet. CSU #2	Projected oil and gas development is not likely to adversely affect bald eagles. . NSO #2 same as Alternative B. NSO #16 buffer decreased to 100 feet. CSU #2 same as Alternative A. Disposal of the Citrus County tracts

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					County. Ongoing management at the Lathrop Bayou HMA and retention of the Citrus County tracts are not expected to adversely affect bald eagle.	CSU #2 restricts removal of suitable nest trees within 0.5 miles. Ongoing management at the Lathrop Bayou HMA and active management of the Citrus County tracts could benefit bald eagle through habitat protection.	buffer increased to 1 mile. Surface tract management would be the same as Alternative B.	could adversely affect bald eagle habitat, if the tracts were developed.
Cape Sable seaside sparrow *Ammodramus maritimus mirabilis*		Occurs in 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 marshes of Big Cypress Swamp and Taylor Slough.	Historic range in Collier County is in oil and gas AED. Range is outside the phosphate AED.	The surface tracts in the Lower Keys outside the current range.	Not likely to adversely affect. No leasing in Big Cypress Swamp, and Taylor Slough is outside the AED. Phosphate development would not affect. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Everglade snail kite	E	Habitat is large, open freshwater	Potential to occur in Collier and Lee	Only the Lake Marion tract in	Oil and gas development is	Not likely to adversely	Not likely to adversely	Likely to adversely

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FL pop. *Rostrhamus sociabilis plumbeus*		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 National Wildlife Refuge, and Big Cypress National Preserve.	counties in the oil and gas AED. 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 AED in Polk County.	Polk County has freshwater wetlands in the range, although habitat on the tract is marginal, primarily scrub, scrubby flatwoods, and fringe of bay swamp.	not likely to adversely affect with existing lease NSO stipulation buffering aquatic habitat and wetlands by 550 feet. Phosphate development is likely to adversely affect in wetlands habitats. Surface tract management is not expected to affect.	affect. NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management is not expected to affect.	affect. NSO #16 buffer increased to 500 feet. Surface tract management is not expected to affect.	affect. NSO #16 buffer decreased to 100 feet. Marginal habitat could be damaged if the Lake Marion tract is developed.
Florida grasshopper sparrow *Ammodramus savannarum floridanus*	E	Dry prairie with stunted saw palmetto and dwarf oaks, bluestems, and wiregrass; unimproved cattle pastures. Habitat is maintained by periodic fires. Cannot survive in pastureland if it is stripped of shrubby patches. Restricted to Kissimmee Prairie region northwest of Lake Okeechobee.	Not expected to occur in the oil and gas AED. Potential to occur on FMO in the phosphate AED with closest occurrence record about 8 miles from FMO in the AED.	There is marginal habitat at the Lake Marion tract.	Oil and gas development would not affect. Phosphate development is likely to adversely affect in De Soto, Hardee, and Polk counties. Surface tract management is not expected to affect.	Same as Alternative A.	Same as Alternative A.	Likely to adversely affect in phosphate AED in De Soto, Hardee, and Polk counties. Marginal habitat could be damaged if the Lake Marion tract is developed.
Florida scrub-	T	Lives only in the	Potential to occur	Has bred at the	Not likely to	Not likely to	Same as	Same as

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jay *Aphelocoma coerulescens*		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.	on suitable habitat in both the oil and gas, and phosphate AEDs. No scrub habitats mapped on FMO in the AEDs.	Jupiter Inlet Lighthouse ONA; however, no birds observed since 2003 despite ongoing scrub management and suitable habitat. Potential to occur at the Lake Marion tract, but habitat is in poor condition.	adversely affect. Existing stipulations prohibit surface occupancy from scrub habitats. Surface tract management at Jupiter Inlet Lighthouse ONA would continue to maintain scrub jay habitat. Unoccupied habitat in poor condition at Lake Marion would continue to degrade without management.	adversely affect. NSO #10 prohibits surface occupancy in scrub habitats. Surface tract management at Jupiter Inlet Lighthouse ONA would continue to benefit scrub jay habitat. Scrub habitat expected to improve with management if incorporated into the Lake Wales Ridge NWR. Marginal habitat would be lost if exchanged.	Alternative B.	Alternative B.
Ivory-billed woodpecker *Campephilus principalis*	E	Described as a 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	Expected current range is outside the AEDs.	Lathrop Bayou is the closest surface tract to recent sightings in the Apalachicola River basin, and potential habitat in the Choctaw-	Mineral development would have no effect. Surface tract management would not affect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

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		continuous supply of food. Bald cypress has been noted as an important component of forests used historically in Florida.		hatchee River and Chipola River basins. However, Lathrop Bayou is a mesic flatwood and does not provide suitable habitat. None of the other surface tracts is 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 gas AED. Not expected to occur in the phosphate AED.	Some potential to use tracts during migration; no records to date.	Not likely to adversely affect migrating Kirkland's warblers because of the small number of wells (3) projected in state. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Piping plover except Great Lakes watershed *Charadrius*	T	Wintering habitat occurs along both Gulf and Atlantic coastal beaches.	Portions of the oil and gas FMO at Cayo Costa State Preserve and surrounding area are in designated	Likely to occur as winter migrant at the Egmont Key tract, which is designated	Oil and gas development is not likely to adversely affect, because of the small number of	Not likely to adversely affect. NSO #6 prohibits surface	Same as Alternative B.	Transfer of the Egmont Key tract to the USFWS is expected to further

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melodus			critical habitat. Phosphate FMO is 31 miles inland and outside the range of this coastal species.	critical habitat. Potential for occasional use of the Gasparilla tract.	wells (3) projected in state and existing NSO lease stipulation excluding oil and gas development from coastal strand habitats. Phosphate development would have no effect. Retention of the Egmont Key without active management would adversely affect the species and designated critical habitat. Retention of the Gasparilla tract is not expected to adversely affect.	occupancy in coastal shoreline habitats. Surface tract management at Egmont Key is expected to support recovery and management of critical habitat. Transfer of the Gasparilla tract to the state is not expected to adversely affect.		improve management and protection of critical habitat.
Red-cockaded woodpecker *Picoides borealis*	E	Live in 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	Potential to occur in Polk County in the phosphate AED and in all counties in the oil and gas AED. The closest cluster is 17 miles west/southwest of FMO in Avon Park Air Force Range in Polk County. In Collier County,	Two breeding clusters on the Lathrop Bayou tract. None of the other surface tracts provide suitable habitat.	Not likely to adversely affect. No known clusters on FMO and existing NSO lease stipulation excludes mining operations from 0.5 miles of clusters. No leasing in	Oil and gas development is not likely to adversely affect. NSO #13 buffer within 0.5 miles of cluster. Phosphate development	Not likely to adversely affect NSO #13 buffer increased to 0.75 miles of cluster. Phosphate development would not	Not likely to adversely affect NSO #13 same as Alternative B. Phosphate development would not affect. Surface tract

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		Polk counties south to Collier County.	multiple clusters in the Big Cypress National Preserve are on FMO.		national parks. Surface tract management at Lathrop Bayou, including prescribed burn program and population management is expected to benefit red-cockaded woodpecker.	would not affect. Surface tract management is expected to benefit.	affect. Surface tract management is expected to benefit.	management is expected to benefit.
Red knot *Calidris canutus*	P	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 winter visitor on the western fringes of the oil and gas FMO in Collier and Lee counties.	Expected to occur as winter visitor at Egmont Key in Hillsborough County, and some potential to occur on the Gasparilla tract in Lee County.	Not likely to adversely affect because of the existing NSO lease stipulation excluding oil and gas development from coastal strand habitats. Phosphate development would have no effect. Retention of the coastal tracts without active management could adversely affect the species.	Oil and gas development is not likely to adversely affect. NSO #6 prohibits surface occupancy in coastal shoreline habitats. Surface tract management at Egmont Key is expected to benefit. No change in management at Gasparilla tract is expected.	Same as Alternative B.	Same as Alternative B, except that transfer of the Egmont Key tract to the USFWS is expected to further improve habitat management and protection.

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Roseate tern Western Hemisphere except NE U.S. *Sterna dougallii dougallii*	T	Nests on islands on sandy beaches, open bare ground, 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 AED in the area of Rookery Bay Aquatic Preserve. Range is outside the phosphate AED.	Sugarloaf Key and Park Key tracts' shorelines provide suitable habitat. Closest occurrence record 5 miles northwest in the Great White Heron NWR.	Projected oil and gas development is not likely to adversely affect Because of the existing NSO lease stipulation excluding oil and gas development from coastal strand habitats. Phosphate development would have no effect. Retention of the Park Key tract without active management could result in unauthorized use with the potential for adverse but negligible effects.	Oil and gas development is not likely to adversely affect. NSO #6 prohibits surface occupancy in coastal shoreline habitats. NSO # 9 in the Keys. Phosphate development would have no effect. Retention and management of the Florida Key tracts could reduce unauthorized uses and benefit the species.	Same as Alternative B.	Same as Alternative B.
Whooping crane *Grus americana*	X N	Habitat includes marshes, shallow lakes, lagoons, salt flats, grain and stubble fields, and barrier islands. An experimental non-migratory flock has been established at	Both experimental populations are outside the AEDs. The closest FMO in the phosphate AED is 71 miles from the Chassahowitzka NWR.	Closest surface tract, the Citrus tract, is 20 miles east of the Chassahowitzka NWR.	Projected mineral development is not likely to adversely affect. Surface tract management would not affect.	Not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats.	Not likely to adversely affect. NSO #16 buffer increased to 500 feet. Surface tract	Not likely to adversely affect. NSO #16 buffer decreased to 100 feet. Surface tract

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		the Chassahowitzka and St. Mark's NWRs.				Surface tract management would be the same as Alternative A.	management would be the same as Alternative A.	management would be the same as Alternative A.
Wood stork *Mycteria americana*	T	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 wetland habitats in both the oil and gas and phosphate AEDs.	Potential foraging habitat on Citrus County and Lake Marion tracts.	Projected oil and gas development is not likely to adversely affect because of the small number of wells (3) projected in state and existing NSO stipulation excluding surface disturbing activities within 550 feet of wetlands and aquatic habitats. Phosphate development could adversely affect foraging habitat through loss of almost 300 acres of wetlands on FMO projected to be mined. Lack of surface tract management, including exotic species removal could degrade	Oil and gas development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. NSO #17 within 1,500 feet of wood stork nesting colony or 1,000 feet from communal roosting site. Phosphate development affects would be the same as in Alternative A. Surface tract management would be the same as Alternative A.	Mineral development affects would be same as Alternative A. NSO #16 buffer increased to 500 feet. NSO #17 would increase buffer to 2,000 feet. Surface tract management same as Alternative A.	Mineral development affects would be same as Alternative A. NSO #16 buffer decreased to 100 feet. NSO #17 would decrease buffer to 1,000 feet. Disposal of the Citrus County tracts could result in loss of foraging habitat, but the effect would be negligible.

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					foraging areas on the Citrus County tract, but the effect would be negligible. Transfer of the Lake Marion tract from federal ownership could result in loss of foraging habitat, but the affect would be negligible.			
Reptiles								
American alligator *Alligator Mississippi-ensis*	S A	Inhabits 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 AEDs.	Potential to occur on all surface tracts adjacent to fresh or brackish waters.	Projected mineral development is not likely to adversely affect because of the small number of wells (3) projected in state and existing NSO stipulation and 550-foot buffer for wetland and aquatic habitats.	Not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats.	Not likely to adversely affect. NSO #16 buffer increased to 500 feet.	Not likely to adversely affect. NSO #16 buffer decreased to 100 feet.
American crocodile FL pop. *Crocodylus acutus*	T	Habitat includes coastal mangrove swamps, brackish and salt water bays, lagoons, marshes, tidal rivers, brackish creeks; also	Potential to occur in Lee and Collier counties in the oil and gas AED.	Potential to occur in the Florida Keys tracts.	Projected mineral development is not likely to adversely affect because of the small number of wells (3) projected	Not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic	Not likely to adversely affect. Same as Alternative B. except NSO #16 buffer	Not likely to adversely affect. Same as Alternative B, except NSO #16 buffer

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		abandoned coastal canals and borrow pits. 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.			in state and existing NSO stipulation and 550-foot buffer for wetland and aquatic habitats, and coastal habitats.	habitats. NSO #6 in coastal shoreline habitats. NSO #9 in the Keys. Surface tract management is not expected to adversely affect.	increased to 500 feet.	decreased to 100 feet.
Atlantic salt marsh snake *Nerodia clarkii taeniata*	T	Inhabits 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	Range is outside the AEDs.	Surface tracts are outside the known range of this species.	Projected mineral development is not likely to adversely affect because of the small number of wells (3) projected in state and existing NSO stipulation in coastal strand and 550-foot buffer for wetland and aquatic habitats. Surface tract management would have no	Not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management would have no effect.	Not likely to adversely affect. Same as Alternative B, except NSO #16 buffer increased to 500 feet.	Not likely to adversely affect. Same as Alternative B, except NSO #16 buffer decreased to 100 feet.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		restricted to a limited coastal strip in Volusia County.			effect.			
Bluetail mole skink *Eumeces egregius lividus*	T	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 8 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. Closest occurrence record is 7.9 miles southwest of the tract from 1969.	Projected mineral development is not likely to adversely affect. Existing lease NSO stipulations exclude development from scrub and sandhill habitats. Habitat at Lake Marion expected to improve with management if incorporated into the Lake Wales Ridge NWR. Marginal habitat would be lost if exchanged.	Not likely to adversely affect. NSO #10 prohibits surface occupancy in scrub habitats.	Same as Alternative B.	Same as Alternative B.
Eastern indigo snake *Drymarchon corais couperi*	T	Habitat includes 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	Potential to occur in both the phosphate and oil and gas AEDs, 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	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	Not likely to adversely affect in the oil and gas AED, because of the small number of wells projected (3) and protection provided by existing NSO lease stipulations that protect scrub and sandhills. Likely to adversely	Not likely to adversely affect. CSU #6 requires surveys prior to any surface disturbance and no disturbance within 600 feet of burrow.	Not likely to adversely affect. CSU #6 requires surveys prior to any surface disturbance, and no disturbance within 1,000 feet of	Likely to adversely affect. CSU #6 requires surveys prior to any surface disturbance, and no disturbance within 300 feet of

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		fields. Occupied sites are often near wetlands and frequently in association with gopher tortoise burrows. Ranges throughout Florida.	on oil and gas FMO at Cayo Costa State Preserve.	habitat not available on other surface tracts.	affect in the phosphate AED, although existing wetland, scrub and, sandhill NSO lease stipulations would provide protection of high quality habitat. Habitat at Lake Marion expected to improve with management if incorporated into the Lake Wales Ridge NWR. Marginal habitat would be lost if exchanged.	NSO #10 prohibits surface occupancy in scrub habitats. NSO #16 within 250 feet of wetlands and aquatic habitats.	burrow. NSO #10 same as Alternative B. NSO #16 buffer increased to 500 feet.	burrow. NSO #10 same as Alternative B. NSO #16 buffer decreased to 100 feet.
Gopher tortoise *Gopherus polyphemus*	C	Sandy soils with herbaceous ground cover. In Florida, occurs throughout the state in suitable habitat.	Potential to occur throughout the oil and gas and phosphate AEDs.	Known to occur at the Jupiter Inlet Lighthouse ONA, Egmont Key, and the Lake Marion tract. Expected to occur at Lathrop Bayou and potential to occur at the Gasparilla tract.	Oil and gas development is not likely to adversely affect. Existing NSO lease stipulations protect scrub and sandhills; potential to adversely affect in other suitable habitats. Phosphate is likely to adversely affect. Existing phosphate lease stipulation requires survey of	Potential to affect same as Alternative A, except: NSO #10 prohibits surface occupancy in scrub habitats. CSU #6 requires surveys prior to any surface disturbance, and no disturbance within 600 feet	Potential to affect same as Alternative A, except: CSU #6 requires surveys prior to any surface disturbance, and no disturbance within 1,000 feet of burrow. Surface tract management	Potential to affect same as Alternative A, except: CSU #6 requires surveys prior to any surface disturbance, and no disturbance within 300 feet of burrow. Surface tract management

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
					suitable habitat and no leasing of areas with tortoise densities of 0.8 or higher, but suitable habitat is expected to be lost during mining. Jupiter population expected to benefit from ongoing habitat maintenance and improvements. Lake Marion population expected to improve with management if incorporated into the NWR system. Population and marginal habitat would be lost if Lake Marion tract exchanged. Habitat at Gasparilla expected to remain static without management.	of burrow. Habitat at Gasparilla is likely to improve with active management.	same as Alternative A, except habitat at Gasparilla is likely to improve with active manage-ment.	same as Alternative A.
Green sea turtle FL, Mexico nesting pops.	E	Open beaches with a sloping platform and minimal disturbance are	Some potential to nest on coastal fringes of oil and gas AED in Lee	Known to nest at Egmont Key NWR and assumed to nest	Oil and gas development would have no effect; existing	Projected mineral development would have no	Same as Alternative B.	Same as Alternative B after transfer of Egmont

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Chelonia mydas		required for nesting. Nests along Atlantic shore and most of the Gulf coast of Florida.	and Collier counties.	on the public domain tract. Some potential to nest at the Gasparilla tract. No suitable habitat on other surface tracts.	lease stipulations exclude development from coastal strand and beach habitats. Phosphate development would have no effect. Lack of surface tract management could result in damage to nests and harassment at Egmont Key. Lack of management would have a negligible effect at Gasparilla tract.	effect. NSO #6 prohibits surface occupancy in coastal shoreline habitats. Surface tract management is not expected to adversely affect at Egmont Key or as a result of transferring Gasparilla to the state.		Key to USFWS.
Hawksbill sea turtle *Eretmochelys imbricata*	E	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 typical site would be a low-energy sand beach with woody vegetation, such as sea grape or salt shrub, near the	Not likely to nest on the coastal fringes of oil and gas AED in Lee and Collier counties.	Potential to nest at the Egmont Key tract. Not likely to nest on any other surface domain tract.	Oil and gas development would have no effect; existing lease stipulations exclude development from coastal strand and beach habitats. Phosphate development would have no effect. Lack of surface tract management could result in damage to nests	Projected mineral development would have no effect. NSO #6 prohibits surface occupancy in coastal shoreline habitats. Surface tract management is not expected to adversely	Same as Alternative B.	Same as Alternative B after transfer of Egmont Key to USFWS.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		water line.			and harassment at Egmont Key.	affect.		
Kemp's Ridley sea turtle *Lepidochelys kempii*	E	Nesting concentrated in along Gulf Coast of Tamaulipas, Mexico, and Texas.	Known nesting range is outside the AEDs.	Not likely to nest on surface tracts in Florida.	Oil and gas development would have no effect; existing lease stipulations exclude development from coastal strand and beach habitats. Phosphate development would have no effect. Surface tract management would have no effect.	Projected mineral development would have no effect. NSO #6 prohibits surface occupancy in coastal shoreline habitats. Surface tract management would have no effect.	Same as Alternative B.	Same as Alternative B.
Leatherback sea turtle *Dermochelys coriacea*	E	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 County.	Range is outside the AEDs.	The Jupiter Inlet Lighthouse ONA tract is within the range; however, it is situated in the estuary and does not provide suitable nesting habitat.	Oil and gas development would have no effect; existing lease stipulations exclude development from coastal strand and beach habitats. Phosphate development would have no effect. Surface tract management would have no	Projected mineral development would have no effect. NSO #6 prohibits surface occupancy in coastal shoreline habitats. Surface tract management would have no effect.	Same as Alternative B.	Same as Alternative B.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
					effect.			
Loggerhead sea turtle *Caretta caretta*	T	Nesting occurs usually 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 south and in the Panhandle from Franklin County westward.	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 tracts have suitable nesting habitat.	Oil and gas development would have no effect; existing lease stipulations exclude development from coastal strand and beach habitats. Phosphate development would have no effect. Lack of surface tract management could result in damage to nests and harassment at Egmont Key. Lack of management would have a negligible effect at Gasparilla tract.	Projected mineral development would have no effect. NSO #6 prohibits surface occupancy in coastal shoreline habitats. Surface tract management is not expected to adversely affect at Egmont Key or as a result of transferring Gasprilla to the state.	Same as Alternative B.	Same as Alternative B after transfer of Egmont Key to USFWS.
Sand skink *Neoseps reynoldsi*	T	Inhabits 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	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.	Projected mineral development is not likely to adversely affect; existing lease NSO stipulations excludes development from scrub and sandhill habitats. Habitat at Lake	Not likely to adversely affect. NSO #10 prohibits surface occupancy in scrub habitats. Surface tract management same as	Same as Alternative B.	Same as Alternative B.

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		elevations of 27 meters or more, in St. Lucie fine and Lakeland yellow sands.			Marion expected to improve with management if incorporated into the Lake Wales Ridge NWR. Marginal habitat would be lost if tract exchanged.	Alternative A.		
Amphibians								
Reticulated flatwoods salamander *Ambystoma bishopi*	E	Typically found in mesic longleaf pine (*Pinus palustris*)-wiregrass (*Aristida stricta*) flatwoods and savannas, and breeds in ephemeral isolated wetlands. In Florida, restricted to coastal plain from Apalachicola River westward through Escambia County.	Range is outside the AEDs.	Lathrop Bayou contains suitable habitat. Survey completed in 2005 by Florida Fish and Wildlife Commission (FFWCC) did not find larvae in surveys of ephemeral wetlands. No other surface tracts are within the range of this species.	Projected mineral development would have no effect. Habitat suitability is expected to be maintained through management at Lathrop Bayou.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Frosted flatwoods salamander *Ambystoma cingulatum*	T	Typically found in mesic longleaf pine-wiregrass flatwoods and savannas, and breeds in ephemeral isolated wetlands. In Florida, restricted to the Panhandle from Franklin County	Range is outside the AEDs.	No surface tracts within known range.	Projected mineral development would have no effect. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		eastward.						
Fish								
Gulf surgeon *Acipenser oxyrinchus desotoi*	T	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 supports the largest numbers.	Range is outside the AEDs.	Lathrop Bayou is in a tidally influenced bay west of the Apalachicola River in the range of the species.	Projected mineral development would have no effect. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Okaloosa darter *Etheostoma okaloosae*	T	Restricted to six 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 AEDs.	No surface tracts located on rivers in known range.	Projected mineral development would have no effect. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Mussels								
Chipola slabshell *Elliptio chipolaensis*	T	Inhabits silty sand substrates of large creeks and the main channel of the Chipola River in slow to moderate	Range is outside the AEDs.	No surface tracts located on rivers in known range.	Projected mineral development would have no effect. Surface tract management	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		current. Currently restricted to Chipola River system in Calhoun, Gulf, and Jackson counties.			would have no effect.			
Fat three-ridge Amblema neislerii	E	Inhabits that main channel of small to large rivers in slow to moderate current. Documented in the Apalachicola and lowermost portions of the Chipola River in Florida.	Range is outside the AEDs.	No surface tracts located on rivers in known range.	Projected mineral development would have no effect. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Gulf moccasinshell *Medionidus penicillatus*	E	Inhabits the channels of small to medium 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 AEDs.	Lathrop Bayou is the only surface tract in the known range; but it has no surface freshwater.	Projected mineral development would have no effect. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Ochlockonee moccasinshell *Medionidus simpsonianus*	E	Inhabits large creeks and the Ochlockonee River. Currently restricted to stretch above Talquin Reservoir.	Range is outside the AEDs.	No surface tracts located on rivers in known range.	Projected mineral development would have no effect. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Oval pigtoe	E	Inhabits small to medium creeks to	Range is outside	Lathrop Bayou is the only	Projected mineral development	Same as	Same as	Same as

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
Pleurobema pyriforme		small rivers where it inhabits silty sand to sand and gravel substrates, usually in slow to moderate current. Occurs in the Apalachicola−Chattahoochee−Flint river basin, and Econfina, Ochlockonee, and Suwannee river systems in central Panhandle area.	the AEDs.	surface tract in the known range; but it has no surface freshwater.	would have no effect. Surface tract management would have no effect.	Alternative A.	Alternative A.	Alternative A.
Purple bankclimber *Elliptoideus sloatianus*	T	Inhabits 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 AEDs.	Lathrop Bayou is the only surface tract in the known range; but it has no surface freshwater.	Projected mineral development would have no effect. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
shinyrayed pocketbook *Lampsilis subangulata*	E	Inhabits small to medium creeks to rivers in clean or silty sand substrates in slow to moderate current. Is thought to persist at 45 sites in	Range is outside the AEDs.	Lathrop Bayou is the only surface tract in the known range; but it has no surface freshwater.	Projected mineral development would have no effect. Surface tract management would have no	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		7 different watersheds in Panhandle.			effect.			
Snails								
Stock Island tree snail *Orthalicus reses (not incl. nesodryas)*	T	An arboreal snail inhabiting the 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 AEDs.	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.	Projected mineral development would have no effect. Surface tract management would have no effect.	Projected mineral development would have no effect. NSO #9 excludes oil and gas development in the Keys. Surface tract management would have no effect.	Same as Alternative B.	Same as Alternative B.
Insects								
Bartram's hairstreak butterfly *Strymon acis bartrami*	E	Restricted to pine rocklands with host plant pineland croton. Occurs in Florida Keys and mainland Miami-Dade County.	Range is outside the AEDs.	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	Projected mineral development would have no effect. Surface tract management would have no effect.	Projected mineral development would have no effect. NSO #9 excludes oil and gas development in the Keys. Surface tract management would have no effect.	Same as Alternative B.	Same as Alternative B.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
				tract from 2001 and 2004.				
Florida leafwing butterfly *Anaea troglodyta floridalis*	E	Restricted to pine rocklands with host plant pineland croton. Occurs in Florida Keys and mainland Miami-Dade County.	Range is outside the AEDs.	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.	Projected mineral development would have no effect. Surface tract management would have no effect.	Projected mineral development would have no effect. NSO #9 excludes oil and gas development in the Keys. Surface tract management would have no effect.	Same as Alternative B.	Same as Alternative B.
Highlands tiger beetle *Cicindela highlandensis*	C	Inhabits 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.	Projected mineral development would have no effect. Existing lease NSO stipulations exclude mineral development from scrub and sandhill habitats. Surface tract management would have no effect.	Projected mineral development is not likely to adversely affect. NSO #10 prohibits surface occupancy in scrub habitats. Surface tract management would have no effect.	Same as Alternative B	Same as Alternative B.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
Miami blue butterfly *Cyclargus (=Hemiargus) thomasi bethunebakeri*	E	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, scrub, and pine rocklands). Occurs only in Monroe and Miami-Dade counties in 2 very restricted metapopulations.	Range is outside the AEDs.	Potential to occur on the Sugarloaf Key or Park Key tracts, but these areas are outside the known occurrences at Marquesas and Boca Grande in the Key Deer NWR.	Projected mineral development would have no effect. Surface tract management would have no effect.	Projected mineral development would have no effect. NSO #9 excludes oil and gas development in the Keys. Surface tract management would have no effect.	Same as Alternative B.	Same as Alternative B.
Schaus swallowtail butterfly *Heraclides aristodemus ponceanus*	E	*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 AEDs.	Sugarloaf Key and Park Key tracts are south of the known range.	Projected mineral development would have no effect. Surface tract management would have no effect.	Projected mineral development would have no effect. NSO #9 excludes oil and gas development in the Keys. Surface tract management would have no effect.	Same as Alternative B.	Same as Alternative B.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
Corals								
Elkhorn coral *Acropora palmata*	T	Limited to shallow-water hard-bottom communities, including reef rubble communities, reef crests, reef flats, spur and groove reefs, and transitional reefs, typically 1–5 meters. Occurs in Miami-Dade and Monroe counties.	Range is outside the AEDs.	Potential to occur in vicinity of the Sugarloaf Key and Park Key tracts. BLM jurisdiction does not extend beyond mean high water.	Projected mineral development would have no effect. Surface tract management would have no effect.	Projected mineral development would have no effect. NSO #9 excludes oil and gas development in the Keys. Surface tract management would have no effect.	Same as Alternative B.	Same as Alternative B.
Staghorn coral *Acropora cervicornis*	T	Typically occurs 15–30 meters on fore-reef communities on bank reefs and fringing reefs. Occurs in Miami-Dade and Monroe counties.	Range is outside the AEDs.	Potential to occur in vicinity of the Sugarloaf Key and Park Key tracts. BLM jurisdiction does not extend beyond mean high water.	Projected mineral development would have no effect. Surface tract management would have no effect.	Projected mineral development would have no effect. NSO #9 excludes oil and gas development in the Keys. Surface tract management would have no effect.	Same as Alternative B.	Same as Alternative B.
Lichens								
Florida perforate cladonia *Cladonia*	E	Occurs in open Florida oak or sand pine scrub, often associated with	Phosphate FMO is southwest of the Florida Central Ridge and outside	Jupiter Inlet Lighthouse ONA supports several thousand	Projected mineral development is not likely to adversely affect;	Not likely to adversely affect. NSO #10	Same as Alternative B.	Same as Alternative B.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
perforata		ceratiola. 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 counties.	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.	individuals. Lake Marion tract has potential habitat, but habitat is marginal and perforate lichen has not been observed despite several surveys of the site.	existing lease stipulation prohibits surface occupancy from scrub habitats. Habitat improvement and population management at Jupiter is expected to benefit species.	prohibits surface occupancy in scrub habitats. Surface tract management same as Alternative A.		
Plants								
Aboriginal prickly-apple *Harrisia aboriginum*	E	Typical habitats are shell mounds, coastal berms, coastal strand, maritime hammocks, and coastal grasslands in Charlotte, Lee, and Sarasota counties.	Range is outside the AEDs.	Potential to occur on the Gasparilla tract, although site heavily infested with exotic plants. Closest occurrence records are 1.5 miles south of the tract from 2006.	Projected mineral development would have no effect. Lack of surface tract management, particularly control of exotic plant species would continue to degrade suitable habitats.	Projected mineral development would have no effect. Transfer to the state is not expected to adversely affect.	Same as Alternative B.	Same as Alternative B.
Avon Park harebells *Crotalaria avonensis*	E	Endemic to the xeric white sand scrub of the Lake Wales ridge of central Florida. Only three populations are known, and they are all in Polk and Highlands counties	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	Projected mineral development would have no effect. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		near Avon Park.						
Beach jacquemontia *Jacquemontia reclinata*	E	Typically found on the 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 AEDs.	Jupiter Inlet Lighthouse ONA is within the range of the species, but is 0.5 miles inland from the coast. Species has not been documented at the ONA despite extensive surveys of the site.	Projected mineral development would have no effect. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Beautiful pawpaw *Deeringotham-nus pulchellus*	E	Typically found in 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 AED 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.	Oil and gas development is not likely to adversely affect due to small number of wells (3) projected in state and distance of FMO from known occurrence records. Phosphate development would not affect. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Big Pine partridge pea	C	Found in primarily in pine rockland	Range is outside the AEDs.	No known occurrences on	Projected mineral development	Projected mineral	Same as Alternative B.	Same as Alternative B.

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Chamaecrista lineata var. keyensis		vegetation. Occurs only in Monroe County on Big Pine Key and Cudjoe Key.		Sugarloaf Key and Park Key tracts.	would have no effect. Surface tract management would have no effect.	development would have no effect. NSO #9 excludes oil and gas development in the Keys. Surface tract management would have no effect.		
Blodgett's silverbush *Argythamnia blodgettii*	C	Grows in 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 AEDs.	No known occurrences on Sugarloaf Key and Park Key tracts	Projected mineral development would have no effect. Surface tract management would have no effect.	Projected mineral development would have no effect. NSO #9 excludes oil and gas development in the Keys. Surface tract management would have no effect.	Same as Alternative B.	Same as Alternative B.
Carter's mustard *Warea carteri*	E	Found in sandy clearings in sand scrub and sandhills; scattered overstory of sand; longleaf or slash pine and scrub oaks. Occurs in the Lake Wales Ridge in Glades, Highland,	Phosphate FMO is southwest of the Florida Central Ridge and outside the expected range of this species.	Small population recorded on the Lake Marion tract (7 individuals in 1997).	Projected mineral development would have no effect. Existing lease NSO stipulations exclude mineral development from scrub and sandhill	Not likely to adversely affect. NSO #10 prohibits surface occupancy in scrub habitats.	Same as Alternative B.	Same as Alternative B.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		and Polk counties.			habitats. Transfer of Lake Marion tract to USFWS for inclusion in Lake Wales Ridge NWR would provide habitat protection; exchange would result in loss of this occurrence but is expected to benefit species overall.	Surface tract management same as Alternative A.		
Cooley's meadowrue *Thalictrum cooleyi*	E	Grows in grass-sedge bogs, wet pine savannahs, and savannah-like areas. It may also grow along fire plow lines, in roadside ditches, woodland clearings, and powerline rights-of-way (ROW), 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 AEDs.	Known occurrence is 14 miles east of Freeport tract.	Projected mineral development would have no effect. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Everglades bully *Sideroxylon*	C	Restricted to pinelands with tropical understory	Range is outside the AEDs.	Sugarloaf Key and Park Key tracts are in	Projected mineral development would have no	Projected mineral development	Same as Alternative B.	Same as Alternative B.

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reclinatum ssp. Austroflorid-ense		vegetation on limestone rock (pine rocklands). Occurs in Miami-Dade and Monroe counties.		potential range, but surveys of the Keys have not documented any occurrences outside the mainland.	effect. Surface tract management would have no effect.	would have no effect. NSO #9 excludes oil and gas development in the Keys. Surface tract management would have no effect.		
Florida bonamia *Bonamia grandiflora*	T	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.	Projected mineral development would have no effect. Transfer of Lake Marion tract to USFWS for inclusion in Lake Wales Ridge NWR would provide habitat protection; exchange would result in loss of this occurrence but is expected to benefit species overall.	Not likely to adversely affect. NSO #10 prohibits surface occupancy in scrub habitats. Surface tract management same as Alternative A.	Same as Alternative B.	Same as Alternative B.
Florida golden aster *Chrysopsis floridana*	E	Sand pine scrub with exposed sunny openings or occurs on the ecotonal edges of scrub. Occurs in Hardee,	Potential to occur in the phosphate AED in Hardee, Hillsborough, and Manatee counties. Closest	Species is not known to occur on Egmont Key. Other surface tracts are outside known	Oil and gas development is not likely to adversely affect. Existing NSO stipulation	Projected mineral development would have no effect. NSO #10	Same as Alternative B.	Same as Alternative B.

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		Hillsborough, Manatee, and Pinellas counties.	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.	range.	prohibits surface occupancy from scrub habitats. Surface tract management would have no effect.	prohibits surface occupancy in scrub habitats. CSU #9 requires survey of all suitable habitat and no disturbances where plants may be affected. Surface tract management would have no effect.		
Florida pineland crabgrass *Digitaria pauciflora*	C	Most commonly along the ecotone between pine rockland and marl prairie, but do overlap somewhat 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 National Park Service.	Range is outside the AEDs. No leasing in national parks.	No surface tracts within known range.	Projected mineral development would have no effect. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Florida prairie-	C	Disturbed pine rockland, pine	Potential to occur on FMO in the oil	No surface tracts within	Projected mineral development not	Projected mineral	Same as	Same as

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clover *Dalea carthagenensis var. floridana*		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.	and gas AED in Collier County, but only occurrence records are in Miami-Dade County.	current range, and no suitable habitat on surface tracts in historic range.	likely to adversely affect Surface tract management would have no effect.	development not likely to adversely affect. CSU #9 requires survey of all suitable habitat and no disturbances where plants may be affected. Surface tract management would have no effect.	Alternative B.	Alternative B.
Florida semaphore cactus *Consolea corallicola*	E	Grows close to salt water on bare rock with a minimum of humus-soil cover in 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 in the Keys, in Miami-Dade and Monroe counties.	Range is outside the AEDs.	The Sugarloaf and Park Key tracts occur within the current range of the species, which has been expanded by augmentation projects. There are no records near any of the surface tracts.	Projected mineral development would have no effect. Surface tract management would have no effect.	Projected mineral development would have no effect. NSO #9 excludes oil and gas development in the Keys. Surface tract management would have no effect.	Same as Alternative B.	Same as Alternative B.

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Florida skullcap *Scutellaria floridana*	T	Found in 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 AEDs.	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.	Projected mineral development would have no effect. Species expected to benefit from continuing use of prescribed fire to maintain longleaf pine flatwoods at Lathrop Bayou.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Florida torreya *Torreya taxifolia*	E	Endemic to dozen ravine complexes along the Apalachicola River in Florida and adjacent Georgia. A fungal pathogen has decimated the populations. There are currently no reproducing individuals known in the wild, and the species is persisting only as stump shoots and occasional root sprouts.	Range is outside the AEDs.	No surface tracts within known range.	Projected mineral development not likely to adversely affect. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Florida ziziphus *Ziziphus celata*	E	Shrub endemic to the Lake Wales Ridge in central Florida occurs on the periphery of turkey oak sandhills	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	Projected mineral development is not likely to adversely affect; existing lease NSO stipulations	Not likely to adversely affect. NSO #10 prohibits surface	Same as Alternative B.	Same as Alternative B.

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		or yellow sand oak hickory scrub communities. Currently known to exist in only 5 remnant populations in Polk and Highlands counties.		suitable.	exclude development from scrub and sandhill habitats.	occupancy in scrub habitats. Surface tract management would not effect.		
Four-petal pawpaw *Asimina tetramera*	E	Found in 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 Palm Beach counties.	Range is outside the AEDs.	At least 4 naturally occurring plants at the Jupiter Inlet Lighthouse ONA, with 2 population augmentations (2009 and 20110, totaling 128 additional plants (5/19/14).	Projected mineral development would have no effect. Surface tract management at Jupiter Inlet Lighthouse ONA would continue to improve habitat and support recovery.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Graber's spurge *Chamaesyce garberi*	T	Found in 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 AED. 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 one 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	Projected mineral development would have no effect. Surface tract management would have no effect.	Projected mineral development would have no effect. NSO #9 excludes oil and gas development in the Keys. Surface tract management would have no effect.	Same as Alternative B.	Same as Alternative B.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
				considered suitable on the surface tracts.				
Godfrey's butterwort *Pinguicula ionantha*	T	Found on 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 AEDs.	Estimated several hundred plants occur at the Lathrop Bayou tract in Bay County. No other surface tracts within species range.	Projected mineral development would have no effect. Expected to benefit from continuing use of prescribed fire to maintain longleaf pine flatwoods at Lathrop Bayou.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Highlands scrub hypericum *Hypericum cumulicola*	E	Found in patches of open, nutrient-poor sand within oak and rosemary scrub. 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.	Projected mineral development is not likely to adversely affect; existing lease NSO stipulations exclude development from scrub and sandhill habitats. Surface tract management not expected to effect.	Not likely to adversely affect. NSO #10 prohibits surface occupancy in scrub habitats. Surface tract management same as Alternative A.	Same as Alternative B.	Same as Alternative B.
Johnson's seagrass *Halophila johnsonii*	T	Found in intertidal areas (typically 6” to 6’) in estuaries and tidal rivers. Occurs	Range is outside the AEDs.	Confirmed population in the Indian River Lagoon adjacent	Projected mineral development would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

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		from Indian River County south to Miami-Dade County.		to the Jupiter Inlet Lighthouse ONA.	Shoreline stabilization projects are expected to benefit sea grass beds in the Indian River Lagoon and Loxahatchee River.			
Key tree cactus *Pilosocereus robinii*	E	Found in 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 AEDs.	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, but habitat is not considered suitable.	Projected mineral development would have no effect. Surface tract management would have no effect.	Projected mineral development would have no effect. NSO #9 excludes oil and gas development in the Keys. Surface tract management would have no effect.	Same as Alternative B.	Same as Alternative B.
Lewton's polygala *Polygala lewtonii*	E	Found in sandhills characterized by longleaf pine and low scrub oaks, including low turkey oak woods, and transitional sandhill/ scrub habitats. Occurs only on the	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.	Projected mineral development is not likely to adversely affect; existing lease NSO stipulations exclude development from scrub and sandhill	Not likely to adversely affect. NSO #10 prohibits surface occupancy in scrub habitats. Surface tract	Same as Alternative B.	Same as Alternative B.

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		Central Florida Ridge in Highlands, Lake, Marion, Orange, Osceola, and Polk counties.			habitats. Surface tract management would have no effect.	management same as Alternative A.		
Okeechobee gourd *Cucurbita okeechobe-ensis ssp. Okeechobe-ensis*	E	Associated with pond apple forest that Lake Okeechobee. Currently along the St. Johns River, which separates Volusia, Seminole, and Lake counties in north Florida, and a second location around the shoreline of Lake Okeechobee in South Florida.	Range is outside the AEDs.	Tavares and Jupiter Inlet Lighthouse ONA are in counties with occurrence records but neither has suitable habitat.	Projected mineral development would have no effect. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Papery whitlow-wort *Paronychia chartacea*	T	Found in rosemary scrub (rosemary phase of sand pine scrub). Occurs in Lake Wales Ridge and in Washington and Bay counties in the Panhandle in the sandy areas along margins of karst lakes.	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.	Projected mineral development is not likely to adversely affect; existing lease NSO stipulations exclude development from scrub and sandhill habitats. Surface tract management would have no effect.	Not likely to adversely affect. NSO #10 prohibits surface occupancy in scrub habitats. Surface tract management same as Alternative A.	Same as Alternative B.	Same as Alternative B.
Pigeon wings	T	Found in turkey oak	Phosphate FMO is	Potential habitat	Projected mineral	Not likely to	Same as	Same as

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Clitoria fragrans		barrens with wire grass, bluejack, and turkey oak; also scrub and scrubby high pine. Occurs in Florida Central Ridge in Highlands and Polk counties.	southwest of the Florida Central Ridge and outside the expected range of this species.	at the Lake Marion tract, but has not been recorded there despite surveys.	development is not likely to adversely affect; existing lease NSO stipulations exclude development from scrub and sandhill habitats. Surface tract management would have no effect.	adversely affect. NSO #10 prohibits surface occupancy in scrub habitats. Surface tract management same as Alternative A.	Alternative B.	Alternative B.
Pygmy fringe-tree *Chionanthus pygmaeus*	E	Found in xeric, coarse white sand of scrub/oak scrub at the southern end of the 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.	Projected mineral development is not likely to adversely affect; existing lease NSO stipulations exclude development from scrub and sandhill habitats. Surface tract management would have no effect.	Not likely to adversely affect. NSO #10 prohibits surface occupancy in scrub habitats. Surface tract management same as Alternative A.	Same as Alternative B.	Same as Alternative B.
Sand flax *Linum arenicola*	C	Found in pine rockland, disturbed pine rockland, marl prairie, roadsides on rocky soils, and disturbed areas. Occurs in Miami-Dade and Monroe	Range is outside the AEDs.	Sand flax has been documented on Sugarloaf Key 0.38 miles northeast of surface tract, but when checked in	Projected mineral development would have no effect. Surface tract management would have no effect.	Projected mineral development would have no effect. NSO #9 excludes oil and gas	Same as Alternative B.	Same as Alternative B.

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		counties.		November 2005, after Hurricane Wilma, there were no living plants.		development in the Keys. Surface tract management would have no effect.		
Sandlace *Polygonella myriophylla*	E	Found in 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.	Projected mineral development is not likely to adversely affect; existing lease NSO stipulations exclude development from scrub and sandhill habitats. Surface tract management would have no effect.	Not likely to adversely affect. NSO #10 prohibits surface occupancy in scrub habitats. Surface tract management same as Alternative A.	Same as Alternative B.	Same as Alternative B.
Scrub blazingstar *Liatris ohlingerae*	E	Found in openings in oak-rosemary scrub and 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.	Projected mineral development is not likely to adversely affect; existing lease NSO stipulations exclude development from scrub and sandhill habitats. Surface tract management would have no effect.	Not likely to adversely affect. NSO #10 prohibits surface occupancy in scrub habitats. Surface tract management same as Alternative A.	Same as Alternative B.	Same as Alternative B.

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Scrub buckwheat *Eriogonum longifolium var. gnaphalifolium*	T	More commonly found 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.	Projected mineral development is not likely to adversely affect; existing lease NSO stipulations exclude development from scrub and sandhill habitats. Surface tract management would have no effect.	Not likely to adversely affect. NSO #10 prohibits surface occupancy in scrub habitats. Surface tract management same as Alternative A.	Same as Alternative B.	Same as Alternative B.
Scrub lupine *Lupinus aridorum*	E	Found sand pine scrub species in well-drained sandy soils of the Lakewood or St. Lucie series, or sand pine and rosemary (*Ceratiola ericoides*). Occurs only in Polk, Orange, and Osceola 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.	Projected mineral development is not likely to adversely affect; existing lease NSO stipulations exclude development from scrub and sandhill habitats. Surface tract management would have no effect.	Not likely to adversely affect. NSO #10 prohibits surface occupancy in scrub habitats. Surface tract management same as Alternative A.	Same as Alternative B.	Same as Alternative B.
Scrub mint *Dicerandra frutescens*	E	Found in and around the sand pine evergreen oak scrub, where it may occur in the low shrub layer or in open stands, clearings, or	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.	Projected mineral development is not likely to adversely affect; existing lease NSO stipulations exclude development from	Not likely to adversely affect. NSO #10 prohibits surface occupancy in	Same as Alternative B.	Same as Alternative B.

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		adjacent sandy places. Occurs in a very limited portion of the Lake Wales Ridge in Highlands County.			scrub and sandhill habitats. Surface tract management would have no effect.	scrub habitats. Surface tract management same as Alternative A.		
Scrub plum *Prunus geniculata*	E	Found in 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.	Projected mineral development is not likely to adversely affect; existing lease NSO stipulations exclude development from scrub and sandhill habitats. Surface tract management would have no effect.	Not likely to adversely affect. NSO #10 prohibits surface occupancy in scrub habitats. Surface tract management same as Alternative A.	Same as Alternative B.	Same as Alternative B.
Short-leaved rosemary *Conradina brevifolia*	E	Found in white sands of sand pine-oak scrub of the Lake Wales Ridge. Occurs in Polk, Highlands, and Osceola 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.	Projected mineral development is not likely to adversely affect; existing lease NSO stipulations exclude development from scrub and sandhill habitats. Surface tract management would have no effect.	Not likely to adversely affect. NSO #10 prohibits surface occupancy in scrub habitats. Surface tract management same as Alternative A.	Same as Alternative B.	Same as Alternative B.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
Telephus spurge *Euphorbia telephioides*	T	Found in 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 AEDs.	Potential habitat at Lathrop Bayou tract, but not recorded despite repeated surveys.	Projected mineral development would have no effect. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Tiny polygala *Polygala smallii*	E	Found in 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 AEDs.	Jupiter Inlet Lighthouse ONA is within species range, but habitats are not considered suitable.	Projected mineral development would have no effect. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Wedge spurge *Chamaesyce deltoidea ssp. serpyllum*	C	Known only from pine rockland vegetation on Big Pine Key in Monroe County.	Range is outside the AEDs.	Sugarloaf Key and Park Key tracts are more than 11 miles southwest of occurrence 2005 record and habitat is not considered suitable.	Projected mineral development would have no effect. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
White birds-in-a-nest *Macbridea alba*	T	Found in grassy vegetation on poorly drained, infertile sandy peat soils of	Range is outside the AEDs.	Occurs at Lathrop Bayou. No other surface tracts are within	Projected mineral development would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		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.		species range.	Species expected to benefit from continuing use of prescribed fire to maintain longleaf pine flatwoods at Lathrop Bayou.			
Wide-leaf warea *Warea amplexifolia*	E	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.	Projected mineral development is not likely to adversely affect; existing lease NSO stipulations exclude development from scrub and sandhill habitats. Surface tract management would have no effect.	Not likely to adversely affect. NSO #10 prohibits surface occupancy in scrub habitats. Surface tract management same as Alternative A.	Same as Alternative B.	Same as Alternative B.
Wireweed *Polygonella basiramia*	E	Restricted to bare patches within sand pine-evergreen oak scrub vegetation. Characteristic of early scrub vegetation	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.	Projected mineral development is not likely to adversely affect; existing lease NSO stipulations exclude	Not likely to adversely affect. NSO #10 prohibits surface occupancy in	Same as Alternative B.	Same as Alternative B.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		development; often absent from later stages. Occurs Highlands and Polk counties			development from scrub and sandhill habitats. Surface tract management would have no effect.	scrub habitats. Surface tract management same as Alternative A.		

4.7.4 Kentucky

In Kentucky, there is potential for oil and gas development to adversely affect gray bat, Indiana bat, northern long-earted bat, bald eagle, and Price's potato-bean *(Apios priceana*) in one or more of the alternatives. The projected coal development has potential to affect gray bat, Indiana bat, blackside dace, Cumberland darter, Kentucky arrow darter *(Etheostoma sagittal spilotum)*, Palezone shiner *(Notropis albizonatus)*, fluted kidneyshell *(Ptychobranchus subtentum)*, snuffbox *(Epioblasma triquetra)*, tan riffleshell *(Epioblasma florentina walker)*, Virginia spirea *(Spiraea virginiana)*, and white-fringeless orchid *(Platanthera integrilabia)* in one or more alternatives.

- In Alternative A, there is potential for oil and gas development to adversely affect gray bat foraging habitat, as well as known hibernacula or maternal roost caves near Lake Barkley, Lake Cumberland, and Dale Hollow Lake. In Alternatives B, C and D, these effects are expected to be avoided with aquatic and wetland buffers of 250 feet, 500 feet, and 100 feet, respectively, with the provision to extend the buffer to 500 feet or 1,000 feet where the slope exceeds 10 percent. In addition, no surface disturbance would be permitted within 10 miles of gray bat hibernacula, 5 miles of maternity caves, and 2.5 miles of other records. All cave and karst features would be buffered 1,000 feet, and no reinjection of produced water would be permitted in karst regions.
- In Alternative A, there is potential for oil and gas development to adversely affect Indiana bat foraging habitat, as well as hibernacula, and maternity and summer roost sites across the state, including at Lake Barkley, Nolin River Lake, Cumberland Lake, Dewey Lake, and Yatesville Lake. In Alternatives B, C, and D, these effects are expected to be avoided by a 10-mile buffer around hibernacula, a 5-mile buffer around maternity sites, and a 2.5 mile aound other records. In addition, all cave and karst features would be buffered 1,000 feet, and no reinjection of produced water permitted in karst regions.
- In Alternative A, there is potential to adversely affect northern long-eared bat. In Alternatives B, C, and D, northern long-eared bat, where they occur with other federally listed bat species, would be protected by those lease stipulations that exclude surface disturbance within 10 miles of hibernacula, 5 miles of maternity roosts, and 2.5 of other records. If listed, these lease stipulations would also apply specifically to northern long-eared bats.
- National Bald Eagle Management Guidelines would be implemented across all alternatives, but in Alternatives A and D, the aquatic and wetland buffer is not considered sufficient to protect foraging habitat in the case of an oil- and gas-related spill or leak.
- Price's potato-bean has potential to be adversely affected by oil and gas development in western Kentucky; however, in Alternatives B, C, and D, mineral leasing stipulations would require surveys and setbacks to avoid effects on special status plants.

Effects on all special status species from underground coal mining would be related to the potential to alter water quality below mine discharge points, and the potential for mine subsidence to affect local hydrology, particularly in the upper reaches of drainages. In all alternatives, BMPs would permit the surface discharge of produced water only if the applicant could document that it would not adversely affect special status species (see Appendix D). This is expected to reduce the potential to affect. There is the potential for subsidence to affect hydrology, but in most cases, the effects could be avoided by modifications to mining operations and impacts from subsidence are expected to be negligible.

Table 4-28 lists those special status species that occur or are suspected to occur in the *decision area* and provides a determination of affect by alternative with a reference to the stipulations that could reduce that affect.

Table 4-28 Kentucky Impacts on Special Status Species from Energy and Mineral Development

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
Mammals							
Gray bat *Myotis grisescens*	E	Foraging habitat in forested riparian areas. Roosting habitat in caves year-round; however, migration occurs between subterranean caves used in the winter as hibernacula and caves used in the summer as maternal roosts. Cave roosts are often close to water bodies, within 1 km of rivers or lakes. White-nose syndrome has been confirmed in at least 4 locations in Kentucky, including Mammoth Cave in Edmonson and Barren counties, and Breckinridge, Trigg, and Wayne counties, as of 01/17/13.	In the oil and gas AEDs, gray bat occurrence records are 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 3 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 within 1.6 miles of FMO associated with Sinking Fork. At Lake Cumberland, there is a foraging record 1 mile from FMO in the AED. There is also a hibernacula record within 1.3	Oil and gas development is likely to adversely affect foraging habitat in Bell, Clinton, and Trigg counties, where 4 wells are projected over the next 10 years disturbing 19 acres. There is also potential to affect foraging habitat in other counties surrounding these lakes. There is potential for oil and gas drilling activities, including access roads, to occur within a mile of known hibernacula or maternal roost caves at Lake Barkley, Lake Cumberland, and Dale Hollow Lake. Development of underground coal resources has potential to affect foraging habitats through subsidence in riparian zones	Oil and gas development is not likely to adversely affect. NSO #3 within 10 miles of hibernacula, 5 miles of maternity roosts, and 2.5 miles of other records. NSO #5 within 1,000 feet of cave or karst feature. NSO #16 within 250 feet of wetland and aquatic habitats. CSU #7 prohibits reinjection of produced or flowback waters into karst formations. Coal impacts would be the same as in Alternative A.	Oil and gas development is not likely to adversely affect. NSO #3 same as Alternative B. NSO #5 buffer increased to 1,500 feet. NSO #16 buffer increased to 500 feet. CSU #7 same as Alternative B. Coal impacts would be the same as in Alternative A.	Projected oil and gas development is likely to adversely affect. NSO #3 same as Alternative B. NSO #5 same Alternative B. NSO #16 buffer decreased to 100 feet. CSU #7 same as Alternative B. Coal impacts would be the same as in Alternative A.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
			miles of FMO, but 17 miles from the AED. At Dale Hollow Lake, there are 2 maternity site records (1 mile and 2.5 miles) from FMO in the AED. At Kentucky Ridge State Forest, there is a 2002 mist net record within 5 miles of FMO. In addition, at Nolin Lake, occurrence records are 7 miles upstream from FMO outside the AED in Edmonson County. There is potential for additional roosting occurrences in caves and foraging occurrences within 135 km 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	and potential changes to water quality downstream of settling pond release points. Most hibernacula are located outside the coal potential area. Given the limited surface disturbance, it is expected that underground coal mining could affect, but is not expected to adversely affect the gray bat.			

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
			hibernacula are located outside the coal potential area.				
Indiana bat *Myotis sodalist*	E	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.	In the oil and gas AEDs, Indiana bat occurrence records are associated with FMO at Lake Barkley (Trigg County), Nolin River Lake, Cumberland Lake (Clinton County), Dewey Lake (Floyd County), and Yatesville Lake (Lawrence County). At Lake Barkley, there is 1 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 AED, and a hibernacula record 2 miles from FMO, but10 miles outside the AED. At Cumberland Lake, there are 2 mist net records1.3 and 2.5 miles from FMO in the AED. A	Oil and gas development is likely to adversely affect known hibernacula at Lake Barkley and Nolin Lake, and is likely to adversely affect foraging habitat and roost locations across oil and gas AED where a total of 139 acres of initial disturbance are projected. Most hibernacula are located outside the coal potential area. Given the limited surface disturbance, it is expected that underground coal mining could affect, but is not expected to adversely affect the Indiana bat.	Oil and gas development is not likely to adversely affect. NSO #3 within 10 miles of hibernacula, 5 miles of maternity roosts, and 2.5 miles of other records. NSO #5 within 1,000 feet of cave or karst feature. NSO #16 within 250 feet of wetland and aquatic habitats. CSU #3 prohibits removal of trees or snags over 5 inches dbh between March 16 and November 30 in known or potential habitat. CSU #7 prohibits reinjection of produced or flowback waters into karst formations. Coal impacts would	Oil and gas development is not likely to adversely affect. NSO #3 same as Alternative B. NSO #5 buffer increased to 1,500 feet. NSO #16 buffer increased to 500 feet. CSU #3 same as Alternative B. CSU #7 same as Alternative B. Coal impacts would be the same as in Alternative A.	Oil and gas development is not likely to adversely affect. NSO #3 same as Alternative B. NSO #5 same as Alternative B. NSO #16 buffer decreased to 100 feet. CSU #3 same as Alternative B. CSU #7 same as Alternative B. Coal impacts would be the same as in Alternative A.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
			cluster of hibernacula locations in Pulaski County are 23 miles from any major FMO in the AED associated with Cumberland Lake. At Yatesville Lake, there was a summer roost record within 1.7 miles of 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 the coal potential area. In the coal high potential area, there are maternity mist net records on FMO at Dewey Lake. In the area with moderate potential for coal development, there are records at Yatesville Lake, with a summer mist		be the same as in Alternative A.		

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
			net record 1.7 miles from FMO. Records in Menifee, Rowan, and western Morgan counties are all more than 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 for the Indiana bat to occur in suitable habitat in other areas across the state.				
Northern long-eared bat (*Myotis septentrionalis*)	P	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 AED.	Oil and gas development is likely to adversely affect foraging and roosting habitat across the state. Given the limited surface disturbance anticipated with any BLM coal development, it is expected that underground coal mining could affect, but is not expected	Oil and gas development is not likely to adversely affect. NSO #3 within 10 miles of hibernacula, 5 miles of maternity roosts, and 2.5 miles of other records. NSO #5 within 1,000 feet of cave or karst feature. NSO #16 within	Oil and gas development is not likely to adversely affect. NSO #3 same as Alternative B NSO #5 buffer increased to 1,500 feet. NSO #16 buffer increased to 500 feet. CSU #3 same as Alternative B	Projected oil and gas development is not likely to adversely affect. NSO #3 same as Alterntive B NSO #5 same Alternative B. NSO #16 buffer decreased to 100 feet. CSU #3 same as Alternative B

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
				to adversely affect the northern long-eared bat.	250 feet of wetland and aquatic habitats. CSU #3 prohibits removal of trees or snags over 5 inches dbh between March 16 and November 30 in known or potential habitat CSU #7 prohibits reinjection of produced or flowback waters into karst formations. Coal impacts would be the same as in Alternative A.	CSU #7 same as Alternative B. Coal impacts would be the same as in Alternative A.	CSU #7 same as Alternative B. Coal impacts would be the same as in Alternative A.
Virginia big-eared bat *Corynorhinus townsendii virginianus*	E	Foraging habitat in riparian hardwood forests and woodlands. Hibernacula and maternal roosts in caves, or sandstone rock shelter.	Records in Menifee, Rowan, and western Morgan counties associated with the Licking River are at least 10 miles from closest FMO at Grayson Lake in eastern Morgan County, with only 1 well projected in county. There is potential for this species to occur in suitable habitat on other	Projected oil and gas development is not likely to adversely affect. Coal development is not expected to affect.	Oil and gas development is not likely to adversely affect. NSO #3 within 10 miles of hibernacula, 5 miles of maternity roosts, and 2.5 miles of other records. NSO #5 within 1,000 feet of cave or karst feature. NSO #16 within 250 feet of wetland	Oil and gas development is not likely to adversely affect. NSO #3 same as Alternative B. NSO #5 buffer increased to 1,500 feet. NSO #16 buffer increased to 500 feet. CSU #7 same as Alternative B. Coal impacts would be the same as in	Projected oil and gas development is likely to adversely affect. NSO #3 same as Alternative B. NSO #5 same as Alternative B. NSO #16 buffer decreased to 100 feet. CSU #7 same as Alternative B. Coal impacts would be the same as in

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
			areas of FMO. Current occurrence records are outside the coal potential area.		and aquatic habitat. CSU #7 prohibits reinjection of produced or flowback waters into karst formations. Coal impacts would be the same as in Alternative A.	Alternative A.	Alternative A.
Birds							
Bald eagle *Haliaeetus leucocephalus*	D	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 the oil and gas AED and coal potential area on FMO associated with reservoirs, lakes, and major rivers.	Projected oil and gas development is not likely to adversely affect bald eagles' nesting sites, but foraging habitat could be adversely affected in the event of an accidental spill or leak. National Bald Eagle Management Guidelines would be applied with NSO excluding mineral development within 660 feet of active and inactive bald eagle nests and communal roost sites, and removal of trees within 0.5 miles of project.	Oil and gas development is not likely to adversely affect. NSO #2 implements National Bald Eagle Management Guidelines with 660-foot buffer around active and inactive bald eagle nests and communal roost sites. NSO #16 within 250 feet of wetlands and aquatic habitats. CSU #2 restricts removal of suitable nest trees within 0.5 miles. Coal development in the area of	Oil and gas development is not likely to adversely affect. NSO #2 buffer increased to 1,000 feet. NSO #16 buffer increased to 500 feet. CSU #2 buffer increased to 1 mile. Coal development in the area of projected development is not expected to affect.	Projected oil and gas development is not likely to adversely affect bald eagles' nesting sites, but foraging habitat could be adversely affected in the event of an accidental spill or leak. NSO #2 same as Alternative B. NSO #16 buffer reduced to 100 feet. CSU #2 same as Alternative B. Coal development in the area of projected development is not expected to affect.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
				Underground coal development in the area of projected development is not expected to adversely affect. Subsidence is unlikely to be permitted in areas along the lake shores where nest and roost sites are expected. Portal areas are also not expected to be located along the lake or reservoir shorelines.	projected development is not expected to affect.		
Fish							
Blackside dace *Phoxinum Cumberland-ensis*	T	Inhabits small (7–15 feet) headwater streams and creeks with moderate flows. Restricted to the Cumberland Plateau portion of the upper Cumberland drainage above and below Cumberland Falls.	Within the oil and gas AED, all occurrence records in 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	Projected oil and gas development is not likely to adversely affect. Coal development has the potential to adversely affect at Kentucky Ridge State Forest in Bell County through subsidence of headwater streams and potential changes in water quality.	Oil and gas development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. Coal impacts would be the same as in Alternative A.	Oil and gas development is not likely to adversely affect. NSO #16 buffer increased to 500 feet. Coal impacts would be the same as in Alternative A.	Oil and gas development is not likely to adversely affect. NSO #16 buffer decreased to 100 feet. Coal impacts would be the same as in Alternative A.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
			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-acre) tract of FMO on the Cumberland River. In the coal potential area, there are occurrence records associated with Kentucky Ridge State Forest in Bell County.				
Cumberland darter *Etheostoma susanae*	E	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 AED. In the coal potential area, there are occurrence records above a 68-acre tract of FMO along the Cumberland River in northwestern corner of Whitley County, outside of critical habitat.	Projected oil and gas development is not likely to adversely affect. Coal development has potential to adversely affect in the upper reaches of the Cumberland River where there is 68 acres of FMO above the confluence of Archers Creek. Potential Impacts would be related to impacts on water	Oil and gas development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. Coal impacts would be the same as in Alternative A.	Oil and gas development is not likely to adversely affect. NSO #16 buffer increased to 500 feet. Coal impacts would be the same as in Alternative A.	Oil and gas development is not likely to adversely affect. NSO #16 buffer decreased to 100 feet. Coal impacts would be the same as in Alternative A.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
				quality downstream, including settling pond discharge points, particularly during periods of low water.			
Kentucky arrow darter *Etheostoma sagittal spilotum*	C	Inhabits 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 AED and area of moderate development potential for coal.	Projected oil and gas development is not likely to adversely affect; occurrences are upstream of FMO associated with impounded Buckthorn Lake in Perry County and Carr Creek Lake in Knott County. Coal development has potential to adversely affect, if FMO at Buckthorn Lake is mined.	Oil and gas development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. Coal impacts would be the same as in Alternative A.	Oil and gas development is not likely to adversely affect. NSO #16 buffer increased to 500 feet. Coal impacts would be the same as in Alternative A.	Oil and gas development is not likely to adversely affect. NSO #16 buffer decreased to 100 feet. Coal impacts would be the same as in Alternative A.
Palezone shiner *Notropis albizonatus*	E	Inhabits 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 the oil and gas AED. 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	Oil and gas development is not likely to adversely affect. Coal development is likely to adversely affect in the upper reaches of the Little South Fork of the Cumberland River if this FMO were mined, but almost	Oil and gas development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. Coal impacts would be the same as in Alternative A.	Oil and gas development is not likely to adversely affect. NSO #16 buffer increased to 500 feet. Coal impacts would be the same as in Alternative A.	Oil and gas development is not likely to adversely affect. NSO #16 buffer decreased to 100 feet. Coal impacts would be the same as in Alternative A.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
			Little South Fork.	all of the FMO is within the Daniel Boone NF.			
Pallid sturgeon *Scaphirhynchus albus*	E	Inhabits 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 the AEDs.	Projected mineral development is not likely to adversely affect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Relic darter *Etheostoma chienense*	E	Inhabits 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 the AEDs.	Projected mineral development is not likely to adversely affect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Mussels							
Clubshell *Pleurobema clava*	E	Inhabits creeks and medium to large rivers in sand and gravel substrates.	Occurrences in Edmonson and Taylor counties are within the oil and gas AED. Range is outside the area of coal	Oil and gas development is not likely to adversely affect. In Taylor or Edmonson counties, occurrence records	Oil and gas development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and	Oil and gas development is not likely to adversely affect. NSO #16 buffer increased to 500 feet.	Oil and gas development is not likely to adversely affect. NSO #16 buffer decreased to 100 feet.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
			potential.	are upstream from FMO associated with the impounded Green River Lake, and only 1 well is projected over the next 10 years in those counties. Coal development is not expected to affect.	aquatic habitats. Coal impacts would be the same as in Alternative A.	Coal impacts would be the same as in Alternative A.	Coal impacts would be the same as in Alternative A.
Cracking pearlymussel *Hemistena lata*	E/X N	Inhabits sand, gravel, and cobble substrates in swift currents or mud and sand in slower currents.	Natural populations presumed extirpated in Kentucky.	Projected mineral development is not likely to adversely affect.	Projected mineral development is not likely to adversely affect. NSO #16 prohibits surface occupancy within 250 feet of wetlands and aquatic habitats.	Projected mineral development is not likely to adversely affect. NSO #16 buffer increased to 500.	Projected mineral development is not likely to adversely affect. NSO #16 decreased to 100 feet.
Cumberland bean *Villosa trabalis*	E	Inhabits 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.	In the oil and gas AED, most records near Cumberland Lake occurred prior to the dam construction in 1952. Both Laurel and Wayne counties, with extant populations, are outside the AED. In the coal potential area, Jackson and Laurel counties have small FMO	Projected mineral development is not likely to adversely affect.	Projected mineral development is not likely to adversely affect. NSO #16 prohibits surface occupancy within 250 feet of wetlands and aquatic habitats.	Projected mineral development is not likely to adversely affect. NSO #16 buffer increased to 500.	Projected mineral development is not likely to adversely affect. NSO #16 decreased to 100 feet.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
			tracts (<6 acres) along the Rockcastle River. There is no FMO in Jackson County.				
Cumberlandian combshell *Epioblasma brevidens*	E/ X N	Inhabits large creeks to large rivers with coarse sand to boulder-sized substrates, generally less than 1 meter. In Kentucky, occurs in South Fork of the Cumberland River, and low numbers in Powell and Clinch rivers.	In the oil and gas AED, there are records in Russell County, but it may no longer be extant. In the moderate coal potential area, in McCreary County there are occurrence records more than 20 miles above FMO on the Big South Fork Cumberland River above Cumberland Lake. Multiple records in the Buck Creek drainage are outside the AED. A record in Rockcastle River is in the AED but there is no FMO in the watershed. Experimental population in Knox County is within area of coal potential, but there is no FMO in Knox County.	Projected mineral development is not likely to adversely affect.	Projected mineral development is not likely to adversely affect. NSO #16 prohibits surface occupancy within 250 feet of wetlands and aquatic habitats.	Projected mineral development is not likely to adversely affect. NSO #16 buffer increased to 500.	Projected mineral development is not likely to adversely affect. NSO #16 decreased to 100 feet.
Cumberland	E/	Inhabits small to	All occurrence	Projected mineral	Projected mineral	Projected mineral	Projected mineral

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
elktoe *Alasmidonta atropurpurea*	X N	medium rivers in shallow flats or pools with slow current. In Kentucky, it occurs in the Big South Fork system of the Upper Cumberland River.	records are outside the oil and gas AED. 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 the Big South Fork Cumberland River 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.	development is not likely to adversely affect.	development is not likely to adversely affect. NSO #16 prohibits surface occupancy within 250 feet of wetlands and aquatic habitats.	development is not likely to adversely affect. NSO #16 buffer increased to 500.	development is not likely to adversely affect. NSO #16 decreased to 100 feet.
Dromedary bean *Dromus dromas*	E	Possibly extirpated in Kentucky.	In McCreary County, in the area of moderate coal	Projected mineral development is not likely to adversely	Projected mineral development is not likely to adversely	Projected mineral development is not likely to adversely	Projected mineral development is not likely to adversely

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
			potential, the only occurrence record (extirpated) in Big South Fork Cumberland River in the southern portion of county is more than 20 miles from FMO associated with Big South Fork Cumberland River above Cumberland Lake.	affect.	affect. NSO #16 prohibits surface occupancy within 250 feet of wetlands and aquatic habitats.	affect. NSO #16 buffer increased to 500.	affect. NSO #16 decreased to 100 feet.
Fanshell *Cyprogenia stegaria*	E	Inhabits 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 AED. However, there is no hydrologic connection to the only FMO in the area at Nolin Lake. No occurrence records associated with FMO in the area with coal potential.	Projected mineral development is not likely to adversely affect.	Projected mineral development is not likely to adversely affect. NSO #16 prohibits surface occupancy within 250 feet of wetlands and aquatic habitats.	Projected mineral development is not likely to adversely affect. NSO #16 buffer increased to 500.	Projected mineral development is not likely to adversely affect. NSO #16 decreased to 100 feet.
Fluted kidneyshell *Ptychobranchus subtentum*	E	Primarily small rivers to large creeks in sand and gravel substrates. Limited to 9 streams in the Cumberland River	Occurrence records are outside the oil and gas AEDs. In the area of moderate coal potential, occurrence records	Oil and gas development is not likely to adversely affect. Coal development has the potential to adversely affect in	Oil and gas development is not likely to adversely affect. NSO #16 prohibits surface occupancy within 250 feet of	Oil and gas development is not likely to adversely affect. NSO #16 buffer increased to 500.	Oil and gas development is not likely to adversely affect. NSO #16 decreased to 100

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		system.	in the headwaters above Lake Cumberland in McCreary, and Whitley counties.	the McCreary and Whitley counties, where populations occur downstream of FMO associated with Lake Cumberland and below Archers Creek.	wetlands and aquatic habitats. Coal impacts would be the same as in Alternative A.	Coal impacts would be the same as in Alternative A.	feet. Coal impacts would be the same as in Alternative A.
Littlewing pearlymussel *Pegias fabula*	E	Inhabits small to medium 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 (2001–2008) 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.	Projected mineral development is not likely to adversely affect.	Projected mineral development is not likely to adversely affect. NSO #16 prohibits surface occupancy within 250 feet of wetlands and aquatic habitats.	Projected mineral development is not likely to adversely affect. NSO #16 buffer increased to 500.	Projected mineral development is not likely to adversely affect. NSO #16 decreased to 100 feet.
Northern riffleshell *Epioblasma torulosa rangiana*	E	Inhabits smaller stream riffles with swift flowing, shallow water and a substrate of gravel. In Kentucky, only known population occurs in Green River.	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 AED, but there is no hydrologic connection to FMO at Nolin Lake. No occurrence	Projected mineral development is not likely to adversely affect.	Projected mineral development is not likely to adversely affect. NSO #16 prohibits surface occupancy within 250 feet of wetlands and aquatic habitats.	Projected mineral development is not likely to adversely affect. NSO #16 buffer increased to 500.	Projected mineral development is not likely to adversely affect. NSO #16 decreased to 100 feet.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
			records associated with FMO in the area of coal potential.				
Orangefoot pimpleback *Plethobasus cooperianus*	E	Inhabits 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 Cumberland River from FMO at Lake Cumberland. No occurrence records associated with FMO in the area of coal potential.	Projected mineral development is not likely to adversely affect.	Projected mineral development is not likely to adversely affect. NSO #16 prohibits surface occupancy within 250 feet of wetlands and aquatic habitats.	Projected mineral development is not likely to adversely affect. NSO #16 buffer increased to 500.	Projected mineral development is not likely to adversely affect. NSO #16 decreased to 100 feet.
Oyster mussel *Epioblasma capsaeformis*	E/ X N	Inhabits moderate to swift currents in large creeks and rivers; various substrates but rarely mud. In Kentucky, occurs in Buck Creek and Big South Fork in McCreary and Pulaski counties.	Known current range is outside the oil and gas AED. In McCreary County in the area of coal potential, occurrence records are more than 11 miles south of FMO associated with Little South Fork and Big South Fork of the Cumberland River.	Projected mineral development is not likely to adversely affect.	Projected mineral development is not likely to adversely affect. NSO #16 prohibits surface occupancy within 250 feet of wetlands and aquatic habitats.	Projected mineral development is not likely to adversely affect. NSO #16 buffer increased to 500	Projected mineral development is not likely to adversely affect. NSO #16 decreased to 100 feet.
Pink mucket *Lampsilis*	E	Occurs in large, fast-flowing rivers; can tolerate river-	Three occurrences (all pre-1989) are in the oil and gas AED	Projected mineral development is not likely to adversely	Projected mineral development is not likely to adversely	Projected mineral development is not likely to adversely	Projected mineral development is not likely to adversely

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
abrupta		like impoundments, but not standing water. In Kentucky, sporadic in the lower Ohio River to the Licking River.	between 3.5 and 10 miles below FMO associated with Lake Barkley. No occurrence records associated with FMO in the area of coal potential.	affect.	affect. NSO #16 prohibits surface occupancy within 250 feet of wetlands and aquatic habitats.	affect. NSO #16 buffer increased to 500.	affect. NSO #16 decreased to 100 feet.
Ring pink *Obovaria retusa*	E	Inhabits 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 River in Hart and Emerson counties.	Occurrence records include a 1987 record 8.5 miles south of FMO at Lake Barkley, 1982 record on the Green River in the oil and gas AED with no FMO in the watershed, and 2007 record 11 miles below FMO at Cumberland Lake. No occurrence records associated with FMO in the area of coal potential.	Projected mineral development is not likely to adversely affect.	Projected mineral development is not likely to adversely affect. NSO #16 prohibits surface occupancy within 250 feet of wetlands and aquatic habitats.	Projected mineral development is not likely to adversely affect. NSO #16 buffer increased to 500.	Projected mineral development is not likely to adversely affect. NSO #16 decreased to 100 feet.
Purple cat's claw *Epioblasma obliquata obliquata*	E	Inhabits 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 AED; however, only FMO in county is at Nolin Lake with no hydrologic connection to the Green River.	Projected mineral development is not likely to adversely affect.	Projected mineral development is not likely to adversely affect. NSO #16 prohibits surface occupancy within 250 feet of wetlands and aquatic habitats.	Projected mineral development is not likely to adversely affect. NSO #16 buffer increased to 500.	Projected mineral development is not likely to adversely affect. NSO #16 decreased to 100 feet.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
			No occurrence records associated with FMO in the area of coal potential.				
Rabbitsfoot *Quadrula cylindrica ssp. cylindrica*	T	Inhabits small to medium streams and larger rivers, usually in shallow areas where velocity is reduced. In Kentucky, occurs in the Tennessee and Red Rivers.	In the oil and gas AED, occurrence records include one historic occurrence inundated by Bards Lake, a 2007 record almost 8 miles below FMO at Bards Lake, and 1982 record in the Green River in the AED with no FMO in the watershed. There are historic records at Lake Cumberland in McCreary County and at Dewy Lake in Floyd County. There are no current occurrence records associated with FMO in the areas of coal potential.	Projected mineral development is not likely to adversely affect.	Projected mineral development is not likely to adversely affect. NSO #16 prohibits surface occupancy within 250 feet of wetlands and aquatic habitats.	Projected mineral development is not likely to adversely affect. NSO #16 buffer increased to 500.	Projected mineral development is not likely to adversely affect. NSO #16 decreased to 100 feet.
Rough pigtoe *Pleurobema plenum*	E	Inhabits medium to large rivers in shoals with cobble, sand, and gravel substrates. In Kentucky, occurs in portions of the	Two occurrences (1989 and 2002) in the Green River in the AED but no hydrologic connection to the only FMO in the	Projected mineral development is not likely to adversely affect.	Projected mineral development is not likely to adversely affect. NSO #16 prohibits surface occupancy within 250 feet of	Projected mineral development is not likely to adversely affect. NSO #16 buffer increased to 500.	Projected mineral development is not likely to adversely affect. NSO #16 decreased to 100

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		Tennessee River (below dams), Clinch River (between miles 154 and 323), Green River, and Barren River.	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 locations.		wetlands and aquatic habitats.		feet.
Sheepnose *Plethobasus cyphyus*	E	Usually has been reported in deep water (>2 meters) 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 3 miles. Occurrence records in Mammoth Cave National Park near FMO associated with Nolin Lake. Occurrence records associated with Cave Run Lake are outside the AED. No occurrence records associated with FMO in the area of coal potential.	Projected mineral development is not likely to adversely affect.	Projected mineral development is not likely to adversely affect. NSO #16 prohibits surface occupancy within 250 feet of wetlands and aquatic habitats.	Projected mineral development is not likely to adversely affect. NSO #16 buffer increased to 500.	Projected mineral development is not likely to adversely affect. NSO #16 decreased to 100 feet.
Slabside pearlymussel *Lexingtonia dolabelloides*	E	Inhabits large creeks to moderate size rivers in relatively shallow riffles and shoals with moderate current. In Kentucky, the	Current range outside the expected AEDs for both oil and gas, and coal.	Projected mineral development is not likely to adversely affect.	Projected mineral development is not likely to adversely affect. NSO #16 prohibits surface occupancy within 250 feet of	Projected mineral development is not likely to adversely affect. NSO #16 buffer increased to 500.	Projected mineral development is not likely to adversely affect. NSO #16 decreased to 100 feet.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		current range is in the Tennessee River system, outside the main river.			wetlands and aquatic habitats.		
Snuffbox *Epioblasma triquetra*	E	Inhabits small to medium 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.	Occurrence records associated with Nolin River north of Nolin Lake are outside the oil and gas AED. Occurrences in the Green River are in the AED but more than 4 miles from FMO associated with Nolin Lake and have no hydrologic connection. Occurrence records in the Kentucky River upstream from Buckhorn Lake are in the coal area of potential development, but Leslie County is not in the oil and gas AED. Occurrence records on Buck Creek in Pulaski County are outside the AED, and there is no hydrological connection to FMO in the AED. Occurrence records in Tygart's Creek	Oil and gas development is not likely to adversely affect. There is potential to adversely affect if there is coal mining of FMO associated with Buckhorn Lake.	Same as Alternative A, except: NSO #16 prohibits surface occupancy within 250 feet of wetlands and aquatic habitats. Coal impacts would be the same as in Alternative A.	Same as Alternative A, except: NSO #16 buffer increased to 500. Coal impacts would be the same as in Alternative A.	Same as Alternative A, except: NSO #16 decreased to 100 feet. Coal impacts would be the same as in Alternative A.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
			have no hydrologic connection to the closest FMO at Grayson Lake.				
Spectaclecase *Cumberlandia monodonta*	E	Inhabits 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 oil and gas AED. Occurrence records in the Green River in Edmonson County are in the oil and gas AED, but there is no hydrological connection to FMO at Nolin Lake in the northern part of the county. Extant occurrences in the Cumberland River basin are in areas without FMO or are outside the AED.	Projected mineral development is not likely to adversely affect.	Projected mineral development is not likely to adversely affect. NSO #16 prohibits surface occupancy within 250 feet of wetlands and aquatic habitats.	Projected mineral development is not likely to adversely affect. NSO #16 buffer increased to 500.	Projected mineral development is not likely to adversely affect. NSO #16 decreased to 100 feet.
Tan riffleshell *Epioblasma florentina walkeri*	E	Inhabits headwaters, riffles, and shoals in sand and gravel substrates. In Kentucky, occurs in the Upper Clinch River and Indian Creek, a tributary of the upper Clinch	Current range is in the coal AED in McCreary County. Occurrence records on the Big South Fork Cumberland River are approximately 12 miles southeast and upstream of	Oil and gas development is not likely to adversely affect. Potential to adversely affect in the coal area of potential in McCreary County.	Projected mineral development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. Coal impacts would be the same as in	Projected mineral development is not likely to adversely affect. NSO #16 buffer increased to 500 feet. Coal impacts would be the same as in	Projected mineral development is not likely to adversely affect. NSO #16 buffer decreased to 100 feet. Coal impacts would be the same as in

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		River.	FMO associated with the Little South Fork of the Cumberland River.		Alternative A.	Alternative A.	Alternative A.
White wartyback *Plethobasus cicatricosus*	E	Presumed to inhabit shoals and riffles in large rivers like the Tennessee River. Historic records in Oldham and Union counties, but possibly extinct in Kentucky	Current range is outside the AEDs.	Mineral development is not likely to adversely affect.	Projected mineral development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats.	Projected mineral development is not likely to adversely affect. NSO #16 buffer increased to 500 feet.	Projected mineral development is not likely to adversely affect. NSO #16 buffer decreased to 100 feet.
Arthropods							
Kentucky cave shrimp *Palaemonias ganteri*	E	Cave obligate known endemic to the Mammoth and Flint Ridge cave systems.	Occurrence records in Hart County are 3 miles east/ northeast of FMO associated with Nolin Lake. Hart County is outside the oil and gas AED. Occurrence records outside the coal area of potential.	Mineral development is not likely to adversely affect.	Mineral development is not likely to adversely affect. NSO #5 within 1,000 feet of cave openings or other karst features. NSO #16 buffer within 250 feet of wetlands and aquatic habitats. CSU #7 prohibits reinjection of produced or flowback waters into karst formations.	Mineral development is not likely to adversely affect. NSO #5 buffer increased to 1,500 feet. NSO #16 buffer increased to 500 feet. CSU #7 same as Alternative B.	Mineral development is not likely to adversely affect. NSO #5 same as Alternative B. NSO #16 buffer decreased to 100 feet. CSU #7 same as Alternative B.
Insects							
Clifton cave	C	Cave obligate known from 2	Range outside	Mineral development is not	Mineral development is not	Mineral development is not	Mineral development is not

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
beetle *Pseudanoph-thalmus caecus*		caves less than 2 kilometers apart in Woodford County.	AEDs.	likely to adversely affect.	likely to adversely affect. NSO #5 within 1,000 feet of cave openings or other karst features. NSO #16 buffer within 250 feet of wetlands and aquatic habitats. CSU #7 prohibits reinjection of produced or flowback waters into karst formations.	likely to adversely affect. NSO #5 buffer increased to 1,500 feet. NSO #16 buffer increased to 500 feet. CSU #7 same as Alternative B.	likely to adversely affect. NSO #5 same as Alternative B. NSO #16 buffer decreased to 100 feet. CSU #7 same as Alternative B.
Louisville cave beetle *Pseudanoph-thalmus troglodytes*	C	Cave obligate known from 2 caves in Jefferson County, Kentucky.	Range outside AEDs.	Mineral development is not likely to adversely affect.	Mineral development is not likely to adversely affect. NSO #5 within 1,000 feet of cave openings or other karst features. NSO #16 buffer within 250 feet of wetlands and aquatic habitats. CSU #7 prohibits reinjection of produced or flowback waters into karst formations.	Mineral development is not likely to adversely affect. NSO #5 buffer increased to 1,500 feet. NSO #16 buffer increased to 500 feet. CSU #7 same as Alternative B.	Mineral development is not likely to adversely affect. NSO #5 same as Alternative B. NSO #16 buffer decreased to 100 feet. CSU #7 same as Alternative B.
Tatum cave	C	Cave obligate	Range outside	Mineral	Mineral	Mineral	Mineral

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
beetle Pseudanoph-thalmus parvus		known from one cave in Marion County, presumed extant.	AEDs.	development is not likely to adversely affect.	development is not likely to adversely affect. NSO #5 within 1,000 feet of cave openings or other karst features. NSO #16 buffer within 250 feet of wetlands and aquatic habitats. CSU #7 prohibits reinjection of produced or flowback waters into karst formations.	development is not likely to adversely affect. NSO #5 buffer increased to 1,500 feet. NSO #16 buffer increased to 500 feet. CSU #7 same as Alternative B.	development is not likely to adversely affect. NSO #5 same as Alternative B. NSO #16 buffer decreased to 100 feet. CSU #7 same as Alternative B.
Plants							
Price's potato-bean *Apios priceana*	T	Open, mixed-oak forests, forest edges, and clearings on river bottoms and ravines; unable to tolerate deep shade.	In the oil and gas AED, occurrence records associated with Lake Barkley and Land Between the Lakes. Occurrence records outside the coal area of potential.	Projected oil and gas development may adversely affect, but only two wells projected in those counties. Coal development is not expected to affect.	Oil and gas development is not likely to adversely affect. CSU #9 requires all suitable habitat be surveyed and no disturbances where plants may be affected. Coal impacts would be the same as in Alternative A.	Same as Alternative B.	Same as Alternative B.
Cumberland sandwort *Arenaria cumberlan-*	E	Restricted to shady, moist rockhouse floors, overhanging ledges in	Occurrence records outside the oil and gas AED. Species	Projected mineral development is not likely to adversely affect.	Projected mineral development is not likely to adversely affect.	Same as Alternative B.	Same as Alternative B.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
densis		sandstone rock faces. Kentucky range in McCreary County.	occurrences in the coal AED, but no FMO in the Big South Fork National River and Recreation Area.		CSU #9 requires all suitable habitat be surveyed and no disturbances where plants may be affected.		
Kentucky glade cress *Leavenworthia exigua laciniata*	T	Restricted to open glades, shallow soils with flat-bedded Silurian dolomite and dolomitic limestone. Occurrences in Bullitt and Jefferson counties.	Range outside AEDs.	Projected mineral development not likely to adversely affect.	Projected mineral development is not likely to adversely affect. NSO #4 glades, fens, or barrens. CSU #9 requires all suitable habitat be surveyed and no disturbances where plants may be affected.	Same as Alternative B.	Same as Alternative B.
Short's bladderpod *Physaria globosa*	E	Grows on 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 AEDs.	Projected mineral development not likely to adversely affect	Projected mineral development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. CSU #9 requires all suitable habitat be surveyed and no disturbances where plants may be affected.	Projected mineral development is not likely to adversely affect. NSO #16 buffer increased to 500 feet. CSU #9 same as Alternative B.	Projected mineral development is not likely to adversely affect. NSO #16 buffer decreased to 100 feet. CSU #9 same as Alternative B.
Virginia spiraea *Spiraea virginiana*	T	Found along scoured banks of high gradient	No occurrence records in the oil and gas AED.	Projected oil and gas development would have no	Oil and gas development is not likely to adversely	Oil and gas development is not likely to adversely	Oil and gas development is not likely to adversely

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		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 1,000–2,400 feet.	In coal area of potential, there are occurrence records adjacent to FMO at Laurel River Lake in Whitley County.	effect. Potential to adversely affect by coal leasing upstream or beneath occurrence records.	affect. NSO #16 within 250 feet of wetlands and aquatic habitats. CSU #9 requires all suitable habitat be surveyed and no disturbances where plants may be affected. Coal impacts would be the same as Alternative A.	affect. NSO #16 buffer increased to 500 feet. CSU #9 same as Alternative B. Coal impacts would be the same as Alternative A.	affect. NSO #16 buffer decreased to 100 feet. CSU #9 same as Alternative B. Coal impacts would be the same as Alternative A.
White fringeless orchid *Platanthera integrilabia*	C	Grows in wet, boggy areas at the heads of streams and on seepage slopes.	No occurrence records in the oil and gas AED. In the moderate coal area of potential, there are 3 occurrence records in the Whitley County in the Daniel Boone NF. Occurrence records in McCreary County are more than 6 miles from FMO associated with Little South Fork.	Projected oil and gas development would have no effect. Potential to adversely affect by coal leasing upstream or beneath occurrence records.	Oil and gas development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. CSU #9 requires all suitable habitat be surveyed and no disturbances where plants may be affected. Coal impacts would be the same as Alternative A.	Oil and gas development is not likely to adversely affect. NSO #16 buffer increased to 500 feet. CSU #9 same as Alternative B. Coal impacts would be the same as Alternative A.	Oil and gas development is not likely to adversely affect. NSO #16 buffer decreased to 100 feet. CSU #9 same as Alternative B. Coal impacts would be the same as Alternative A.

4.7.5 Louisiana

In Louisiana, projected oil and gas development could adversely affect Louisiana black bear, West Indian manatee, interior least tern, piping plover, red-cockaded woodpecker, Sprague's pipit *(Anthus spragueii)*, gopher tortoise, green sea turtle, hawksbill sea turtle, Kemp's Ridley sea turtle, leatherback sea turtle, loggerhead sea turtle, Louisiana pine snake *(Pituophis ruthveni)*, ringed map turtle *(Graptemys oculifera)*, Gulf sturgeon *(Acipenser oxyrinchus desotoi)*, pallid sturgeon *(Scaphirhynchus albus)*, Louisiana pearlshell *(Margaritifera hembeli)*, earthstar *(Geocarpon minimum)*, and Louisiana quillwort *(Isoetes louisianensis)* in one or more of the alternatives.

- In Alternative A, Louisiana black bear could be adversely affected by oil and gas development in suitable habitat across the state. In Alternatives B and C, no surface occupancy would be permitted in suitable habitat in parishes with critical habitat, and in Alternative D, no surface occupancy would be permitted in suitable habitat in the actual critical habitat boundary. These leasing stipulations are expected to avoid adverse impacts on Louisiana black bear.
- West Indian manatee, green sea turtle, hawksbill sea turtle, Kemp's Ridley sea turtle, leatherback sea turtle, loggerhead sea turtle, Gulf sturgeon, and pallid sturgeon have the potential to be adversely affected by oil and gas drilling in Plaquemines Parish. In most cases, the projected wells in Plaquemines Parish are expected to be drilled on existing leases, which do not exclude drilling in aquatic or wetland habitats. In these cases, the potential to affect special status species would be determined on a case-by-case basis and is expected to require separate coordination with the USFWS and/or National Marine Fisheries Service to meet ESA Section 7 requirements.
- National Bald Eagle Management Guidelines would be implemented across all alternatives, but in Alternatives A and D, the aquatic and wetland buffer is not considered sufficient to protect foraging habitat in the case of an oil- and gas-related spill or leak.
- In Alternative A, interior least tern and piping plover could be adversely affected by oil and gas development on or near coastal shorelines or sandbanks on major rivers. These areas are excluded from development in Alternatives B, C, and D. In Alternative D, a 100-foot wetland and aquatic habitat buffer is not considered to be adequate to avoid displacing birds or provide sufficient distance to avoid potential contamination by accidental spills or leaks.
- Red-cockaded woodpecker has the potential to be adversely affected by oil and gas development, particularly on split-estate in-holdings in national forests where populations are being managed. In Alternative A, BLM would require separate coordination with the USFWS to meet ESA Section 7 requirements. In Alternatives B, C, and D, mineral leasing stipulations would require the setbacks of 0.5, 0.75, and 0.5 miles, respectively, from occupied red-cockaded woodpecker clusters to avoid potential impacts.
- In Alternative A, Louisiana pine snake has the potential to be affected by up to 15 wells in a four-county area in central Louisiana. In Alternatives B, C, and D, suitable habitat, typically longleaf pine savannas, would be surveyed prior to disturbance, and no surface disturbance permitted within 1,000 feet of pocket gopher *(Geomys breviceps)* burrow systems, which are strongly associated with Louisiana pine snake.
- In Alternative A, species associated with freshwater aquatic habitats, including ringed map turtle, Louisiana pearlshell, and Louisiana quillwort could be adversely affected by oil and gas activities adjacent to suitable or occupied habitat. In Alternatives B, C, and D mineral leasing stipulations would require setbacks from aquatic and wetland habitats of 250 feet, 500 feet, and 100 feet, respectively. These buffers could be extended if the slope were more than 10 percent, as needed to meet site conditions. Alternatives B and C are considered adequate to avoid adverse impacts on

these special status species. The 100-foot buffer in Alternative D is not considered adequate to avoid adverse impacts.

Surface tract management has the potential to affect Louisiana black bear at the Baldwin tract and Louisiana pearlshell at the Big Saline Bayou tract. In Alternative A, lack of management of the Baldwin County tract would preclude habitat protection of 330 acres of bottomland hardwood, marsh, and swamp habitats in Louisiana black bear critical habitat. In Alternatives B and C, BLM would retain the tract, actively manage to remove intrusions, and restore 30 acres of habitat. In Alternative D, the tract would be transferred to the Bayou Teche NWR to benefit black bear management. At Big Saline Bayou, the installation of a hardened boat launch facility would stabilize the bank of the bayou, improving water quality in this section of the Red River basin.

Table 4-29 lists those special status species that occur or are suspected to occur in the *decision area* and provides a determination of effect by alternative with a reference to the stipulations that could reduce that effect, or surface management actions that could affect the species.

Table 4-29 Louisiana Impacts on Special Status Species from Energy and Mineral Development and Surface Tract Management

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
Mammals								
Louisiana black bear *Ursus americanus luteolus*	T	Typically inhabits bottomland forests, but may use a variety of habitats. Hollow tree cavities important for denning. Critical habitat designated in southeastern Louisiana.	Could occur in suitable habitat across state. Critical habitat overlaps the AED 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 Louisiana. However, only 1 tract is in the AED, 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 the AED.	Oil and gas development is likely to adversely affect in suitable habitat across state, but particularly on FMO in or near the critical habitat boundaries. Highest potential for impacts to occur in critical habitat are in Richland Parish on the north, where 10 wells are projected over the next 10 years. The FMO tract in critical habitat includes the northeastern corner of Poverty Point State Park and a wooded block (approximately 100 acres) surrounded by agricultural	Oil and gas development is not likely to adversely affect. NSO stipulation #12 would be applied to all suitable habitats in parishes with designated critical habitat (10,691 acres of FMO). Surface tract management at the Baldwin tract is not expected to adversely affect.	Same as Alternative B.	Projected oil and gas development is not likely to adversely affect NSO stipulation #12 would be applied to all suitable habitats in designated critical habitat (8,794 acres of FMO). Surface tract management at the Baldwin tract is not expected to adversely affect.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
					areas. In West Feliciana, only 1 well is projected in the next 10 years, but FMO tracts in that parish are primarily forested and are expected to provide suitable habitat. Surface tract management at the Baldwin tract could affect, but is not expected to adversely affect.			
West Indian manatee *Trichechus manatus*	E	Marine mammal found in marine, estuarine and freshwater environments. In Louisiana, occurs occasionally along the coast and major waterways.	Closest occurrence record is 9 miles northeast of FMO in Plaquemines Parish. Potential for occasional occurrences in coastal parishes in AED, including Plaquemines and Cameron parishes.	Baldwin County tract in St. Mary Parish does not have suitable habitat; no other surface tracts in species' range.	Dredging associated with oil and gas development in Plaquemines and Cameron parishes could damage sea grass beds adversely affecting foraging manatee. Collisions with slow-moving barges are very unlikely.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
					Surface tract management would not affect.			
Birds								
Bald eagle *Haliaeetus leucoce-phalus*	D	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 AED, including Louisiana Ammunition Depot, and 2 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.	Projected oil and gas development is not likely to adversely affect bald eagles nesting sites, but foraging habitat could be adversely affected in the event of an accidental spill or leak. National Bald Eagle Management Guidelines would be applied with NSO excluding mineral development within 660 feet of active and inactive bald eagle nests and communal roost sites, and removal of trees within 0.5 miles of project.	Oil and gas development is not likely to adversely affect. NSO #2 implements National Bald Eagle Management Guidelines with 660-foot buffer around active and inactive bald eagle nests and communal roost sites. NSO #16 within 250 feet of wetlands and aquatic habitats. CSU #2 restricts removal of suitable nest trees within 0.5 miles. Surface tract management	Oil and gas development is not likely to adversely affect. NSO #2 exceeds National Bald Eagle Management Guidelines with 1,000-foot buffer around active and inactive bald eagle nests and communal roost sites. NSO #16 buffer increased to 500 feet. CSU #2 buffer increased to 1 mile. Surface tract management would not affect.	Projected oil and gas development is not likely to adversely affect bald eagles nesting sites, but foraging habitat could be adversely affected in the event of an accidental spill or leak. Potential to degrade foraging habitat along lake shorelines. NSO #2 same as Alternative B. NSO #16 buffer decreased to 100 feet. CSU #2 same as Alternative A.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
						would not affect.		Surface tract management would not affect.
Interior least tern *Sterna antillarum athalassos*	E	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 AED and within one-quarter mile of FMO in East Carroll Parish.	No suitable habitat on or near surface tracts.	Sand bar habitats are not static; species could be affected by any oil and gas development near major river systems in Louisiana. Direct loss of habitat is unlikely, but there is potential for breeding and foraging birds to be displaced by oil and gas activity in the vicinity of development. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #11 within 1,000 feet of riverine sand bars. NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #11 buffer increased to 1,500 feet. NSO #16 buffer increased to 500 feet. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #11 buffer decreased to 500 feet. NSO #16 buffer decreased to 100 feet. Surface tract management would have no effect.
Piping plover *Charadrius melodus*	T	Sandy upper beaches and shores in coastal parishes.	Potential to occur on FMO in Plaquemines Parish.	No suitable habitat on or near surface tracts.	Oil and gas development has potential to disrupt wintering birds, particularly those using	Oil and gas development is not likely to adversely affect. NSO #11 within 1,000	Oil and gas development is not likely to adversely affect. NSO #11 buffer increased to	Oil and gas development is not likely to adversely affect. NSO #11 buffer

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
					mudflats and other suitable habitat in Plaquemines Parish. Surface tract management would have no effect.	feet of riverine sand bars. NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management would have no effect.	1,500 feet. NSO #16 buffer increased to 500 feet. Surface tract management would have no effect.	decreased to 500 feet. NSO #16 buffer decreased to 100 feet. Surface tract management would have no effect.
Red-cockaded woodpecker *Picoides borealis*	E	Red-cockaded woodpeckers live in 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 AED. Most state records are on NFs or outside the AED, 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.	Projected oil and gas development could adversely affect suitable habitat across the state, result in loss or disruption of clusters, or more likely loss of trees in foraging areas. This could occur on FMO inholdings in the NFs or at the Louisiana Ammunition Plant in Bossier County. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #13 buffer within 0.5 miles of cluster. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #13 buffer increased to 0.75 miles. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #13 same as Alternative B. Surface tract management would have no effect.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
Sprague's pipit *Anthus spragueii*	C	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.	Projected oil and gas development could affect migrating individuals using open grasslands and pastures across state. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Whooping crane *Grus americana*	E/X	Experimental, non-essential population at the White Lake Wetlands Conservation Area.	Vermillion Parish is outside the AED. Closest FMO in the AED is in extreme western Cameron Parish.	No surface tracts within species range.	Projected oil and gas development is not likely to adversely affect this non-migratory population. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Reptiles								
Gopher tortoise *Gopherus polyphemus*	T	Sandy soils with herbaceous ground cover. 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.	Projected oil and gas development could adversely affect by the direct loss of habitat and mortality, as well as	Not likely to adversely affect. CSU #6 requires surveys prior to any surface disturbance in Tangipahoa,	Not likely to adversely affect. CSU #6 would extend buffer to 1,000 feet. Surface tract management would have no	Likely to adversely affect. CSU #6 would reduce buffer 300 feet. Surface tract management would have no

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
					increased potential for vehicle collision in 3 parishes, particularly in Tangipahoa and Washington parishes in the AED. Surface tract management would have no effect.	St. Tammany, and Washington parishes, and no disturbance within 600 feet of burrows. Surface tract management would have no effect.	effect.	effect.
Green sea turtle *Chelonia mydas*	T	Feeds in shallow, low-energy waters along coastal parishes	Foraging potential near/on FMO in Plaquemines Parish.	No surface tracts within species range.	Projected oil and gas development could adversely affect foraging habitat as a result of dredging in Plaquemines Parish. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Hawksbill sea turtle *Eretmo-chelys imbricata*	E	Uses 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.	Projected oil and gas development could adversely affect foraging habitat as a result of dredging in Plaquemines	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
					Parish. Surface tract management would have no effect.			
Kemp's Ridley sea turtle *Lepidochelys kempii*	E	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.	Projected oil and gas development could adversely affect foraging habitat as a result of dredging in Plaquemines Parish. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Leatherback sea turtle *Dermochelys coriacea*	E	Largely pelagic, feeding primarily on jellyfish. Occasional occurrences along coastal parishes.	Foraging potential near/on FMO in Plaquemines Parish.	No surface tracts within species range.	Projected oil and gas development could adversely affect foraging habitat as a result of dredging in Plaquemines Parish. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Loggerhead sea turtle	T	Can be found at sea, as well as bays, lagoons, and	Foraging potential near/on FMO in Plaquemines	No surface tracts within species	Projected oil and gas development	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
Caretta caretta		mouths of large rivers. Occurs along coastal parishes.	Parish.	range.	could adversely affect foraging habitat as a result of dredging in Plaquemines Parish. Surface tract management would have no effect.			
Louisiana pine snake *Pituophis ruthveni*	C	Occurs in 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. Home ranges average 69 acres.	Potential to occur in suitable habitat in the AED in Bienville Parish. Two FMO tracts (40 acres and 80 acres) in Bienville Parish near (0.4 and 0.1 miles) cluster of occurrence records. Other occurrences, including those on Fort Polk, are outside the AED.	Potential to occur in upland habitats at Black Lake tract in Natchitoches Parish.	Oil and gas development is likely to adversely affect through direct loss of habitat and increased mortality throughout current range, particularly in Bienville Parish where 5 wells are projected. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. CSU stipulation #8 would require surveys in suitable habitat within range and no disturbance within 1,000 feet of a pocket gopher burrow system. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. CSU stipulation #8 would extend buffer to 1,500 feet. Surface tract management would have no effect.	Likely to adversely affect. CSU stipulation #8 would reduce buffer to 500 feet. Surface tract management would have no effect.
Ringed map turtle *Graptemys*	T	Riverine habitats with moderate to fast currents, with	There is FMO on the Tangipahoa River, West Pearl	No surface tracts within species range.	Oil and gas development is likely to	Not likely to adversely affect.	Not likely to adversely affect.	Likely to adversely affect.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
oculifera		basking areas. In Louisiana, occur in St. Tammany and Washington parishes.	River, and Bogue Chitto River approximately 2 miles from occurrence records.		adversely affect through increased sedimentation or degrade water quality in downstream areas, particularly in AED in Washington Parish. Surface tract management would have no effect.	NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management would have no effect.	NSO #16 buffer increased to 500 feet. Surface tract management would have no effect.	NSO #16 buffer decreased to 100 feet. Surface tract management would have no effect.
Amphibians								
Dusky gopher frog *Rana capito sevosa*	E	In St. Tammany Parish, there is a series of suitable but currently unoccupied ponds in the historic range that may be used for translocation and are designated critical habitat.	The closest FMO is 20 miles to the east of designated critical habitat in St. Tammany Parish.	There are no surface tracts in range.	Projected oil and gas development would have no effect. Surface tract management would have no effect.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Fish								
Gulf sturgeon *Acipenser oxyrinchus desotoi*	T	Shallow coastal waters and estuaries, spawning in large rivers of the northern Gulf of Mexico. In	Potential to occur on FMO in coastal southeastern Louisiana parishes.	No surface tracts in range.	Projected oil and gas development is likely to adversely affect. A total of 75 wells are	Oil and gas development is likely to adversely affect. NSO #16 within 250 feet	Oil and gas development is likely to adversely affect. NSO #16 buffer increased to	Oil and gas development is likely to adversely affect. NSO #16 buffer

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		Louisiana, occurs in Ascension, Jefferson, Lafourche, Orleans, Plaquemines, St. Bernard, St. Charles, St. James, and St. John the Baptist parishes.			projected in coastal marshes and open water in Plaquemines and Lafourche parishes. Surface tract management would have no effect.	of wetlands and aquatic habitats. Surface tract management would have no effect.	500 feet. Surface tract management would have no effect.	decreased to 100 feet. Surface tract management would have no effect.
Alabama shad *Alosa alabamae*		Anadromous fish, originally across the Gulf Coast states.	Occurrence records on the Amite River between St. Helena/East Feliciana parishes and the Tangipahoa River in Tangipahoa Parish in same drainages as several small split-estate tracts. Species is depleted in most Louisiana rivers.	No surface tracts in range.	Projected oil and gas development is not likely to adversely affect. Surface tract management would have no effect.	Projected mineral development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management would have no effect.	Projected mineral development is not likely to adversely affect. NSO #16 buffer increased to 500 feet. Surface tract management would have no effect.	Projected mineral development is not likely to adversely affect. NSO #16 buffer decreased to 100 feet. Surface tract management would have no effect.
Pallid sturgeon *Scaphirhynchus albus*	E	Large riverine systems associated with the Mississippi River and its tributaries. In Louisiana, occurs in Ascension, Jefferson, Orleans,	Potential to occur on FMO in Plaquemines Parish.	No surface tracts in range.	Projected mineral development is likely to adversely affect. A total of 75 wells are projected in coastal marshes and	Projected development is likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic	Projected development is likely to adversely affect. NSO #16 buffer increased to 500 feet. Surface tract	Projected development is likely to adversely affect. NSO #16 buffer decreased to 100 feet.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		Plaquemines, St. Bernard, St. Charles, St. James, and St. John the Baptist parishes.			open water in Plaquemines and Lafourche parishes. Surface tract management would have no effect.	habitats. Surface tract management would have no effect.	management would have no effect.	Surface tract management would have no effect.
Mussels								
Alabama heelsplitter *Potamilus inflatus*	T	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 upland FMO 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 the AED.	No surface tracts within species range.	Oil and gas development is not likely to adversely affect. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 buffer increased to 500 feet. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 buffer decreased to 100 feet. Surface tract management would have no effect.
Fat pocketbook *Potamilus capax*	E	Tolerates river-like reservoirs and lakes, occurs in Concordia, East Carroll, Madison, and Tensas parishes along the Mississippi River.	One occurrence record associated with the Mississippi River in Jefferson Parish is 121 river miles below the only FMO on river, and	No surface tracts within species range.	Oil and gas development is not likely to adversely affect. Surface tract management would have no	Oil and gas development is not likely to adversely affect. NSO #16 within 250 feet of wetlands	Oil and gas development is not likely to adversely affect. NSO #16 buffer increased to 500 feet.	Oil and gas development is not likely to adversely affect. NSO #16 buffer decreased to

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
			the entire range is outside the AED.		effect.	and aquatic habitats. Surface tract management would have no effect.	Surface tract management would have no effect.	100 feet. Surface tract management would have no effect.
Louisiana pearlshell *Margaritifera hembeli*	T	Occurs in 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 AED.	Potential to occur at Big Saline Bayou tract in Rapides Parish.	Projected oil and gas development could affect through degradation in water quality downstream of FMO in Rapides Parish. Surface tract management at Big Saline Bayou tract, including development of hardened boat launch would benefit by stabilizing bayou shoreline and reducing sedimentation.	Oil and gas development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management same as Alternative A.	Oil and gas development is not likely to adversely affect. NSO #16 buffer increased to 500 feet. Surface tract management same as Alternative A.	Likely to affect. NSO #16 buffer decreased to 100 feet. Surface tract management same as Alternative A.
Pink mucket *Lampsilis abrupta*	E	Occurs in large, fast-flowing rivers; can tolerate river-like impoundments, but not standing water. In Louisiana, occurs	One occurrence record on FMO on Bayou Bartholomew in Morehouse Parish, but there is no hydrologic connection to FMO	No surface tracts within species' range.	Oil and gas development is not likely to adversely affect. Surface tract management	Oil and gas development is not likely to adversely affect. NSO #16 within 250 feet	Oil and gas development is not likely to adversely affect. NSO #16 buffer increased to	Oil and gas development is not likely to adversely affect. NSO #16 buffer

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		Morehouse Parish in portions of Bayou Bartholomeau.	in the AED more than 40 miles to the south in Caldwell Parish.		would have no effect.	of wetlands and aquatic habitats. Surface tract management would have no effect.	500 feet. Surface tract management would have no effect.	decreased to 100 feet. Surface tract management would have no effect.
Rabbitsfoot *Quadrula cylindrical ssp. cylindrical*	C	Inhabits small to medium-sized streams and larger rivers, usually in shallow areas where velocity is reduced. In Louisiana, occurs Morehouse Parish in portions of Bayou Bartholomew and Ouachita River.	There are two 40-acre FMO tracts on Bayou Bartholomew in close proximity (0.16 and 0.8 mile) to occurrence records. There is no hydrologic connection with FMO in the AED more than 40 miles to the south in Caldwell Parish.	No surface tracts within species' range.	Oil and gas development is not likely to adversely affect. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 buffer increased to 500 feet. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 buffer decreased to 100 feet. Surface tract management would have no effect.
Plants								
Chaffseed *Schwalbea americana*	E	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 the AED.	No surface tracts within species' range.	Oil and gas development is not likely to adversely affect. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. CSU #9 requires all suitable	Oil and gas development is not likely to adversely affect. NSO #16 buffer increased to 500 feet. CSU #9 same as Alternative B. Surface tract management	Oil and gas development is not likely to adversely affect. NSO #16 buffer decreased to 100 feet. CSU #9 same as Alternative B. Surface tract

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
						habitat be surveyed and no disturbances where plants may be affected. Surface tract management would have no effect.	would have no effect.	management would have no effect.
Earth star *Geocarpon minimum*	E	Grows in saline prairies. Occurrences in Caddo, Caldwell, De Soto, and Winn parishes.	In the AED, 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 species' range, but heavily forested tract does not provide suitable habitat.	Projected oil and gas development has potential to adversely affect through loss of habitat. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #4 in glades, fens, or barrens. CSU #9 requires all suitable habitat be surveyed and no disturbances where plants may be affected. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #4 same as Alternative B. CSU #9 same as Alternative B. Surface tract management would have no effect.	Oil and gas development is not likely to adversely affect. NSO #4 same as Alternative B. CSU #9 same as Alternative B. Surface tract management would have no effect.
Louisiana quillwort *Isoetes*	E	Semi-aquatic, found in slow-moving shallow	Potential to occur in suitable habitat on split-estate	No surface tracts within species' range.	Oil and gas development is likely to	Oil and gas development is not likely to	Oil and gas development is not likely to	Oil and gas development is not likely to

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts Outside Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
louisianensis		water in sandy loam soils or coarse sand. Occurs in St. Tammany and Washington parishes.	FMO in St. Tammany and Washington parishes.		adversely affect through direct loss of habitat, particularly at stream crossings, and potential for increased sedimentation in suitable habitat downstream from well pads, access roads, and flowlines. Surface tract management would have no effect.	adversely affect. NSO #16 within 250 feet of wetlands and aquatic habitats. CSU #9 requires all suitable habitat be surveyed and no disturbances where plants may be affected. Surface tract management would have no effect.	adversely affect. NSO #16 buffer increased to 500 feet. CSU #9 same as Alternative B. Surface tract management would have no effect.	adversely affect. NSO #16 buffer decreased to 100 feet. CSU #9 same as Alternative B. Surface tract management would have no effect.

4.7.6 Tennessee

There is potential for oil and gas development to adversely affect gray bat, Indiana bat, northern long-eared bat, bald eagle, Fowler's cave beetle *(Pseudanoph-thalmus fowlerae)*, and inquirer cave beetle *(Pseudanoph-thalmus inquisitor)*. The projected drilling of only one well at Dale Hollow Lake and one well at Standing Stone State Forest over the next 10 years reduces the likelihood that drilling would affect suitable habitat for these special status species.

- In Alternative A, gray bat foraging could be temporarily displaced along water courses or at Dale Hollow Lake if oil and gas development occurred near aquatic habitats. It is unlikely that the projected oil and gas development would adversely affect hibernacula or summer roost caves. In Alternatives B, C, and D, these effects are expected to be avoided with aquatic and wetland buffers of 250 feet, 500 feet, and 100 feet, respectively. In Alternatives B, C, and D, no surface occupancy would be permitted within 10 miles of hibernacula, 5 miles of maternity roost caves, and 2.5 miles of other records. In addition, all cave and karst features would be buffered 1,000 feet, and no reinjection of produced water permitted in karst regions.
- In Alternative A, Indiana bat could be adversely affected through the loss of summer and maternity roost trees at Dale Hollow Lake and Standing Stone State Forest, although it is unlikely that the projected oil and gas development would adversely affect hibernacula. In Alternatives B, C, and D effects would be avoided with no surface occupancy permitted within 10 miles of hibernacula, 5 miles of maternity roost sites, and 2.5 miles of other records. In Alternatives B, C, and D, no trees or snags over 5 inches in diameter could be removed within known or potential habitat between March 16 and November 30. In addition, all cave and karst features would be buffered 1,000 feet, and no reinjection of produced water permitted in karst regions.
- In Alternative A, there is potential to adversely affect northern long-eared bat. In Alternatives B, C, and D, northern long-eared bat, where they occur with other federally listed bat species, would be protected by those lease stipulations that exclude surface disturbance within 10 miles of hibernacula, 5 miles of maternity roosts, and 2.5 of other records. If listed, these lease stipulations would also apply specifically to northern long-eared bats.
- National Bald Eagle Management Guidelines would be implemented across all alternatives, but in Alternatives A and D, the aquatic and wetland buffer is not considered sufficient to protect foraging habitat in the case of an oil- and gas-related spill or leak.
- In Alternative A, cave obligates, Fowler's cave beetle, and inquirer cave beetle in Clay County are unlikely to be affected by the projected oil and gas drilling, with only one well projected in the vicinity of Dale Hollow Lake. In Alternatives B, C, and D all cave and karst features would be buffered 1,000 feet, and no reinjection of produced water permitted in karst regions, further reducing the potential to adversely affect.

Table 4-30 lists those special status species that occur or are suspected to occur in the *decision area* and provides a determination of affect by alternative with a reference to the stipulations that could reduce that effect.

Table 4-30 Tennessee Impacts on Special Status Species from Energy and Mineral Development

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
Mammals							
Gray bat *Myotis griscens*	E	Foraging habitat in forested riparian areas. Roosting habitat in caves year-round; however, migration occurs between subterranean caves used in the winter as hibernacula and caves used in the summer as maternal roosts. Cave roosts are often close to water bodies, within 1 km of rivers or lakes.	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.	Oil and gas development could temporarily displace foraging bats if wells are placed near aquatic habitats. An accidental spill or increased sedimentation could adversely affect foraging habitat. Unlikely to adversely affect hibernacula or summer roosting caves.	Oil and gas development is not likely to adversely affect. NSO #3 within 10 miles of hibernacula, 5 miles of maternity roosts, and 2.5 miles of other records. NSO #5 within 1,000 feet of cave or karst feature. NSO #16 within 250 feet of wetland and aquatic habitats. CSU #7 prohibits reinjection of produced or flowback waters into karst formations.	Oil and gas development is not likely to adversely affect. NSO #3 same as Alternative B. NSO #5 buffer increased to 1,500 feet. NSO #16 within 500 feet of wetland and aquatic habitats. CSU #7 same as Alternative B.	Oil and gas development is likely to adversely affect. NSO #3 same as Alternative B. NSO # 5 same as Alternative B. NSO #16 within 100 feet of wetland and aquatic habitats. CSU #7 same as Alternative B.
Indiana bat *Myotis sodalis*	E	Foraging habitat in hardwood forests, forested wetlands, and adjacent ponds and	Expected to occur in suitable habitat on FMO.	Projected development is likely to adversely affect foraging, and	Oil and gas development is not likely to adversely	Oil and gas development is not likely to adversely	Oil and gas development is likely to adversely

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		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.		summer and maternal roosting habitat; projected to be 2 wells disturbing 13.80 acres.	affect. NSO #3 within 10 miles of hibernacula, 5 miles of maternity roosts, and 2.5 miles of other records. NSO #5 within 1,000 feet of cave or karst feature. NSO #16 within 250 feet of wetland and aquatic habitats. CSU #3 prohibits removal of trees or snags over 5inches dbh between March 16 and November 30 in known orpotential habitat. CSU #7 prohibits reinjection of produced or flowback waters into karst formations.	affect. NSO #3 same as Alternative B. NSO #5 buffer increased to 1,500 feet. NSO #16 buffer increased to 500 feet. CSU #3 same as Alternative B. CSU #7 same as Alternative B.	affect. NSO #3 same as Alternative B. NSO # 5 same as Alternative B. NSO #16 buffer decreased to 100 feet. CSU #3 same as Alternative B. CSU #7 same as Alternative B.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
Northern long-eared bat (*Myotis septentrionalis*)	P	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 AED.	Oil and gas development is likely to adversely affect foraging and roosting habitat within the AED	Oil and gas development is not likely to adversely affect. NSO #3 within 10 miles of hibernacula, 5 miles of maternity roosts, and 2.5 miles of other records. NSO #5 within 1,000 feet of cave or karst feature. NSO #16 within 250 feet of wetland and aquatic habitats. CSU #3 prohibits removal of trees or snags over 5 inches dbh between March 16 and November 30 in known or potential habitat. CSU #7 prohibits reinjection of produced or	Oil and gas development is not likely to adversely affect. NSO #3 same as Alternative B NSO #5 buffer increased to 1,500 feet. NSO #16 buffer increased to 500 feet. CSU #3 same as Alternative B CSU #7 same as Alternative B.	Projected oil and gas development is not likely to adversely affect. NSO #3 same as Alterntive B NSO #5 same Alternative B. NSO #16 buffer decreased to 100 feet. CSU #3 same as Alternative B CSU #7 same as Alternative B.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
					flowback waters into karst formations.		
Birds							
Bald eagle *Haliaeetus leucocephalus*	D	Varied, typically associated with large water bodies, nests in tall trees with clear flight paths.	Potential to occur in suitable habitat at Dale Hollow Lake, includes resident eagles and large wintering population.	Projected oil and gas development is not likely to adversely affect bald eagles nesting sites, but foraging habitat could be adversely affected in the event of an accidental spill or leak. National Bald Eagle Management Guidelines would be applied with NSO excluding mineral development within 660 feet of active and inactive bald eagle nests and communal roost sites, and removal of trees within 0.5 miles of project. Potential to adversely affect foraging habitat in the event of an accidental spill or leak.	Projected oil and gas development is not likely to adversely affect bald eagles. National Bald Eagle Management Guidelines would be applied with NSO excluding mineral development within 660 feet of active and inactive bald eagle nests and communal roost sites. NSO #16 within 250 feet of wetlands and aquatic habitats. CSU #2 restricts removal of suitable nest trees within 0.5	Oil and gas development is not likely to adversely affect. NSO #2 buffer increased to 1,000 feet. NSO #16 buffer increased to 500 feet. CSU #2 buffer increased to 1 mile.	Projected oil and gas development is not likely to adversely affect bald eagles nesting sites, but foraging habitat could be adversely affected in the event of an accidental spill or leak. NSO #2 same as Alternative B. NSO #16 buffer decreased to 100 feet. CSU #2 same as Alternative B.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
					miles.		
Fish							
Blackside dace *Phoxinum cumberlandensis*	T	Inhabits small (7-15 feet) upland streams with moderate flows in Scott, Campbell, and Claiborne counties.	Range is outside the AED.	Projected oil and gas development would have no effect.	Projected oil and gas development would have no effect. NSO #16 within 250 feet of wetland and aquatic habitats.	Projected oil and gas development would have no effect. NSO #16 buffer increased to 500 feet.	Projected oil and gas development would have no effect. NSO #16 buffer decreased to 100 feet.
Duskytail darter *Etheostoma percnurum*	E/XN	Occupied habitat described as 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 the AED.	Projected oil and gas development would have no effect.	Projected oil and gas development would have no effect. NSO #16 within 250 feet of wetland and aquatic habitats.	Projected oil and gas development would have no effect. NSO #16 buffer increased to 500 feet.	Projected oil and gas development would have no effect. NSO #16 buffer decreased to 100 feet.
Mussels							
Cumberland bean *Villosa trabalis*	E	Inhabits small rivers and streams in fast riffles with gravel or sand and gravel substrate. Currently in Tennessee occurs only in the Hiwassee River.	Two historic records in area inundated by the Dale Hollow Lake.	Projected oil and gas development would have no effect.	Projected oil and gas development would have no effect. NSO #16 within 250 feet of	Projected oil and gas development would have no effect. NSO #16 buffer increased to	Projected oil and gas development would have no effect. NSO #16 buffer decreased to

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
					wetland and aquatic habitats.	500 feet.	100 feet.
Cumberland elktoe *Alasmidonta atropurpurea*	E/XN	Small to medium 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 AED, including experimental, non-essential populations.	Projected oil and gas development would have no effect.	Projected oil and gas development would have no effect. NSO #16 within 250 feet of wetland and aquatic habitats.	Projected oil and gas development would have no effect. NSO #16 buffer increased to 500 feet.	Projected oil and gas development would have no effect. NSO #16 buffer decreased to 100 feet.
Cumberlandian combshell *Epioblasma brevidens*	E/XN	Large creeks to large rivers with coarse sand to boulder-sized substrates, generally less than 1 meter. 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 AED, including experimental, non-essential populations.	Projected oil and gas development would have no effect.	Projected oil and gas development would have no effect. NSO #16 within 250 feet of wetland and aquatic habitats.	Projected oil and gas development would have no effect. NSO #16 buffer increased to 500 feet.	Projected oil and gas development would have no effect. NSO #16 buffer decreased to 100 feet.
Fluted kidneyshell *Ptychobranchus subtentum*	E	Primarily small rivers to large creeks in sand and gravel substrates. Currently in Claiborne and Hancock counties.	Range is outside the AED.	Projected oil and gas development would have no effect.	Projected oil and gas development would have no effect. NSO #16 within 250 feet of wetland and aquatic habitats.	Projected oil and gas development would have no effect. NSO #16 buffer increased to 500 feet.	Projected oil and gas development would have no effect. NSO #16 buffer decreased to 100 feet.
Littlewing	E	Restricted to small, cool	Range is outside	Projected oil and	Projected oil	Projected oil	Projected oil

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
pearlymussel *Pegias fabula*		streams. Currently occurs in Scott and Van Buren counties.	the AED, including experimental, non-essential populations.	gas development would have no effect.	and gas development would have no effect. NSO #16 within 250 feet of wetland and aquatic habitats.	and gas development would have no effect. NSO #16 buffer increased to 500 feet.	and gas development would have no effect. NSO #16 buffer decreased to 100 feet.
Oyster mussel *Epioblasma capsaeformis*	E/XN	Found in 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 AED, including experimental, non-essential populations.	Projected oil and gas development would have no effect.	Projected oil and gas development would have no effect. NSO #16 within 250 feet of wetland and aquatic habitats.	Projected oil and gas development would have no effect. NSO #16 buffer increased to 500 feet.	Projected oil and gas development would have no effect. NSO #16 buffer decreased to 100 feet.
Pink mucket *Lampsilis abrupta*	E	Occurs in large, fast-flowing rivers; can tolerate river-like impoundments, but not standing water. Occurs in disjunct populations across state.	Range is outside the AED. Closest record is historic (1939) record 3 miles south of FMO at Standing Stone State Park.	Projected oil and gas development would have no effect.	Projected oil and gas development would have no effect. NSO #16 within 250 feet of wetland and aquatic habitats.	Projected oil and gas development would have no effect. NSO #16 buffer increased to 500 feet.	Projected oil and gas development would have no effect. NSO #16 buffer decreased to 100 feet.
Slabside pearlymussel *Lexingtonia dolabelloides*	E	Inhabits large creeks to moderate size rivers in relatively shallow riffles and shoals with moderate current. In Kentucky, the current range is in the	Range is outside the AED.	Projected oil and gas development would have no effect.	Projected oil and gas development would have no effect. NSO #16 within	Projected oil and gas development would have no effect. NSO #16 buffer	Projected oil and gas development would have no effect. NSO #16 buffer

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		Tennessee River system, outside the main river.			250 feet of wetland and aquatic habitats.	increased to 500 feet.	decreased to 100 feet.
Tan riffleshell *Epioblasma florentina walkeri*	E	Remnant populations in the Big South Fork Cumberland River and Hiwassee River in Marshall, Polk, and Scott counties.	Range is outside the AED.	Projected oil and gas development would have no effect.	Projected oil and gas development would have no effect. NSO #16 within 250 feet of wetland and aquatic habitats.	Projected oil and gas development would have no effect. NSO #16 buffer increased to 500 feet.	Projected oil and gas development would have no effect. NSO #16 buffer decreased to 100 feet.
Insects							
Fowler's cave beetle *Pseudanoph-thalmus fowlerae*	C	Cave obligate found in a single limestone cave in Clay County.	Single occurrence location is 1.7 miles east and upstream of FMO at Dale Hollow Reservoir in AED.	Projected oil and gas development could adversely affect if there is a hydrologic connection in the karst formation.	Projected oil and gas development is not expected to adversely affect. NSO #5 within 1,000 feet of cave or karst feature. NSO #16 within 250 feet of wetland and aquatic habitats. CSU #7 prohibits reinjection of produced or flowback waters into karst	Projected oil and gas development is not expected to adversely affect. NSO #5 buffer increased to 1,500 feet. NSO #16 buffer increased to 500 feet. CSU #7 same as Alternative B.	Projected oil and gas development could adversely affect. NSO # 5 same as Alternative B. NSO #16 buffer decreased to 100 feet. CSU #7 same as Alternative B.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
					formations.		
Inquirer cave beetle *Pseudanoph-thalmus inquisitor*	C	Cave obligate found in a single limestone cave in Clay County.	Single occurrence location is 1.7 miles east and upstream of FMO at Dale Hollow Reservoir in AED.	Projected oil and gas development could adversely affect if there is a hydrologic connection in the karst formation.	Projected oil and gas development is not expected to adversely affect. NSO #5 within 1,000 feet of cave or karst feature. NSO #16 within 250 feet of wetland and aquatic habitats. CSU #7 prohibits reinjection of produced or flowback waters into karst formations.	Projected oil and gas development is not expected to adversely affect. NSO #5 buffer increased to 1,500 feet. NSO #16 buffer increased to 500 feet. CSU #7 same as Alternative B.	Projected oil and gas development could adversely affect. NSO # 5 same as Alternative B. NSO #16 buffer decreased to 100 feet. CSU #7 same as Alternative B.
Plants							
Cumberland sandwort *Arenaria cumberlandensis*	E	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.	Projected oil and gas development is not expected to adversely affect. Rock faces and ledges are not typically part of well pad locations, and narrow habitat can generally be avoided at the APD stage. Some potential to	Projected oil and gas development is not expected to adversely affect. CSU #9 requires all suitable habitat be surveyed and no disturbances	Projected oil and gas development is not expected to adversely affect. CSU #9 same as Alternative B.	Projected oil and gas development is not expected to adversely affect. CSU #9 same as Alternative B.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
				disrupt local hydrology above locations.	where plants may be affected		

4.7.7 Virginia

Oil and gas development and surface tract management in Virginia has the potential to affect Indiana bat, northern long-eared bat, bald eagle, Mitchell's satyr butterfly, Virginia fringed mountain snail, small whorled pogonia *(Isotric medioloides)*, smooth coneflower *(Echinacea laevigata)*, and Virginia spireaea *(Spiraea virginiana)*.

- In Alternative A, Indiana bat could be adversely affected at the John W. Flannagan Reservoir and Radford Ammunition Plant. It is unlikely that the projected oil and gas development would adversely affect hibernacula, but there is potential to adversely affect summer roost and maternity sites. In Alternatives B, C, and D effects would be avoided with no surface occupancy permitted within 10 miles of hibernacula, 5 miles of maternity roost sites, and 2.5 miles of other records. In Alternatives B, C, and D, no trees or snags over 5 inches in diameter could be removed within known or potential habitat between March 16 and November 30. In addition, all cave and karst features would be buffered 1,000 feet, and no reinjection of produced water permitted in karst regions.
- In Alternative A, there is potential to adversely affect northern long-eared bat. In Alternatives B, C, and D, northern long-eared bat, where they occur with other federally listed bat species, would be protected by those lease stipulations that exclude surface disturbance within 10 miles of hibernacula, 5 miles of maternity roosts, and 2.5 of other records. If listed, these lease stipulations would also apply specifically to northern long-eared bats.
- National Bald Eagle Management Guidelines would be implemented across all alternatives, but in Alternatives A and D, the aquatic and wetland buffer is not considered sufficient to protect foraging habitat, in the case of an oil- and gas-related spill or leak.
- In Alternative A, there is potential for oil and gas development to adversely affect suitable Mitchell's satyr butterfly habitat through impacts to downstream wetland habitats. In Alternatives B and C, aquatic and wetland buffers of 250 and 500 feet, respectively, would reduce the potential to adversely affect.
- In Alternative A, there is potential for oil and gas development to adversely affect Virginia fringed mountain snail downstream of the Radford Ammunition Plant. In Alternative B and C, aquatic and wetland buffers of 250 feet and 500 feet, respectively, would reduce the potential to adversely affect.
- Across all alternatives, small whorled pogonia habitat at the Meadowood SRMA is expected to benefit from habitat management and improvement. Additional surveys may be conducted, and if the species is found, additional protection measures would be taken to avoid conflicts with visitor use and other activities.
- Smooth coneflower occurs near but is not known to occur at the Radford Ammunition Plant. In Alternatives B, C, and D prairies and native grasslands would be excluded from surface occupancy, further reducing the potential to adversely affect this species.
- In Alternative A, Virginia spiraea has the potential to be adversely affected along scoured banks in Dickenson County at the John W. Flannagan Reservoir. In Alternatives B and C, aquatic and wetland buffers of 250 feet and 500 feet, respectively, would reduce the potential to adversely affect. In Alternative D, a 100-foot buffer is not considered adequate to avoid adverse impacts in the case of accidental spills or leaks.

Table 4-33 lists those special status species that occur or are suspected to occur in the *decision area* and provides a determination of effect by alternative with a reference to the stipulations that could reduce that effect, or surface management actions that could affect the species.

Table 4-31 Virginia Impacts on Special Status Species from Energy and Mineral Development and Surface Tract Management

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
Mammals								
Indiana bat *Myotis sodalis*	E	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 of the oil and gas AED in Dickenson and Montgomery counties.	Meadowood tract is outside the known range.	Potential to adversely affect foraging, roosting trees, roosting and hibernacula caves in Dickenson and Montgomery counties where a total of 21 wells are projected over the next 10 years, disturbing up to 100 acres.	Oil and gas development is not likely to adversely affect. NSO #3 within 10 miles of hibernacula, 5 miles of maternity roosts, and 2.5 miles of other records. NSO #5 within 1,000 feet of cave or karst feature. NSO #16 within 250 feet of wetland and aquatic habitats. CSU #3 prohibits removal of trees or snags over 5 inches dbh between March 16 and November 30 in known or potential habitat. CSU #7	Oil and gas development is not likely to adversely affect. NSO #3 same as Alternative B. NSO #5 buffer increased to 1,500 feet. NSO #16 buffer increased to 500 feet. CSU #3 same as Alternative B. CSU #7 same as Alternative B.	Oil and gas development is likely to adversely affect. NSO #3 same as Alternative B. NSO # 5 same as Alternative B. NSO #16 buffer decreased to 100 feet. CSU #3 same as Alternative B. CSU #7 same as Alternative B.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
						prohibits reinjection of produced or flowback waters into karst formations.		
Northern long-eared bat (*Myotis septentrionalis*)	P	Generally associated with old-growth intact, interior forest. A variety of cave overhangs, tunnels, and mines used as hibernacula and roosts.	Potential to occur in suitable habitat throughout the AED	Meadowood is outside the known range	Oil and gas development is likely to adversely affect foraging and summer and maternity roosting sites	Oil and gas development is not likely to adversely affect. NSO #3 within 10 miles of hibernacula, 5 miles of maternity roosts, and 2.5 miles of other records. NSO #5 within 1,000 feet of cave or karst features. NSO #16 within 250 feet of wetland and aquatic habitats. CSU #3 prohibits removal of trees or snags over 5 inches dbh between March 16 and	Oil and gas development is not likely to adversely affect. NSO #3 same as Alternative B NSO #5 buffer increased to 1,500 feet. NSO #16 buffer increased to 500 feet. CSU #3 same as Alternative B CSU #7 same as Alternative B. Surface tract management would not affect.	Oil and gas development is not likely to adversely affect. NSO #3 same as Alternative B NSO #5 same as Alternative B. NSO #16 buffer decreased to 100 feet. CSU #3 same as Alternative B CSU #7 same as Alternative B. Surface tract management would not affect.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
						November 30 in known or potential habitat. CSU #7 prohibits reinjection of produced or flowback waters into karst formations. Surface tract management would not affect.		
Virginia big-eared bat *Corynorhinus townsendii virginianus*	E	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 AED, but are in adjacent counties.	Meadowood tract is outside the known range.	Not likely to adversely affect.	Oil and gas development is not likely to adversely affect. NSO #3 within 10 miles of hibernacula, 5 miles of maternity roosts, and 2.5 miles of other records. NSO #5 within 1,000 feet of cave or karst feature. NSO #16 within 250 feet of wetland and	Oil and gas development is not likely to adversely affect. NSO #3 same as Alternative B. NSO #5 buffer increased to 1,500 feet. NSO #16 buffer increased to 500 feet. CSU #3 same as Alternative B. CSU #7 same as Alternative	Oil and gas development is not likely to adversely affect. NSO #3 same as Alternative B. NSO # 5 same as Alternative B. NSO #16 buffer decreased to 100 feet. CSU # same as Alternative B. CSU #7 same as Alternative B.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
						aquatic habitats. CSU #3 prohibits removal of trees or snags over 5 inches dbh between March 16 and November 30 in known or potential habitat. CSU #7 prohibits reinjection of produced or flowback waters into karst formations.	B.	
Birds								
Bald eagle *Haliaeetus leucocephalus*	D	Varied, typically associated with large water bodies, nests in tall trees with clear flight paths.	Potential to occur in suitable habitat at Flanagan Dam, but no occurrence records in vicinity.	There is potential for bald eagle to nest at Meadowood, particularly in the vicinity of Thompson Creek and Occoquan River. Two records less than 1 mile away in	Projected oil and gas development is not likely to adversely affect bald eagles at Flanagan Dam but foraging habitat could be adversely affected in the event of an accidental spill	Oil and gas development is not likely to adversely affect. NSO #2 implements National Bald Eagle Management Guidelines with 660-foot buffer around active and inactive	Oil and gas development is not likely to adversely affect. NSO #2 buffer increased to 1,000 feet. NSO #16 buffer increased to 500 feet. CSU #2 buffer extended to 1	Projected oil and gas development is not likely to adversely affect bald eagles at Flanagan Dam but foraging habitat could be adversely affected in the event of an accidental spill or leak.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
				Massey Creek from 2002.	or leak. National Bald Eagle Management Guidelines would be applied with NSO excluding mineral development within 660 feet of active and inactive bald eagle nests and communal roost sites, and removal of trees within 0.5 miles of project.	bald eagle nests and communal roost sites NSO #16 within 250 feet of wetlands and aquatic habitats. CSU #2 prohibits removal of suitable nest trees within 0.5 miles of active or inactive nests or communal roost sites.	mile.	NSO #2 same as Alternative B. NSO #16 buffer decreased to 100 feet. CSU #2 same as Alternative B.
Insects								
Mitchell's satyr butterfly *Neonympha mitchellii mitchellii*	E	Restricted to calcareous sedge wetlands, usually true fens, sometimes sedge meadows in fen complexes. Larvae almost certainly feed in nature on Carex. Occurs in southwestern Virginia in Floyd and Patrick counties.	Occurrence records in county adjacent to Radford Ammunition Plant, but not hydrologically connected. Considered potential habitat.	Meadowood tract is outside the known range.	Projected oil and gas development could affect, but is not likely to adversely affect. Surface tract management would have no effect.	Projected oil and gas development would have no effect. NSO #16 within 250 feet of wetland and aquatic habitats. Surface tract management would have no effect.	Projected oil and gas development would have no effect. NSO #16 buffer increased to 500 feet. Surface tract management would have no effect.	Projected oil and gas development could affect, but is not likely to adversely affect. NSO #16 buffer decreased to 100 feet. Surface tract management would have no effect.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
Snails								
Virginia fringed mountain snail	E	Very restricted range from bluffs on the New River in losse, damp dolomitic limestone.	No known occurrence on FMO within the AED.	Meadowood tract is outside the known range.	Projected oil and gas development at Radford Ammunition Plant is upstream of known of known occurrence record. Impacts to water quality from accidental spill or leaks could adversele affect this species. Surface tract management would have no effect.	Projected oil and gas development could affect, but is not likely to adversely affect. NSO #16 within 250 feet of wetland and aquatic habitats. Surface tract management would have no effect.	Projected oil and gas development would have no effect. NSO #16 buffer increased to 500 feet. Surface tract management would have no effect.	Projected oil and gas development would have no effect. NSO #16 buffer decreased to 100 feet. Surface tract management would have no effect.
Plants								
Sensitive joint-vetch *Aeschynomene virginica*	T	An annual legume that grows in fresh to slightly brackish tidal river systems, within the intertidal zone where populations are flooded twice daily. In Virginia, populations occur	Range is outside the oil and gas AED.	Meadowood is within the known range of the species. However, Thompson Creek is not tidally influenced	Projected oil and gas development would have no effect. Surface tract management would have no effect.	Projected oil and gas development would have no effect. NSO #16 within 250 feet of wetland and aquatic habitats.	Projected oil and gas development would have no effect. NSO #16 buffer increased to 500 feet. CSU #9 same as Alternative	Projected oil and gas development would have no effect. NSO #16 buffer decreased to 100 feet. CSU #9 same as Alternative

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
		along the Potomac, Mattaponi, Pamunkey, Rappahannock, Chickahominy, and James rivers and their tributaries.		and not considered suitable habitat.		CSU #9 requires all suitable habitat be surveyed and no disturbances where plants may be affected. Surface tract management would have no effect.	B. Surface tract management would have no effect.	B. Surface tract management would have no effect.
Small whorled pogonia *Isotria medeoloides*	T	Acidic soils, in dry to mesic second-growth, deciduous or deciduous-coniferous forests; typically with light to moderate leaf litter, an open herb layer (occasionally dense ferns), moderate to light shrub layer, and relatively open canopy. Isotria medioloides frequently occurs on flats or slope bases near canopy breaks. Occurs in the Coastal Plain and Piedmont.	Range is outside the oil and gas AED.	Meadowood is within the known range of the species. Surveys in 2004, 2008, 2009, and 2011 by Virginia Natural Heritage, observed none to date. Closest record is 4.3 miles north of Meadowood.	Projected oil and gas development would have no effect. Vegetation management at Meadowood may improve habitat potential.	Projected oil and gas development would have no effect. CSU #9 requires all suitable habitat be surveyed and no disturbances where plants may be affected. Vegetation management at Meadowood may improve habitat potential.	Same as Alternative B.	Same as Alternative B.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
Smooth coneflower *Echinacea laevigata*	E	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.	Potential to occur on FMO in the oil and gas AED in Montgomery County. Closest record is 1 mile northwest of Radford Ammunition Plant.	Meadowood tract is outside the known range.	Not likely to be adversely affected by oil and gas development at the Radford Ammunition Plant. Surface tract management would have no effect.	Projected oil and gas development is not expected to adversely affect. CSU #9 requires all suitable habitat be surveyed and no disturbances where plants may be affected. Surface tract management would have no effect.	Projected oil and gas development is not expected to adversely affect. CSU #9 same as Alternative B. Surface tract management would have no effect.	Projected oil and gas development is not expected to adversely affect. CSU #9 same as Alternative B. Surface tract management would have no effect.
Virginia spiraea *Spiraea virginiana*	T	Found 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—2,400 feet. In Virginia, occurrence records in western counties: Carroll, Dickenson, Grayson, and Wise.	Potential to occur on FMO in the oil and gas AED in Dickenson County. Closest record at Flannagan Dam near the mouth of the Russell Fork.	Meadowood tract is outside the known range.	Potential to adversely affect by oil and gas development, particularly if there is offsite erosion upstream of suitable habitat. Surface tract management would have no effect.	Projected oil and gas development is not expected to adversely affect. NSO #16 within 250 feet of wetland and aquatic habitats. CSU #9 requires all suitable habitat be surveyed and no disturbances	Projected oil and gas development is not expected to adversely affect. NSO #16 buffer increased to 500 feet. CSU #9 same as Alternative B. Surface tract management would have no effect.	Projected oil and gas development is not expected to adversely affect. NSO #16 buffer decreased to 100 feet. CSU #9 same as Alternative B. Surface tract management would have no effect.

Common Name *Scientific Name*	Federal Status	Habitat/Range	Occurrence on FMO in Areas of Expected Development	Occurrence on Surface Tracts	Alternative A (No Action) Potential to Affect	Alternative B (Preferred Alternative) Potential to Affect	Alternative C Potential to Affect	Alternative D Potential to Affect
						where plants may be affected. Surface tract management would have no effect.		

4.8 WILDLAND FIRE

This section presents potential impacts on wildland fire management from implementing management actions for each resource program. Existing conditions concerning wildland fire management are described in Chapter 3.

Impacts on wildland fire are not anticipated as a result of implementing management actions for the cultural resources and VRM programs.

4.8.1 Assumptions

The analysis is based on the following assumptions:

- Fire is an important functional, natural disturbance in many of the ecological systems found in the *planning area*.
- A direct relationship exists between density of human use within the *planning area* and the frequency of human-caused fires.
- A direct relationship exists between fuel loads (standing and nonstanding vegetation) and potential fire size and intensity.
- Proper application of prescribed fire (as well as mechanical, chemical, and biological treatments) could reduce the potential for wildland fire by reducing fuel loads.
- The projected annual average prescribed burn for the *planning area* would be 50 acres under Alternatives A and D, and 100 acres under Alternatives B and C.

4.8.2 Alternative A (No Action Alternative)

Conducting vegetation treatments (e.g., prescribed burning, mechanical, chemical, manual, and biological) and continuing wildlife habitat improvement actions on the Lathrop Bayou, Jupiter Inlet Lighthouse ONA, and the Meadowood SRMA surface tracts (a total of 1,075 acres), under the vegetation, fish and wildlife, and special status species resource programs, would decrease the amount of standing and nonstanding vegetation within these areas, which would 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.

Fire suppression activities implemented under the wildland fire program would help to reduce the size of wildland fires but would also limit and exclude fire from functioning in its natural role in some areas, which would result in a longer fire-return interval, the buildup of fuel loads, and the promotion of vegetation communities that are more likely to fuel high-intensity fires.

Activities associated with oil and gas exploration and development would increase human presence and the use of heavy equipment in. These activities would introduce additional ignition sources and thereby increase the probability of wildland fire occurrence and the need for fire suppression to protect life, property, and sensitive resources. However, projected development of 815 wells and disturbance of 4,964 acres would result in the removal of vegetation (i.e., fuel loads) and thereby reduce the intensity of wildland fires and the potential for fire occurrence. Mineral development could also provide increased accessibility to areas for fire suppression equipment and provide fuel breaks in the case of wildland fire events.

Phosphate mining would remove fuel sources and reduce the potential for wildland fires. Fuel sources would be removed by mining and clearing vegetation on 802 acres (already leased) in Florida and potentially on an additional 1,083 acres expected to be leased over the next 10 years.

Coal mining of FMO would not directly affect wildland fire management because mining would be limited to underground mining methods. Indirectly, however, the use existing surface infrastructure could introduce additional ignition sources to the analysis area.

Recreation and travel activities on surface tracts would increase the probability of wildland fire occurrence. Recreation and travel opportunities on surface tracts would attract increasing numbers of recreation and OHV users, which introduces additional ignition sources to the area and thereby increases the probability of unintentional fire starts, wildland fire frequency, and the need for fire suppression activities. Providing recreation facilities and opportunities (e.g., trail-based and equestrian activities) in the Meadowood SRMA (804 acres) and Big Saline Bayou SRMA (158 acres) would further encourage and likely increase recreation use in these areas and thereby increase the potential for impacts.

Wildland fire management would be affected by new land uses after disposal (or exchange) of four surface tracts with a total of 77.27 acres. It is assumed that new land use would be similar to surrounding use in the vicinity of each tract. For three tracts in Arkansas (55 acres), new land use would likely include timber harvest, conversion to pasture, and construction of access roads and possibly home sites. In Florida, the Lake Marion tract (22.27 acres) would likely be incorporated into the surrounding residential development. Construction and development, including conversion to pasture, would remove vegetation (i.e., fuel loads) and thereby reduce the potential for wildland fire occurrence and the need for fire suppression activities. New houses or other structures, however, would potentially be threatened by wildland fires that do occur. Transfer of three tracts, with a total of 83.57 acres, for management by other agencies would not measurably affect wildland fire management. Wildland fire could be affected if ROWs are developed under the lands and realty program. ROW construction would introduce additional potential ignition sources. However, land-clearing activities for communication towers, and linear features, such as roads, pipelines, and transmission lines would remove vegetation (i.e., fuel loads), and thereby reduce the potential for wildland fire occurrence. Such development would also create fuel breaks that could be effective in preventing the spread of wildland fires. Based on historic activities, development of ROWs on BLM-administered surface tracts is anticipated to be low.

4.8.3 Alternative B (Preferred Alternative)

Impacts on wildland fire from implementing actions for wildland fire, oil and gas development, phosphate mining, and coal mining would be the same as those identified under Alternative A.

Impacts from conducting vegetation treatments (e.g., prescribed burning, mechanical, chemical, manual, and biological) and continuing wildlife habitat improvement actions would be similar to those described for Alternative A, except that these management actions could be applied to all surface tracts identified for retention (2,776 acres), under the vegetation, fish and wildlife, and special status species resource programs. These management actions would decrease the amount of standing and nonstanding vegetation within these areas, which would 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.

The impacts on wildland fire from managing recreation and travel would be the same as those identified under Alternative A, except that 8,236 feet of roads would be closed to OHV use. Limiting the routes

available for OHV use could reduce ignition sources, the probability of unintentional fire starts, and the need for fire suppression activities.

Wildland fire management would be affected by new land uses after disposal (or exchange) of six surface tracts with a total of 87.96 acres. It is assumed that new land use would be similar to surrounding use in the vicinity of each tract. For three tracts in Arkansas (65 acres), new land use would likely include timber harvest, conversion to pasture, and construction of access roads and possibly home sites. In Florida, three tracts (22.96 acres) would likely be incorporated into the surrounding residential development. Construction and development, including conversion to pasture, would remove vegetation (i.e., fuel loads) and thereby reduce the potential for wildland fire occurrence and the need for fire suppression activities. New houses or other structures, however, would potentially be threatened by wildland fires that do occur. Transfer of three tracts, with a total of 127.4 acres, for management by other agencies would not measurably affect wildland fire management. Wildland fire could be affected if ROWs are developed under the lands and realty program. ROW construction would introduce additional potential ignition sources. However, land-clearing activities for communication towers, and linear features, such as roads, pipelines, and transmission lines would remove vegetation (i.e., fuel loads), and thereby reduce the potential for wildland fire occurrence. Such development would also create fuel breaks that could be effective in preventing the spread of wildland fires. However, the likelihood of development would be reduced compared with Alternative A, because all surface tracts would be identified as ROW avoidance areas.

4.8.4 Alternative C

Impacts on wildland fire from implementing actions for wildland fire, oil and gas management, phosphate mining, and coal mining would be the same as those identified under Alternative A. Impacts on wildland fire from implementing actions for recreation management and travel and access management, and ROW development would be the same as those identified under Alternative B.

The impacts on soil resources from conducting vegetation treatments and implementing habitat improvement actions would be the same as Alternative B, except that management actions could be implemented on 60 additional acres identified for retention. These actions would be implemented to maintain desired vegetation communities and to support habitat goals identified in the state WAP. These actions would further reduce fuel loads and promote healthy, diverse vegetation communities, which would decrease the size and intensity of wildland fires and allow fires to be more easily controlled.

Wildland fire management would be affected by new land uses after disposal (or exchange) of three surface tracts with a total of 27.75 acres. It is assumed that new land use would be similar to surrounding use in the vicinity of each tract. For the five-acre Drasco tract in Arkansas, new land use would likely be conversion to pasture with possible construction of an access road and home site. In Florida, two tracts (22.75 acres) would likely be incorporated into the surrounding residential development. Construction and development, including conversion to pasture, would remove vegetation (i.e., fuel loads) and thereby reduce the potential for wildland fire occurrence and the need for fire suppression activities. New houses or other structures, however, would potentially be threatened by wildland fires that do occur. Transfer of three tracts, with a total of 127.4 acres, for management by other agencies would not measurably affect wildland fire management.

4.8.5 Alternative D

Impacts on wildland fire from implementing actions for vegetation, fish and wildlife, special status species, wildland fire, oil and gas development, phosphate mining, and coal mining would be the same as

those identified under Alternative A. Impacts on wildland fire from implementing actions for ROW development would be the same as those identified under Alternative B.

The impacts on wildland fire from managing recreation and travel would be the same as those identified under Alternative A, except 4,206 feet of roads would be closed to OHV use. Limiting the roads available for OHV use could reduce ignition sources, the probability of unintentional fire starts, and the need for fire suppression activities.

Wildland fire management would be affected by new land uses after disposal (or exchange) of 16 surface tracts with a total of 615.87 acres. It is assumed that new land use would be similar to surrounding use in the vicinity of each tract. For 12 tracts in Arkansas (580 acres), new land use would likely include timber harvest, conversion to pasture, and construction of access roads and possibly home sites. In Florida, four tracts (35.87 acres) would likely be incorporated into the surrounding residential development. Construction and development, including conversion to pasture, would remove vegetation (i.e., fuel loads) and thereby reduce the potential for wildland fire occurrence and the need for fire suppression activities. New houses or other structures, however, would potentially be threatened by wildland fires that do occur. Transfer of six tracts, with a total of 542.67 acres, for management by other agencies would not measurably affect wildland fire management.

4.9 CULTURAL RESOURCES

This section presents potential impacts on cultural resources from implementing management actions for each resource program. Existing conditions concerning cultural resources are described in Chapter 3.

4.9.1 Assumptions

The cultural resources impact analysis is based on the following assumptions:

- Cultural resource inventories would result in the continued identification of cultural resources. The cultural resource data acquired through these inventories and evaluations would increase overall knowledge of cultural resources in the region.
- Cultural resource protection and mitigation measures apply to all proposed federal, federally permitted, or federally assisted undertakings, and would be applied at project design and implementation phases.
- Specific mitigation actions for known cultural resource sites from authorized uses would be identified and applied after appropriate Section 106 and protocol consultation requirements were met. Mitigation can include site avoidance, project redesign, or data recovery.
- The number of sites that could be affected by various actions directly correlates with the degree, nature, and quantity of surface disturbing activities within the *decision area*, and the cultural sensitivity of the area.
- Because there are no known Native American cultural sites within the analysis area, impacts on known sites would not occur.

4.9.2 Alternative A (No Action Alternative)

Continuing to implement vegetation manipulation activities (e.g., mechanical, chemical, manual, biological, and prescribed burning) on the Lathrop Bayou, Jupiter Inlet Lighthouse ONA, and the Meadowood SRMA surface tracts (a total of 1,075 acres) could affect cultural sites in these areas. Non-fire vegetation treatments with the potential to affect cultural resources are subject to the requirements of Section 106. Treatments that could result in surface disturbance would be subject to a cultural resource inventory. Inventories would result in the identification of more cultural sites and lower the potential for impacts on cultural resources. Non-fire vegetation treatments could directly affect cultural resources, depending on their location and type. Mechanical treatments (e.g., brush crunching) are more likely to affect cultural resources than are low-intensity treatments such as chemical treatments or hand lop-and-scatter. Non-fire vegetation treatments involving surface and shallow subsurface disturbance could introduce organic materials into lower soil layers, contaminating shallow subsurface cultural resource sites containing early historic or prehistoric dateable organics, such as charcoal, wood, or preserved plant materials. The projected annual average of prescribed burns for this alternative is 50 acres, occurring on the Lathrop Bayou and Jupiter Inlet Lighthouse tracts. Prescribed fire events are occasionally preceded by non-fire fuels reduction actions to obtain a smaller, more manageable, and less intense planned burn. Although loss of or damage to cultural resources during planned habitat management actions is possible, proper planning and consultation with a cultural resource specialist would reduce these impacts to a negligible level.

Wildfire suppression efforts (including Emergency Stabilization and Rehabilitation actions), and wildland fire use could affect cultural resource sites on the surface tracts, including the eligibility characteristics of sites that are listed or eligible for listing on the National Register of Historic Places (NRHP). Because not

all cultural resource sites are known, the potential for impacts on cultural resources exists where wildland fire occurs. Impacts from wildland fire vary, depending on the temperature and duration of exposure to heat. Generally, higher temperatures and/or longer duration of exposure to heat increase the potential for damage to cultural resources. Wildfire impacts on inorganic cultural resources include fracturing, shattering, and changes in color and internal luster, which might reduce an artifact's ability to render information about the past. (Deal n.d., Buenger 2003, Loyd et al. 2002, Shackley et al. 2002, Solomon 2002). As a general rule, fire would not affect buried cultural materials. Studies show that even a few centimeters of soil cover (four inches) are sufficient to protect cultural materials (Oster n.d.).

Cultural resource management actions would provide protection from the potentially damaging effects of surface-disturbing activities through implementation of existing laws and policy, such as Section 106 of the National Historic Preservation Act (NHPA) and Federal Land Policy and Management Act (FLPMA). Federal undertakings typically require cultural resource inventories that would result in the identification of cultural resource sites and determination of eligibility for the NRHP. Following site-specific inventories, mitigation measures could be prescribed for eligible properties. Through this process, impacts on cultural sites eligible for the NRHP would be avoided or mitigated. Despite efforts to identify cultural resources, there could be inadvertent impacts on previously undiscovered sites, especially buried sites with no surface indications. Following discovery of cultural resources, activities would stop to allow mitigation to minimize further damage to cultural resources. There is a defined process through Section 106 for identifying, evaluating, and treating the effects of inadvertent discoveries to reduce potential impacts from these discoveries. Allocating cultural sites to use categories and managing them for their various uses would result in sites being proactively managed considering cultural resource sites' varied values. Protecting sites within the Jupiter Inlet Lighthouse ONA tract through management, interpretation, and avoidance, and by allocating for conservation use would ensure that all sites in that tract are protected. While public, traditional, and scientific uses would be allowed on the Jupiter Inlet Lighthouse ONA, those uses would only be allowed if the cultural resources values could be enhanced.

Restrictions on visually obtrusive developments on VRM Class II areas would limit development on the Lathrop Bayou tract (185 acres). Although not a restriction on surface disturbance, management to maintain the landscape could reduce disturbance that could affect cultural resources. This long-term impact generally would preserve cultural resources in place.

Mineral development (oil and gas, phosphate, and coal) would involve direct and indirect impacts on cultural resources. Direct impacts are related to the level of surface disturbance assumed under the RFD scenario. Because the actual placement of each mineral development or associated feature is unknown at this level of planning, impacts on cultural resources are noted as potential impacts.

Based on the RFD, oil and gas development on FMO could affect 4,964 acres over a 10-year period (BLM 2012a). Proposed 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. Site densities throughout the *decision area* generally would result in the identification and avoidance of cultural sites during development. However, development in areas of high cultural site density could result in the identification of sites that are unavoidable to mineral development, and these sites would be physically altered or eliminated during mitigation activities such as data recovery or other onsite means, as determined through the Section 106 process. Although the physical site could be altered or eliminated, excavation would preserve the artifacts and information associated with the site, maintaining the cultural values.

Phosphate mining activities would occur on 802 acres (already leased) of the FMO in Florida and potentially on an additional 1,083 acres expected to be leased over the next 10 years. These mining activities would create disturbances that would likely result in the identification of cultural sites. Because

a phosphate mine would disturb surface resources, cultural sites would generally not be avoided. This would result in mitigation through data recovery for many of these cultural sites. This would increase the knowledge of the cultural resources in the area but would eliminate these sites from future study and uses (e.g., public, traditional, and scientific). Development of a scientific research design prior to development of a phosphate mine would result in mitigation of the sites with the greatest potential for data recovery and information, limiting the extent of this impact to the degree possible.

Portions of the federal mineral ownership in eastern Kentucky are available for further coal leasing consideration (79,282 acres). Production of coal from underground mines would not result in new surface disturbance; therefore, impacts on cultural resources would not be anticipated from coal development.

Recreation activities and travel on the surface tracts could result in inadvertent damage and vandalism to cultural sites on tracts that contain cultural resources. Although recreation use on most of the surface tracts is very low, there is a potential for cultural resources to be found. Implementation of management actions in the Meadowood and Big Saline Bayou SRMAs would serve to manage recreation use at popular use areas. In the Meadowood SRMA, several developments focus recreation use, minimizing long-term impacts. This would decrease the potential for inadvertent damage of cultural sites. In the Big Saline Bayou tract, the recreation is much more dispersed in nature. The presence of dispersed recreation and the development of additional minor facilities could result in more recreation in this area. The increase in recreation use and the dispersed nature of the site could lead to a potential increase in inadvertent damage at cultural sites on this tract. Combined with the number of routes that are available for use on this tract, there is a potential for cultural resources to be inadvertently damaged by recreation use. However, the regularly flooding of the area and the amount of vegetation and soils on this tract make the potential for a cultural resource site at the surface low.

Recreation activities also occur on Egmont Key and the Jupiter Inlet Lighthouse ONA, which contain cultural resources that are eligible for the NRHP. The designation and cooperative management of the Jupiter Inlet Lighthouse ONA provides a high degree of management scrutiny that has addressed the protection of cultural resources in light of high recreation use. Continued management as an ONA would provide protection to the cultural resources on that tract. However, the isolated nature of the Egmont Key has made protection of the cultural values on that tract more difficult. Under this alternative, the cultural resources would continue to wear owing to the natural elements and dispersed recreation use. In the long term, the cultural values could be damaged and lose the qualities that make them valuable for continued public use.

Inadvertent damage to cultural resource sites from OHV use is concentrated mainly within several hundred yards of roads because of increased accessibility (Sullivan et al. 2002). Managing the Meadowood SRMA and Jupiter Inlet Lighthouse ONA tracts as limited to designated routes would provide more protection, because OHV users would only be allowed to use routes that were designated open. In these areas, the designated routes have been cleared of cultural resources, resulting in no impacts on cultural sites. Closing the Lathrop Bayou tract would preclude OHV impacts, although the isolated nature of the tract and its geography create a natural obstacle to OHV use. In the Big Saline Bayou tract, recreation is more dispersed, which could lead to a potential increase in inadvertent damage to cultural sites on this tract. However, the regularly flooding of the area and the amount of vegetation and soils on this tract make the potential for a cultural resource site at the surface low. On the other surface tracts, OHV use would be limited to existing routes of travel. Limiting use to existing routes that already receive OHV use would not, by the act of such a decision, result in increased impacts. Because the existing routes are very small in number and currently receive very little use, impacts on and/or adjacent to them would be minimal.

Disposal (or exchange) of four surface tracts, with a total of 77.27 acres, under the lands and realty program, would exclude them from BLM management and associated resource protections. Following disposal, impacts on cultural resources could potentially occur from new land use on these tracts. For three tracts in Arkansas (55 acres), new land use would likely include timber harvest, conversion to pasture, and construction of access roads and possibly home sites. In Florida, the Lake Marion tract (22.27 acres) would likely be incorporated into the surrounding residential development. Cultural resources inventories would be completed prior to disposal, however, and would potentially identify cultural resource sites. Completion of scientific research prior to disposal could result in mitigation through data recovery, limiting the extent of impacts. Appropriate inventory and potential mitigation would be determined through the Section 106 consultation process. Three tracts, with a total of 83.57 acres, would be transferred to other federal agencies, where protection of cultural resources under the NHPA would continue to be applied. Cultural resources could be affected if ROWs were developed under the lands and realty program. This would involve land-clearing activities to make way for communication towers and linear features, such as roads, pipelines, and transmission lines. Before a ROW would be approved on a surface tract, however, an appropriate level of cultural resource survey would need to be conducted. This would increase the potential for identification of cultural resources, so that impacts could be avoided or mitigated before development activities. There would still be potential for inadvertent damage to sites not identified during the inventories. However, based on historic activities, development of ROWs on BLM-administered surface tracts is anticipated to be low.

4.9.3 Alternative B (Preferred Alternative)

Impacts on cultural resources from implementing actions for wildland fire, phosphate mining, and coal mining would be the same as those described in Alternative A.

Impacts from vegetation, fish and wildlife, and special status species management actions would be the same as those described in Alternative A, except vegetation manipulation would be allowed on all surface tracts identified for retention (2,776 acres), which is an increase of 1,701 acres compared with Alternative A. This could increase the scope of the impacts from the three surface tracts identified in Alternative A to all the surface tracts. It could also increase the potential to identify cultural resources in the inventories preceding the vegetation manipulation actions. The projected annual average of prescribed fire would increase from 50 acres in Alternative A to 100 acres in this alternative, and could be applied to all retained surface tracts. Prescribed fire events are occasionally preceded by non-fire fuels reduction actions to obtain a smaller, more manageable, and less intense planned burn. Although loss of or damage to cultural resources during planned habitat management actions is possible, proper planning and consultation with a cultural resource specialist would reduce these impacts to a negligible level.

Impacts from cultural resources management actions would be the same as those described in Alternative A, except that public, traditional, and scientific uses would also be allowed on the Egmont Key tract. This would allow the cultural resources to be used by the public for recreational purposes (e.g., interpretive trails), but only if the natural and cultural resource values could be enhanced. In addition, restoration of the historic structures on the tract would occur through conservation efforts.

Restrictions on visually obtrusive developments on VRM Class II areas would limit development on 92 acres (portions of the Meadowood SRMA). Although not a restriction on surface disturbance, management to maintain the landscape could reduce disturbance that could affect cultural resources. This long-term impact generally would preserve cultural resources in place.

The impacts on cultural resources from oil and gas development activities would be similar to those identified under Alternative A, except the application of leasing stipulations would reduce impacts in specific areas where stipulations (Appendix C) were applied. An NSO stipulation would be applied to

sites listed or potentially eligible for listing on the NRHP, and a CSU stipulation would be applied to sites containing historic properties and/or resources protected under the NHPA, American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act (NAGPRA), Executive Order (EO) 13007, and/or other statutes and EOs. In these areas, there would be a reduction in the potential for damage to cultural resources.

Recreation activities and travel on the surface tracts could result in inadvertent damage and vandalism to cultural sites on tracts that contain cultural resources. Although recreation use on most of the surface tracts is very low, there is a potential for cultural resources to be found. Impacts from management of the Meadowood and Big Saline Bayou SRMAs would be the same as identified in Alternative A. Management of Egmont Key would provide a sustainable recreation experience while protecting cultural resources. This would allow management to specifically address the deteriorating condition of some of the cultural resources in this tract, as well as protecting some the sites that long-term recreation has slowly affected. Increased interpretation opportunities would increase public appreciation for the area's cultural values. Increased emotional linkages associated with public appreciation could lead to increased user stewardship behavior (Sharpe and Ewert 2000). Major impacts associated with stewardship behavior include increased protection of cultural sites, decreased inadvertent damage to or disturbance of cultural sites, decreased vandalism and looting, and preservation of the integrity of cultural resources.

Limiting OHV use on all the surface tracts to designated routes would protect cultural resources by ensuring that OHV use only occurs where cultural resource sites could be protected. The routes on the Meadowood SRMA and Jupiter Inlet Lighthouse ONA tracts would remain designated as under Alternative A. These routes have already avoided cultural sites, so no further impact would be anticipated. Only 455 feet of route would be open for the general public use on the Big Saline Bayou tract. This tract has a county road and has been in use for years. No impacts on cultural resources are anticipated from its continued use. The remainder of the routes would be either closed or limited to administrative use only, and would protect any adjacent cultural sites from route expansion or looting. No other routes would be designated in the remainder of the tracts, similarly protecting cultural resources.

Disposal (or exchange) of six surface tracts, with a total of 87.96 acres, under the lands and realty program, would exclude them from BLM management and associated resource protections. Following disposal, impacts on cultural resources could potentially occur from new land use on these tracts. For three tracts in Arkansas (65 acres), new land use would likely include timber harvest, conversion to pasture, and construction of access roads and possibly home sites. In Florida, three tracts (22.96 acres) would likely be incorporated into adjacent surrounding residential developments. Cultural resources inventories would be completed prior to disposal, however, and would potentially identify cultural resource sites. Completion of scientific research prior to disposal could result in mitigation through data recovery, limiting the extent of impacts. Appropriate inventory and potential mitigation would be determined through the Section 106 consultation process. Three tracts, with a total of 120 acres, would be transferred to other federal agencies, where protection of cultural resources under the NHPA would continue to be applied. The Gasparilla tract (7.4 acres) would be transferred to the State of Florida, providing for restoration and maintenance of the historic Boca Grande Rear Range Light. Cultural resources could be affected if ROWs were developed under the lands and realty program. This would involve land-clearing activities to make way for communication towers and linear features, such as roads, pipelines, and transmission lines. Before a ROW was approved on a surface tract, however, an appropriate level of cultural resource survey would need to be conducted. This would increase the potential for identification of cultural resources, so that impacts could be avoided or mitigated before development activities. There would still be potential for inadvertent damage to sites not identified during the inventories. However, the likelihood of development would be reduced compared with Alternative A, because all surface tracts would be identified as ROW avoidance areas.

4.9.4 Alternative C

Impacts on cultural resources from implementing actions for wildland fire, phosphate mining, and coal mining would be the same as those described in Alternative A. Impacts on cultural resources from implementing actions for cultural resources, VRM, oil and gas development, recreation management, and travel and access management, and ROW management would be the same as those described in Alternative B.

The impacts on cultural resources from conducting vegetation treatments and implementing habitat improvement actions would be the same as Alternative B, except that management actions could be implemented on 60 additional acres identified for retention. This could marginally increase the scope of the impacts compared with Alternative B, including the potential to identify cultural resources in the inventories preceding the vegetation manipulation actions. Although loss of or damage to cultural resources during planned habitat management actions is possible, proper planning and consultation with a cultural resource specialist would reduce these impacts to a negligible level.

Disposal (or exchange) of three surface tracts, with a total of 27.75 acres, under the lands and realty program, would exclude them from BLM management and associated resource protections. Following disposal, impacts on cultural resources could potentially occur from new land use on these tracts. For the five-acre Drasco tract in Arkansas, new land use would likely be conversion to pasture with possible construction of an access road and home site. In Florida, two tracts (22.75 acres) would likely be incorporated into surrounding residential developments. Cultural resources inventories would be completed prior to disposal, however, and would potentially identify cultural resource sites. Completion of scientific research prior to disposal could result in mitigation through data recovery, limiting the extent of impacts. Appropriate inventory and potential mitigation would be determined through the Section 106 consultation process. Three tracts, with a total of 120 acres, would be transferred to other federal agencies, where protection of cultural resources under the NHPA would continue to be applied. The Gasparilla tract (7.4 acres) would be transferred to the State of Florida, providing for restoration and maintenance of the historic Boca Grande Rear Range Light.

4.9.5 Alternative D

Impacts on cultural resources from implementing actions for vegetation, fish and wildlife, special status species, wildland fire, cultural resource, phosphate mining, and coal mining, would be the same as those described in Alternative A. The impacts on cultural resources from VRM, oil and gas development, and ROW management would be the same as those identified under Alternative B.

Impacts from recreation management, and travel and access management of the Meadowood SRMA and Jupiter Inlet Lighthouse ONA would be the same as identified in Alternative B. Under this alternative, however, the Big Saline Bayou tract would not be an SRMA. The presence of undeveloped recreation and the lack of supporting facilities in the Big Saline Bayou tract would result in recreation users identifying the areas they want to use and creating makeshift facilities to support their recreation use. This could result in new surface disturbances without any associated cultural clearances, which would increase the risk of impacts on cultural sites. In addition, impacts from OHV use would be similar to those identified in Alternative B, except most of the routes (Appendix G) in the Big Saline Bayou tract would be open to public use. The increase in recreation use and the dispersed nature of the site could lead to a potential increase in inadvertent damage at cultural sites on this tract. However, the regularly flooding of the area and the amount of vegetation and soils on this tract make the potential for a cultural resource site at the surface low.

Disposal (or exchange) of 16 surface tracts, with a total of 615.87 acres, under the lands and realty program, would exclude them from BLM management and associated resource protections. Following disposal, impacts on cultural resources could potentially occur from new land use on these tracts. For 12 tracts in Arkansas (580 acres), new land use would likely include timber harvest, conversion to pasture, and construction of access roads and possibly home sites. In Florida, four tracts (35.87 acres) would likely be incorporated into surrounding residential developments. Cultural resources inventories would be completed prior to disposal, however, and would potentially identify cultural resource sites. Completion of scientific research prior to disposal could result in mitigation through data recovery, limiting the extent of impacts. Appropriate inventory and potential mitigation would be determined through the Section 106 consultation process. Five tracts, with a total of 535.27 acres, would be transferred to other federal agencies, where protection of cultural resources under the NHPA would continue to be applied. The Gasparilla tract (7.4 acres) would be transferred to the State of Florida, providing for restoration and maintenance of the historic Boca Grande Rear Range Light.

4.10 PALEONTOLOGICAL RESOURCES

This section presents potential impacts on paleontological resources from implementing management actions for each resource program. Existing conditions concerning paleontological resources are described in Chapter 3.

Impacts on paleontological resources are not anticipated as a result of implementing management actions for the following resource programs/activities: vegetation, fish and wildlife, special status species, wildland fire, and cultural resources. The management actions for these programs would not affect the discovery, recovery, or curation of paleontological resources.

4.10.1 Assumptions

The paleontological resources impact analysis is based on the following assumptions:

- Paleontological resources would be discovered in portions of the *planning area*, although at a rate similar to what has historically been identified in the area (see Chapter 3).
- Recovery and curation in paleontological resources by permitted specialists would result in resource protection and preservation of paleontological values and in educational opportunities.
- Paleontological resources identified during assessments would be protected through data collection and mitigation.
- The number of localities that could be affected by various actions would be directly correlated with the degree, nature, and quantity of surface disturbing activities within the *decision area*.
- Surface disturbing activities could expose, dislodge, or damage paleontological resources and features that were not visible prior to surface disturbance.

4.10.2 Alternative A (No Action Alternative)

Restrictions on visually obtrusive developments on VRM Class II areas would limit development on 185.03 acres (Lathrop Bayou tract). Although not a restriction on surface disturbance, management to maintain the landscape could reduce disturbance that could impact paleontological resources. This long-term impact generally would protect paleontological resources from disturbance.

Based on the RFD, oil and gas development within these areas could affect up to 4,964 acres over a 10-year period (BLM 2012a). Such disturbance could inadvertently damage vertebrate or other scientifically significant fossils, but could also result in the identification of unknown paleontological resources.

Phosphate mining activities would occur on approximately 802 acres (already leased) of the FMO in Florida and potentially on an additional 1,083 acres expected to be leased over the next 10 years, which would create disturbances that could result in the identification of paleontological resources. This would increase the knowledge of the paleontological resources in the area, but could also result in damage to paleontological resources. Development of a scientific research design prior to development of a phosphate mine would result in mitigation of the sites with the greatest potential for data recovery and information, limiting the extent of this impact to the degree possible.

Portions of the federal mineral ownership in eastern Kentucky are available for further coal leasing consideration (79,282 acres). Production of coal from underground mines could damage or destroy paleontological resources that were not discovered and mitigated before the disturbance occurred.

Recreation activities and travel would potentially affect paleontological resources. Because of their widespread occurrence and generally unsupervised nature, casual recreational use could result in unmitigated impacts on paleontological resources exposed at the surface. Given the lack of known paleontological resources on the surface tracts, however, the potential for an impact is very low. Most of this impact would result from unauthorized collecting and vandalism; however, unmitigated impacts could also result from any surface disturbing aspect of recreation.

Disposal (or exchange) of four surface tracts, with a total of 77.27 acres, under the lands and realty program, would exclude them from BLM management and associated resource protections. Following disposal, impacts on paleontological resources could potentially occur from new land use on these tracts. For three tracts in Arkansas (55 acres), new land use would likely include timber harvest, conversion to pasture, and construction of access roads and possibly home sites. In Florida, the Lake Marion tract (22.27 acres) would likely be incorporated into the surrounding residential development. As a result, increased surface disturbance from potential development activities and general use of the tracts would occur, which would increase the potential for identification of paleontological resources and for inadvertent damage to fossils during development activities. Given the lack of known paleontological resources on the surface tracts, however, the potential for an impact is very low. Three tracts, with a total of 83.57 acres, would be transferred to other federal agencies, where protection of paleontological resources would continue to be applied. There would be potential for impacts on paleontological resources from ROW development on the surface tracts as a result of land-clearing activities to make way for communication towers and linear features, such as roads, pipelines, and transmission lines. However, based on historic activities, development of ROWs on BLM-administered surface tracts is anticipated to be low.

4.10.3 Alternative B (Preferred Alternative)

Impacts on paleontological resources from implementing actions for paleontological resources, oil and gas development, phosphate mining, coal mining, recreation management, and travel and access management would be the same as those described in Alternative A. While the management actions for oil and gas development, recreation management, and travel and access management vary by alternative, the impacts from these actions to paleontological resources would be the same.

Restrictions on visually obtrusive developments on VRM Class II areas would limit development on 92 acres (portions of the Meadowood SRMA). Although not a restriction on surface disturbance, management to maintain the landscape could reduce disturbance that could affect paleontological resources. This long-term impact generally would protect paleontological resources from disturbance.

Disposal (or exchange) of six surface tracts, with a total of 87.96 acres, under the lands and realty program, would exclude them from BLM management and associated resource protections. Following disposal, impacts on paleontological resources could potentially occur from new land use on these tracts. For three tracts in Arkansas (65 acres), new land use would likely include timber harvest, conversion to pasture, and construction of access roads and possibly home sites. In Florida, three tracts (22.96 acres) would likely be incorporated into adjacent surrounding residential developments. As a result, increased surface disturbance from potential development activities and general use of the tracts would occur, which would increase the potential for identification of paleontological resources and for inadvertent damage to fossils during development activities. Given the lack of known paleontological resources on the surface tracts, however, the potential for an impact is very low. Four tracts, with a total of 127.4 acres, would be transferred to other agencies, where protection of paleontological resources would continue to be applied. There would be potential for impacts on paleontological resources from ROW development on the surface tracts as a result of land-clearing activities to make way for communication towers and linear features, such as roads, pipelines, and transmission lines. However, based on historic activities,

development of ROWs on BLM-administered surface tracts is anticipated to be low. In addition, the likelihood of development would be reduced compared with Alternative A, because all surface tracts would be identified as ROW avoidance areas.

4.10.4 Alternative C

Impacts on paleontological resources from implementing actions for paleontological resources, oil and gas development, phosphate mining, coal mining, recreation management, and travel and access management would be the same as those described in Alternative A. While the management actions for oil and gas development, recreation management, and travel and access management vary by alternative, the impacts from these actions on paleontological resources would be the same. Impacts on paleontological resources from implementing actions for visual resources and ROW management would be the same as those described in Alternative B.

Disposal (or exchange) of three surface tracts, with a total of 27.75 acres, under the lands and realty program, would exclude them from BLM management and associated resource protections. Following disposal, impacts on paleontological resources could potentially occur from new land use on these tracts. For the five-acre Drasco tract in Arkansas, new land use would likely be conversion to pasture with possible construction of an access road and home site. In Florida, two tracts (22.75 acres) would likely be incorporated into surrounding residential developments. As a result, increased surface disturbance from potential development activities and general use of the tracts would occur, which would increase the potential for identification of paleontological resources and for inadvertent damage to fossils during development activities. Given the lack of known paleontological resources on the surface tracts, however, the potential for an impact is very low. Four tracts, with a total of 127.4 acres, would be transferred to other agencies, where protection of paleontological resources would continue to be applied.

4.10.5 Alternative D

Impacts on paleontological resources from implementing actions for paleontological resources, oil and gas development, phosphate mining, coal mining, recreation management, and travel and access management would be the same as those described in Alternative A. While the management actions for oil and gas development, recreation management, and travel and access management vary by alternative, the impacts from these actions on paleontological resources would be the same. Impacts on paleontological resources from implementing actions for visual resources and ROW management would be the same as those described in Alternative B.

Disposal (or exchange) of 16 surface tracts, with a total of 615.87 acres, under the lands and realty program, would exclude them from BLM management and associated resource protections. Following disposal, impacts on paleontological resources could potentially occur from new land use on these tracts. For 12 tracts in Arkansas (580 acres), new land use would likely include timber harvest, conversion to pasture, and construction of access roads and possibly home sites. In Florida, four tracts (35.87 acres) would likely be incorporated into surrounding residential developments. As a result, increased surface disturbance from potential development activities and general use of the tracts would occur, which would increase the potential for identification of paleontological resources and for inadvertent damage to fossils during development activities. Given the lack of known paleontological resources on the surface tracts, however, the potential for impact is very low. Six tracts, with a total of 542.67 acres, would be transferred to other federal agencies, where protection of paleontological resources would continue to be applied.

4.11 VISUAL RESOURCES

This section presents potential impacts on visual resources from implementing management actions for each resource program. Existing conditions concerning visual resources are described in Chapter 3.

Impacts on visual resources are not anticipated from cultural resources management. Cultural resource management actions would not alter the scenic quality or modify the landscape.

4.11.1 Assumptions

The impact analysis for visual resources is based on the following assumptions:

- VRM classes (objectives) are prescriptive for all resources and uses on the BLM-administered surface estate. Proposed activities that would not meet the designated VRM objectives would be mitigated to the extent needed to meet the objectives. Proposed activities that could not be mitigated would not be authorized.
- The visual resources "inventory classes represent the relative value of the visual resources" (BLM-H-8410 VRI).
- New proposed surface disturbing activities would be subject to NEPA analysis, including a VRM contrast rating.

Potential impacts on scenic quality were estimated by evaluating the potential for management actions to introduce visual changes to existing landscapes. Current visual resource conditions, against which management impacts are compared, were identified through the inventory of visual resources. The scenic qualities of the landscape are described comparatively by application of visual resource inventory (VRI) classes (I, II, III, and IV). Impacts from actions proposed in Chapter 2, including alternative VRM objectives, are analyzed against the scenic quality of the existing landscape, as characterized by the VRI classes. Landscape modifications and impacts on visual resources could occur under most of the management classes (II, III, and IV). The degree of impact would depend on the visual objectives, the nature of the proposed project, and the observation point of the visitor.

Table 4-33 shows the VRI Class for each surface tract, and also shows the the proposed VRM Classes for each tract by alternative.

Table 4-32. Visual Resource Inventory Class and Visual Resource Management Class by Alternative for Each Surface Tract

State/ County	Tract Name: Description	Acres	VRI Class	VRM Class Alt A	VRM Class Alt B - D
Arkansas/ Baxter	Long Mountain Creek	80	IV	Unclassified	IV
	Norfolk Lake	20	IV	Unclassified	IV
Arkansas/ Cleburne	Drasco	5	IV	Unclassified	IV
Arkansas/ Crawford	Locust Mountain	40	IV	Unclassified	IV
Arkansas/ Fulton	Bennett Bayou	40	IV	Unclassified	IV
	Foster Branch	40	IV	Unclassified	IV

State/ County	Tract Name: Description	Acres	VRI Class	VRM Class Alt A	VRM Class Alt B - D
	Gepp	40	IV	Unclassified	IV
Arkansas/ Marion	Marion	80	IV	Unclassified	IV
	Mountain Creek	80	IV	Unclassified	IV
Arkansas/ Pike	Redland Mountain	40	IV	Unclassified	IV
Arkansas/ Searcy	Bear Creek	160	IV	Unclassified	IV
	Buffalo River	40	III	Unclassified	III
	Calf Creek	40	IV	Unclassified	IV
	Campbell Hollow	40	IV	Unclassified	IV
	Middle Fork	40	IV	Unclassified	IV
	Point Peter Mountain	40	IV	Unclassified	IV
	Tilly	40	IV	Unclassified	IV
Arkansas/ Sharp	Martins Creek	40	IV	Unclassified	IV
Arkansas/ Van Buren	Dry Creek	40	IV	Unclassified	IV
	Lost Creek	40	IV	Unclassified	IV
	Rattlesnake Hollow	40	IV	Unclassified	IV
	West Fork	10	IV	Unclassified	IV
Arkansas/ Washington	Henderson Mountain	40	IV	Unclassified	IV
Florida/ Bay	Lathrop Bayou	185.03	IV	II	IV
Florida/ Citrus	Citrus County	12.91	IV	Unclassified	IV
Florida/ Hillsborough	Egmont Key	55	III	Unclassified	III
Florida/ Lee	Gasparilla	7.4	IV	Unclassified	IV
Florida/ Monroe	Park Key	1.36	IV	Unclassified	IV
	Sugarloaf Key	3.57	IV	Unclassified	IV
Florida/ Palm beach	Jupiter Inlet Lighthouse ONA	85.83	III	III	III
Florida/ Polk	Lake Marion	22.27	IV	Unclassified	IV
Florida/ Suwannee	Suwannee	0.21	IV	Unclassified	IV

State/ County	Tract Name: Description	Acres	VRI Class	VRM Class Alt A	VRM Class Alt B - D
Florida/ Walton	Freeport	0.48	IV	Unclassified	IV
Louisiana/ Desoto	Rocky Bayou	21	IV	Unclassified	IV
Louisiana/ Natchitoches	Black Lake	135.19	IV	Unclassified	IV
Louisiana/ Rapides	Big Saline Bayou	158	IV	Unclassified	IV
Louisiana/ St. Martin	Duck Lake	65.59	IV	Unclassified	IV
Louisiana/ St. Mary	Baldwin	360.27	IV	Unclassified	IV
Virginia/ Fairfax	Meadowood: West Meadow	35	III	III	III
Virginia/ Fairfax	Meadowood: Horse Pasture, Undeveloped Areas Visible from the Road	26	II	III	II
Virginia/ Fairfax	Meadowood: Horse Pasture, Undeveloped Areas Not Visible from the Road	16	III	III	III
Virginia/ Fairfax	Meadowood: East Meadow	66	II	III	II
Virginia/ Fairfax	Meadowood: South Meadow	24	III	III	III
Virginia/ Fairfax	Meadowood: Horse Pasture, Developed Areas Not Visible from the Road	26	IV	III	IV
Virginia/ Fairfax	Meadowood: Woodlands (Remainder of tract)	611	III	III	III

4.11.2 Alternative A (No Action Alternative)

Continuing vegetation manipulation (e.g., prescribed burning, mechanical, chemical, manual, and biological) on the Lathrup Bayou, Jupiter Inlet Lighthouse ONA and the Meadowood SRMA surface tracts (a total of 1,075 acres), under the vegetation, fish and wildlife, and special status species resource programs, would affect visual resources on these tracts in the short-term. Such impacts could include reduced visibility as a result of smoke from prescribed fires and observable lines on the landscape from machinery. However, the results of the action on vegetation (improving overall health and functioning of vegetation) would improve the visual quality of the vegetation in the long term. Implementing actions to

improve fish and wildlife and special status species habitat could help to maintain or improve healthy vegetation communities, thereby enhancing the diversity, color, and texture of the vegetation. Habitat restoration measures that include surface or vegetation disturbance, however, could create noticeable short-term changes in the landscape, as described in the effects of vegetation treatments.

Wildland fire and fire suppression activities have many effects on the landscape, and thus its visual values. Fire severity varies depending on the vegetation community. 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. More variety often leads to more interest and more visual appeal to the visitor. In the short term, burned vegetation would be unpleasant to view for many visitors. Over the long term, however, fire could lead to variety in the vegetation of a landscape that is interesting and appealing to view, depending on vegetation type and size of the fire. Fire suppression would result in construction of fire lines (hand and bulldozer) that remove vegetation and expose the underlying soil, which would produce short- and long-term changes to the landscape and visual resources.

VRM actions to designate 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, such as form, line, and color. Class II objectives would provide protection of visual qualities, retaining the existing character of the landscape. VRM Class III (890 acres) objectives are less protective and would allow more surface disturbing impacts and landscape change. Class III objectives would not emphasize protection of an unmodified landscape and visual resources. There are no VRM Class I or Class IV areas under this alternative.

Energy and minerals management actions would have a direct impact on visual resources. Development of oil and gas could result in removal of vegetation, alteration of the landform, and placement of structures on the landscape. Residual surface disturbance of 1,624 acres through the construction of roads to the site would create lines in the landscape through removal of vegetation and cutting and filling of soils for the roadbed. The type of vegetation and the slope of the landform would affect the degree of contrast created. Road construction on steep slopes would require more cutting and filling of soil than construction on shallower slopes. Placement of roads in dense vegetation would result in more evident lines through the vegetation. Roads on gentle terrain through sparse vegetation generally would result in less contrast on the landscape. The exposure of soils likely could result in noticeable changes in the color of the landform. Equipment and buildings, and other support facilities would introduce human-made structures to an otherwise more natural landscape. The size and degree of these changes would vary with the size of the operation, topography (landform), soil type (color and texture), vegetation type, and position of the observer. Implementation of BMPs (Appendix D) would help to mitigate impacts on visual resources.

Phosphate mining activities would occur on approximately 802 acres (already leased) of the FMO in Florida and potentially on an additional 1,083 acres expected to be leased over the next 10 years, which would create disturbances and visual intrusions on the landscape. Such development would result in the removal of vegetation, alteration of the landform, and placement of structures on the landscape. The construction of roads to the site would create lines in the landscape through removal of vegetation and cutting and filling of soils for the roadbed. The exposure of soils likely could result in noticeable changes in the color of the landform. Equipment and buildings, and other support facilities would introduce human-made structures to an otherwise more natural landscape.

Because coal development activities in eastern Kentucky would be limited to underground mining methods and would use existing infrastructure, these activities would not create additional effects to visual resources.

Recreation management actions and travel and access management actions would affect visual resources by creating landscape intrusions. Management actions that require construction of recreation sites and facilities (e.g., facilities in the Meadowood and Big Saline Bayou SRMAs, such as signs, interpretive sites, trailheads, roads, parking areas, and a boat access area), and the associated landform and vegetation disturbances needed to accommodate the facilities, would directly affect visual resources by adding unnatural features at the site of the facilities and to the surrounding landscape. These facilities would be designed and located to meet visual objectives for the given area, but the effects would remain localized and long term. The visual effect would be less noticeable on a larger, landscape scale. Management actions that limit OHV use to existing roads and trails would confine impacts on the landscape to the existing transportation system and help to eliminate the creation of new routes that would result in further changes to the landscape and visual quality. However, some areas, such as Big Saline Bayou, contain multiple existing routes, resulting in duplicate routes. OHV routes create visible lines on the landscape. Depending on topography, the vegetation community, and the observation points, those lines would be visible to varying degrees. Actions to limit OHV use to designated routes on Jupiter Inlet Lighthouse ONA and the Meadowood SRMA would further protect visual resources.

Disposal (or exchange) of four surface tracts, with a total of 77.27 acres, under the lands and realty program, would exclude them from BLM management and associated resource protections. As a result, increased surface disturbance from potential development activities and general use of the tracts could occur, which would create visual intrusions in the landscape and alter viewsheds. For three tracts in Arkansas (55 acres), new land use would likely include timber harvest, conversion to pasture, and construction of access roads and possibly home sites. Because this land use would be similar to the surrounding landscape, impacts on visual resources on these tracts would be minor. In Florida, the Lake Marion tract (22.27 acres) would likely be incorporated into the surrounding residential development. Development, including construction of structures, could occur on this 22-acre tract and would increase visual intrusions in the landscape. Three tracts with a total of 83.57 acres would be transferred to management by other agencies, and management actions would be expected to result in relatively minor impacts on visual resources. Visual resources also could be affected if ROWs were developed under the lands and realty program. This would involve land-clearing activities to make way for communication towers and linear features, such as roads, pipelines, and transmission lines. This would create noticeable lines (edges) in the vegetation, increase visual contrast from exposed soils, and alter viewsheds. However, based on historic activities, development of ROWs on BLM-administered surface tracts is anticipated to be low.

4.11.3 Alternative B (Preferred Alternative)

Impacts on visual resources from implementing actions for wildland fire, phosphate mining, and coal mining 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 would increase impacts on visual resources compared with Alternative A. Vegetation treatments could be applied to all surface tracts identified for retention. In addition, desired vegetation communities would be managed to meet habitat goals identified in the state WAP. These actions would further decrease vegetation cover over the short term and increase interest and variety in form, line, color, and texture over the long term. Restoration and vegetation treatments designed to improve ecological conditions would create a mosaic in vegetation pattern, composition, and texture that would increase visual variety and interest and improve scenic quality. Habitat restoration measures that include surface or vegetation disturbance, however, could create noticeable short-term changes in the landscape, as described in the effects of vegetation treatments.

Impacts on visual resources from VRM actions would be the same as those described in Alternative A except there would be fewer acres (92 acres as opposed to 185 acres in Alternative A) of VRM Class II areas and the addition of 2,032 Class IV acres. Fewer VRM Class II areas would not provide as much protection.

Impacts from oil and gas management actions would be similar to those described in Alternative A. While the oil and gas management actions vary by alternative, the RFD scenario projects the same amount of surface disturbance for each alternative. Applying stipulations to protect special status species, habitats, and cultural resources could affect the location of oil and gas development.

Impacts on visual resources from recreation management and travel and access management actions would be the same as those identified under Alternative A, except limiting OHV use to designated routes and closing 8,236 of roads to OHV use would help to restore visual impacts from existing roads and trails that are not designated routes. Linear disruptions of vegetation on the landscape from existing roads would gradually disappear as new vegetation growth encroaches on the existing roads and trails.

Disposal (or exchange) of six surface tracts, with a total of 87.96 acres, under the lands and realty program, would exclude them from BLM management and associated resource protections. As a result, increased surface disturbance from potential development activities and general use of the tracts could occur, which would create visual intrusions in the landscape and alter viewsheds. For three tracts in Arkansas (65 acres), new land use would likely include timber harvest, conversion to pasture, and construction of access roads and possibly home sites. Because this land use would be similar to the surrounding landscape, impacts on visual resources on these tracts would be minor. In Florida, three tracts (22.96 acres) would likely be incorporated into adjacent surrounding residential developments. Development, including construction of structures, could occur on these tracts and would increase visual intrusions in the landscape. Four tracts with a total of 127.4 acres would be transferred to management by other agencies, and management actions would be expected to result in relatively minor impacts on visual resources. Visual resources also could be affected if ROWs are developed under the lands and realty program. This would involve land-clearing activities to make way for communication towers and linear features, such as roads, pipelines, and transmission lines. This would create noticeable lines (edges) in the vegetation, increase visual contrast from exposed soils, and alter viewsheds. However, based on historic activities, development of ROWs on BLM-administered surface tracts is anticipated to be low. In addition, the likelihood of development would be reduced compared with Alternative A, because all surface tracts would be identified as ROW avoidance areas.

4.11.4 Alternative C

Impacts on visual resources from implementing actions for wildland fire, phosphate mining, and coal mining would be the same as those identified under Alternative A. Impacts on visual resources from vegetation resources, fish and wildlife, special status species, visual resource, recreation, travel and access management actions, and ROW management would be the same as those identified under Alternative B.

Impacts from oil and gas management actions would be similar to those described in Alternative A. While the oil and gas management actions vary by alternative, the RFD scenario projects the same amount of surface disturbance for each alternative. Applying stipulations to protect special status species, habitats, and cultural resources could affect the location of oil and gas development.

Disposal (or exchange) of three surface tracts, with a total of 27.75 acres, under the lands and realty program, would exclude them from BLM management and associated resource protections. As a result, increased surface disturbance from potential development activities and general use of the tracts could occur, which would create visual intrusions in the landscape and alter viewsheds. For the five-acre Drasco

tract in Arkansas, new land use would likely be conversion to pasture, with possible construction of an access road and home site. Because this land use would be similar to the surrounding landscape, impacts on visual resources would be minor. In Florida, two tracts (22.75 acres) would likely be incorporated into adjacent surrounding residential developments. Development, including construction of structures, could occur on these tracts and would increase visual intrusions in the landscape. Four tracts with a total of 127.4 acres would be transferred to management by other agencies, and management actions would be expected to result in relatively minor impacts on visual resources.

4.11.5 Alternative D

Impacts on visual resources from implementing actions for vegetation, fish and wildlife, special status species, wildland fire, phosphate mining, and coal mining would be the same as those identified under Alternative A. Impacts on visual resources from VRM and ROW management would be the same as those described in Alternative B.

Impacts from oil and gas management actions would be similar to those described in Alternative A. While the oil and gas management actions vary by alternative, the RFD scenario projects the same amount of surface disturbance for each alternative. Applying stipulations to protect special status species, habitats, and cultural resources could affect the location of oil and gas development.

Impacts on visual resources from recreation management and travel and access management actions would be the same as those identified under Alternative A, except limiting OHV use to designated routes and closing 4,206 of roads to OHV use would help to restore visual impacts from existing roads and trails that were not designated routes. Linear disruptions of vegetation on the landscape from existing roads would gradually disappear as new vegetation growth encroached on the existing roads and trails.

Disposal (or exchange) of 16 surface tracts, with a total of 615.87 acres, under the lands and realty program, would exclude them from BLM management and associated resource protections. As a result, increased surface disturbance from potential development activities and general use of the tracts could occur, which would create visual intrusions in the landscape and alter viewsheds. For 12 tracts in Arkansas (580 acres), new land use would likely include timber harvest, conversion to pasture, and construction of access roads and possibly home sites. Because this land use would be similar to the surrounding landscape, impacts on visual resources on these tracts would be minor. In Florida, four tracts (35.87 acres) would likely be incorporated into adjacent surrounding residential developments. Development, including construction of structures, could occur on these tracts and would increase visual intrusions in the landscape. Six tracts with a total of 542.67 acres would be transferred to management by other agencies, and management actions would be expected to result in relatively minor impacts on visual resources.

4.12 ENERGY AND MINERALS

This section presents potential impacts on energy and minerals resources from implementing management actions for each resource program. Existing conditions concerning energy and minerals are described in Chapter 3.

4.12.1 Assumptions

The analysis is based on the following assumptions:

- Valid existing leases would be managed under the stipulations in effect when the leases were issued, and new stipulations proposed under this RMP would apply if leases were renewed.
- The RFD scenario would not vary by alternative based on the proposed stipulations and the historic levels of development.
- Initial disturbance from oil and gas development would average six acres per well.
- Residual disturbance from oil and gas development would average two acres per well.

4.12.2 Alternative A (No Action Alternative)

Vegetation manipulation (e.g., prescribed burning, mechanical, chemical, manual, and biological) would continue on the Lathrup Bayou, Jupiter Inlet Lighthouse ONA, and the Meadowood SRMA surface tracts (a total of 1,075 acres) under the vegetation, fish and wildlife, and special status species resource programs. None of these tracts, however, are within areas of expected energy or mineral development, so no impacts would be expected.

While mineral development facilities, such as well sites, could potentially be affected by wildland fire, wildland fire management, e.g., suppression, would be designed to avoid and protect such facilities.

Cultural resource management actions on BLM surface tracts would not affect energy and minerals resources. There are only eight surface tracts with 449 acres (15% of the total surface tract acreage) in areas of expected mineral development with no known cultural resource sites on these eight tracts.

Restrictions on visually obtrusive developments on VRM Class II areas would limit development on the Lathrop Bayou tract (185 acres). Because this tract is not within an area of expected energy or mineral development, however, energy and mineral resources would not be affected.

Under this alternative for the oil and gas leasing program, lease stipulations from the Florida RMP would be carried forward, and stipulations for other states would be applied on a site-specific basis during case-by-case review of new leasing proposals. Applying these lease stipulations, such as for protection of special status species, on FMO throughout the *decision area* could restrict oil and gas development and exploration by applying NSO in certain areas or through seasonal timing limitations. The Meadowood SRMA in Virginia and the Jupiter Inlet Lighthouse ONA in Florida (890 acres total) would be closed to oil and gas leasing. However, neither of these two tracts is within areas of expected oil and gas development.

Providing for future phosphate mining of 802 acres and the leasing of 1,083 acres would allow the development of phosphate to continue at historic and current rates. This would allow development to meet existing demands while allowing future expansion of the existing site.

Making the FMO in eastern Kentucky available for further coal leasing consideration would allow the development of coal resources to continue at the current rate while allowing future consideration of leases in the area.

Recreation management and travel and access management actions could potentially affect energy and mineral resources development. However, Big Saline Bayou tract is the only SRMA within an AED, and, in fact, already has existing oil and gas wells. Location of recreational facilities and designation of travel routes within the SRMA would improve multiple use compatibility. There are seven additional surface tracts (291 acres total) within AEDs for oil and gas. However, the level of recreational use on these tracts is low, and impacts on energy and minerals management would be minor.

Tracts proposed for disposal would be evaluated for mineral potential prior to being offered. Based on the current RFD, eight surface tracts (a total of 449 acres) are within AEDs for oil and gas. Of these, only two tracts (15 acres) would be available for disposal. Impacts on oil and gas development would not be affected, however, because oil and gas rights would be reserved. The demand for BLM to grant ROWs in support of oil and gas development is considered unlikely, because the surface tracts are relatively small and scattered, and few are within AEDs.

4.12.3 Alternative B (Preferred Alternative)

Impacts on energy and mineral resources management from implementing actions for wildland fire, cultural resources management, phosphate mining, coal mining, and recreation management, and travel and access management would be the same as those identified under Alternative A.

Vegetation manipulation (e.g., prescribed burning, mechanical, chemical, manual, and biological) could be applied to all surface tracts identified for retention (2,776 acres), which would be an increase of 1,701 acres compared with Alternative A. However, only seven tracts (444 acres) are within areas of expected oil and gas development. Through coordinated management, it is expected that actions would be implemented to avoid impacts on any oil and gas facilities that might be located on or near surface tracts.

Restrictions on visually obtrusive developments on VRM Class II areas would limit development on 92 acres of the Meadowood SRMA tract. Because this tract is not within an area of expected energy or mineral development, however, energy and mineral resources would not be affected

Applying lease stipulations (Appendix C) throughout the *decision area* could restrict or preclude oil and gas development and exploration activities. Impacts would not be anticipated on 301,843 acres open to oil and gas leasing subject to standard terms and conditions. Managing 112,276 acres open to oil and gas leasing subject to moderate constraints and 610,927 acres open to leasing subject to major constraints could affect the location or timing of development activities and could increase development costs. Allowing exceptions, waivers, and modifications to these stipulations could reduce the impact of stipulations in some cases. Closing 1,130 acres in the Meadowood SRMA (legislative closure), Jupiter Inlet Lighthouse ONA (legislative closure), Lathrop Bayou, and Egmont Key to oil and gas leasing would not likely affect oil and gas leasing and development. These areas are not considered high development potential areas. Overall, the projected number of oil and gas wells to be developed over the next 15 years would not likely be affected by the additional stipulations.

Tracts proposed for disposal would be evaluated for mineral potential prior to being offered. Based on the current RFD, eight surface tracts (a total of 449 acres) are within AEDs for oil and gas. Of these, only the five-acre Drasco tract would be available for disposal. Impacts on oil and gas development would not be affected, however, because oil and gas rights would be reserved. All surface tracts would be designated as ROW avoidance areas. However, the demand for BLM to grant ROWs in support of oil and gas

development is considered unlikely, because the surface tracts are relatively small and scattered and few are within areas of expected mineral development.

4.12.4 Alternative C

Impacts on energy and mineral resources management from implementing actions for wildland fire, cultural resources management, phosphate mining, coal mining, and recreation management, and travel and access management would be the same as those identified under Alternative A. Impacts on energy and mineral resources management from VRM, and lands and realty management would be the same as those described for Alternative B.

Vegetation manipulation (e.g., prescribed burning, mechanical, chemical, manual, and biological) could be applied to all surface tracts identified for retention (2,836 acres). However, only seven tracts (444 acres) are within areas of expected oil and gas development. Through coordinated management, it is expected that actions would be implemented to avoid impacts on any oil and gas facilities that might be located on or near surface tracts.

The impacts on energy and mineral resources 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 and conditions, 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 constraints could affect the location of development activities depending on the restriction. Closing the Meadowood SRMA (legislative closure), Jupiter Inlet Lighthouse ONA (legislative closure), Lathrop Bayou, and Egmont Key (1,130 acres) to oil and gas leasing would have the same impacts as those described under Alternative B. While there is an increase in the area covered by stipulations, the projected number of oil and gas wells to be developed over the next 15 years would not likely be affected by the additional stipulations.

4.12.5 Alternative D

Impacts on energy and mineral resources management from implementing actions for vegetation, fish and wildlife, special status species, wildland fire, cultural resources management, phosphate mining, coal mining, and recreation management, and travel and access management would be the same as those identified under Alternative A. Impacts on energy and mineral resources management from VRM would be the same as those described for Alternative B.

The impacts on energy and mineral resources 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 and conditions, 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 constraints could affect the location of development activities depending on the restriction. Closing the Meadowood SRMA (legislative closure) and Jupiter Inlet Lighthouse ONA (legislative closure) to oil and gas leasing would have the same impacts as those described under Alternative B. Similarly, the projected number of oil and gas wells to be developed over the next 15 years would not likely be affected by the proposed stipulations.

Impacts on energy and minerals from lands and realty management would be similar to those describe in Alternative B, except that no tracts in areas of expected mineral development would be available for disposal.

4.13 RECREATION MANAGEMENT

This section presents potential impacts on recreation management from implementing management actions for each resource program. Existing conditions concerning recreation management are described in Chapter 3.

4.13.1 Assumptions

The recreation impact analysis is based on the following assumptions:

- Recreation use within the *planning area* would continue to increase during the life of the RMP, most notably in coastal areas and SRMAs (e.g., Meadowood).
- The incidence of resource damage and conflicts between recreationists involved in motorized and non-motorized activities would increase with increasing use of public lands.

4.13.2 Alternative A (No Action Alternative)

Conducting vegetation treatments (e.g., prescribed burning, mechanical, chemical, manual, and biological) and continuing habitat improvement actions on the Lathrop Bayou, Jupiter Inlet Lighthouse ONA, and the Meadowood SRMA surface tracts (a total of 1,075 acres), under the vegetation, fish and wildlife, and special status species resource programs, could enhance the recreation setting and experience for recreationists seeking natural landscapes. Such actions also could limit the type and frequency of recreational activities allowed on tracts on which treatments were being implemented. This could reduce some recreational opportunities in some areas. The type of activities restricted and the areas for the restrictions would be identified on a case-by-case basis following activity-level planning and analysis.

Wildland fire and associated suppression activities could create direct short-term impacts on recreational users by limiting or prohibiting recreation activities in areas where wildland fire occurs.

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) on the Lathrop Bayou tract would retain the existing character of the landscape and would maintain scenic quality, which would enhance the recreation experience. Management of VRM Class III areas (890 acres) would generally not limit the type or amount of recreation use that would occur in these areas.

Oil and gas development activities could result in surface disturbance that could affect the desirability of these areas for recreation use. Recreation opportunities for recreationists seeking natural landscapes would be reduced in these areas. However, the presence of roads to access the mineral developments could also be used for recreational purposes (e.g., OHV use) or to improve access to currently inaccessible areas. 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.

Phosphate mining would not affect recreation resources or activities on the BLM surface tracts because all expected phosphate mining would occur on private surface.

Because coal development activities in eastern Kentucky would be limited to underground mining methods and existing infrastructure would be used, these activities would not affect recreation resources and activities.

Management of the Meadowood SRMA would provide non-motorized trail-based and equestrian recreational opportunities, such as bird-watching, nature viewing, hiking, and control-line flying. Management of the SRMA would address user and resource conflicts while providing for a quality rural recreation experience within an urban region for different types of users. 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 in areas where there were no existing routes, but these areas would remain open for non-motorized recreation opportunities.

Identifying a total of four surface tracts as available for disposal (or exchange) under the lands and realty program could exclude 77.27 acres from BLM management, and thereby reduce the amount of land available for recreation opportunities. Recreation also could be affected if ROWs were developed under the lands and realty program. This would involve land-clearing activities to make way for communication towers and linear features, such as roads, pipelines, and transmission lines. This would increase visual intrusions in the landscape and degrade the recreational setting and experience. However, based on historic activities, development of ROWs on BLM-administered surface tracts is anticipated to be low.

4.13.3 Alternative B (Preferred Alternative)

Impacts on recreation management from implementing actions for wildland fire, oil and gas management, phosphate mining and coal management would be the same as those described in Alternative A.

The impacts on recreation from conducting vegetation treatments and implementing habitat improvement actions would increase compared with Alternative A. Vegetation treatments could be applied to all surface tracts identified for retention (2,776 acres), which would be an increase of 1,701 acres compared with Alternative A. In addition, desired vegetation communities would be managed to meet habitat goals identified in the state WAP. These actions would further enhance the recreation setting and experience and could further reduce recreational opportunities.

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.

Application of VRM Class II designations (92 acres) in the Meadowood SRMA would retain the existing character of the landscape and would maintain scenic quality, which would enhance the recreation experience throughout these areas in the Meadowood SRMA. Management of VRM Class III areas (867 acres) would generally not limit the type or amount of recreation use that would occur in these areas. Management of VRM Class IV areas (2,032 acres) would allow major modifications to the landscape, which would potentially diminish scenic quality to a degree that would detract from recreation experiences for recreationists seeking natural landscapes.

Impacts on recreation from recreation management and travel and access management actions would be the same as those described in Alternative A, except that management of the Egmont Key ACEC would provide recreation with a historical component. The isolated nature of the Egmont Key tract results in lower recreation visitation compared with areas associated with the mainland, but it also provides a unique recreational experience with limited opportunities for intergroup conflicts. In addition, limiting OHV use to designated routes on the surface tracts would further restrict recreational OHV use compared with Alternative A. However, these areas would remain open for non-motorized recreation opportunities.

Identifying a total of six surface tracts as available for disposal (or exchange) under the lands and realty program could exclude 87.96 acres from BLM management, and thereby reduce the amount of land available for recreation opportunities. Recreation also could be affected if ROWs were developed under the lands and realty program. This would involve land-clearing activities to make way for communication towers and linear features, such as roads, pipelines, and transmission lines. This would increase visual intrusions in the landscape and degrade the recreational setting and experience. However, based on historic activities, development of ROWs on BLM-administered surface tracts is anticipated to be low.

4.13.4 Alternative C

Impacts on recreation from implementing actions for wildland fire, oil and gas management, phosphate mining, and coal management 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 those described in Alternative B.

The impacts on recreation from conducting vegetation treatments and implementing habitat improvement actions would increase compared with Alternatives A and B. Vegetation treatments could be applied to all surface tracts identified for retention (2,836 acres), which would be an increase of 1,761 acres compared with Alternative A, and an increase of 60 acres compared with Alternative B. In addition, desired vegetation communities would be managed to meet habitat goals identified in the state WAP. These actions would further enhance the recreation setting and experience and could further reduce recreational opportunities.

Identifying a total of three surface tracts as available for disposal (or exchange) under the lands and realty program could exclude 27.75 acres from BLM management, and thereby reduce the amount of land available for recreation opportunities. Recreation also could be affected if ROWs were developed under the lands and realty program. This would involve land-clearing activities to make way for communication towers and linear features, such as roads, pipelines, and transmission lines. This would increase visual intrusions in the landscape and degrade the recreational setting and experience. However, based on historic activities, development of ROWs on BLM-administered surface tracts is anticipated to be low.

4.13.5 Alternative D

Impacts on recreation from implementing actions for vegetation, fish and wildlife, special status species, wildland fire, cultural resources management, oil and gas management, phosphate mining, and coal management would be the same as those described in Alternative A.

Impacts on recreation from VRM would be the same as those described in Alternative B.

Impacts on recreation from management of the Jupiter Inlet Lighthouse ONA and the Meadowood SRMA would be the same as in 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 closed.

Identifying a total of 16 surface tracts as available for disposal (or exchange) under the lands and realty program could exclude 615.87 acres from BLM management, and thereby reduce the amount of land available for recreation opportunities. Recreation also could be affected if ROWs were developed under the lands and realty program. This would involve land-clearing activities to make way for communication towers and linear features, such as roads, pipelines, and transmission lines. This would increase visual

intrusions in the landscape and degrade the recreational setting and experience. However, based on historic activities, development of ROWs on BLM-administered surface tracts is anticipated to be low.

4.14 TRAVEL AND ACCESS MANAGEMENT

This section presents potential impacts on travel and access management from implementing management actions for each resource program. Existing conditions concerning travel and access management are described in Chapter 3.

Impacts on travel and access management are not anticipated as a result of implementing management actions for the following resource programs: vegetation, wildland fire, cultural resources, visual resources, energy and minerals, and lands and realty management. The management actions for these resource programs would not limit OHV use or access.

4.14.1 Assumptions

The travel and access management impact analysis is based on the following assumption:

- The existing transportation network would remain in place throughout the life of this plan except as noted in the alternatives.

4.14.2 Alternative A (No Action Alternative)

Recreation management 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 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.

4.14.3 Alternative B (Preferred Alternative)

Impacts on travel and access from recreation management and travel and access management actions would increase compared with Alternative A. OHV use would be limited to designated routes on all surface tracts, and 8,236 feet of roads would be closed to OHV use. This would limit OHV use to only those routes that were designated for use by BLM, which would reduce the miles of routes available for motorized access and travel.

4.14.4 Alternative C

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.

4.14.5 Alternative D

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 4,206 feet.

4.15 LANDS AND REALTY

This section presents potential impacts on lands and realty from implementing management actions for each resource program. Existing conditions concerning lands and realty management are described in Chapter 3.

Impacts on lands and realty are not anticipated as a result of implementing management actions for the following resource programs: wildland fire, cultural resources, visual resources, energy and minerals, recreation management, and travel and access management. The management actions for these resource programs would not affect lands and realty actions such as disposals, transfers, exchanges, and/or consideration of ROWs.

4.15.1 Assumptions

The lands and realty impact analysis is based on the following assumptions:

- Existing ROWs could be modified or amended if the action was consistent with the RMP.
- ROW holders could renew their ROWs within the terms of the original ROW grant.
- BLM would continue to process land tenure adjustments consistent with RMP goals and decisions.
- Lands identified for FLPMA Section 203 sale could be sold or otherwise disposed of within the life of the plan.
- Land tenure adjustment decisions would be based on the set of criteria in Appendix E.

4.15.2 Alternative A (No Action Alternative)

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 four tracts with 77.27 acres would be available for disposal (or exchange). Tracts identified as suitable for disposal would be evaluated for protected resources, including federally listed species, wetlands, and cultural resource sites eligible of listing on the NRHP. The presence of protected resources could change the disposal category according to disposal criteria (Appendix E); based on current information as documented in Appendix B, however, this is not anticipated. In addition, allowing transfer of some tracts for management by other agencies would accommodate resource management needs and could improve management efficiency. Three tracts with 83.57 acres would be available for transfer under this alternative. 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.

4.15.3 Alternative B (Preferred Alternative)

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, six tracts with 87.96 acres would be available for disposal (or exchange). Tracts identified as suitable for disposal would be evaluated for protected resources, including federally listed species, wetlands, and cultural resource sites eligible of listing on the NRHP. The presence of protected resources could change the disposal category according to disposal criteria (Appendix E); based on current information as documented in Appendix B, however, this is not anticipated. In addition, allowing transfer of some tracts for management by other agencies would accommodate resource management needs and

could improve management efficiency. Four tracts with 127.4 acres would be available for transfer under this alternative. ROW avoidance would be applied on retained surface tracts in support 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.

4.15.4 Alternative C

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, three tracts with 27.75 acres would be available for disposal (or exchange). Tracts identified as suitable for disposal would be evaluated for protected resources, including federally listed species, wetlands, and cultural resource sites eligible of listing on the NRHP. The presence of protected resources could change the disposal category according to disposal criteria (Appendix E); based on current information as documented in Appendix B, however, this is not anticipated. In addition, allowing transfer of some tracts for management by other agencies would accommodate resource management needs and could improve management efficiency. Four tracts with 127.4 acres would be available for transfer under this alternative. Impacts on ROW management would be the same as described for Alternative B.

4.15.5 Alternative D

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 615.87 acres would be available for disposal (or exchange). Tracts identified as suitable for disposal would be evaluated for protected resources, including federally listed species, wetlands, and cultural resource sites eligible of listing on the NRHP. The presence of protected resources could change the disposal category according to disposal criteria (Appendix E); based on current information as documented in Appendix B, however, this is not anticipated. In addition, allowing transfer of some tracts for management by other agencies would accommodate resource management needs and could improve management efficiency. Six tracts with 542.67 acres would be available for transfer under this alternative. Impacts on ROW management would be the same as described for Alternative B.

4.16 AREAS OF CRITICAL ENVIRONMENTAL CONCERN

This section presents potential impacts on ACECs from implementing management actions for each resource program. Existing conditions concerning ACECs are described in Chapter 3. There is one existing ACEC and three proposed ACECs, as discussed in Chapter 3. All three proposed ACECs include wildlife and botanical resources, and two include cultural values. Other relevant and important (R&I) values, resources, systems or processes, and hazards/safety/public welfare addressed during this analysis include geologic features, special status species, and human safety. Appendix F contains documentation of the process to evaluate nominations for ACECs and the R&I values for each ACEC.

This analysis identifies effects of management decisions on BLM's ability to protect against and prevent irreparable damage to the R&I values associated with each proposed ACEC across the alternatives. Protection of R&I values can occur as a result of management associated with ACECs, other special designations (e.g., ONA), and other planning decisions. The most restrictive management that protects an area with R&I values is the focus of the analysis.

In concert with BLM guidelines, the impact analysis considers management actions that "defend or guard against damage or loss" of the R&I values. This includes damaged values that can be restored over time and those that are irreparable. The management actions associated with the alternatives could degrade, protect, or enhance the R&I values and either cause or prevent irreparable damage to such values.

This section is structured by alternative, then by ACEC. The ACECs are organized in the order they appear in Chapter 2.

4.16.1 Assumptions

The impact analysis for ACECs is based on the assumption that although management decisions for most resources and resource uses have *decision area*-wide application, ACEC management prescriptions would apply only to those lands within each specific ACEC, as outlined.

4.16.2 Alternative A (No Action Alternative)

Jupiter Inlet Lighthouse ONA

While only 54.33 acres of the Jupiter Inlet Lighthouse ONA are designated an ACEC under this alternative, the entire area (85.83 acres) is covered by the congressionally designated Jupiter Inlet Lighthouse ONA. When Congress designated the ONA, it included broad management direction that addresses several of the RMP-level issues and threats facing the R&I values, including closing the area to all forms of potential mineral development, while requiring the protection of unique and nationally important historical, natural, cultural, scientific, educational, scenic, and recreational values. The existing ACEC also includes management for VRM Class II and Recreation Opportunity Spectrum (ROS) Urban, although recreation cannot be an R&I value and scenery was not a relevant and important value. Between Congress' direction for the ONA and the existing management, the R&I values would be protected for irreparable damage, and proactive vegetation manipulation would be implemented to benefit endemic plants and wildlife. Although the entire ONA is not designated an ACEC, the remainder of the ONA (31.5 acres) would be protected by the broad managed direction that was established when Congress designated the ONA.

Lathrop Bayou

The Lathrop Bayou tract would not be designated as an ACEC, but specific management in the existing RMP and subsequent implementation-level planning provides management specifically to address a variety of species, which are also R&I values on the tract. Under the current Florida RMP, the area is closed to motorized vehicle use and managed as VRM Class II, but the current RMP-level decisions do not specifically identify actions designed to proactively manage the uses and resources in a manner that would protect R&I values. While there are few outside threats to the R&I values, impacts remaining from former land uses require that long-term management be proactively and consistently applied to restore native vegetation communities and the habitats they provide for special status R&I species. Without such long-term management, the area will not be naturally restored to its former values and species. As such, existing management is neither consistent nor complete enough to fully protect and prevent irreparable damage to the R&I values.

Egmont Key

The Egmont Key tract would not be designated as an ACEC and would continue to be managed by the Florida Division of Recreation and Parks. The geographic nature of the area provides a degree of protection because access is only available by boat. However, the isolation has also allowed invasive species to affect the local vegetation and wildlife populations. It has also made proactive management of the tract more difficult, resulting in limited oversight of the recreation use and, as a result, impacts on the cultural resources that could be avoided with additional management emphasis. While the area still provides habitat and settings for a variety of R&I values, past use and introduction of non-native species, combined with continuing use and limited management focus, has resulted in the R&I values long-term health and protection being threatened.

4.16.3 Alternative B (Preferred Alternative)

Jupiter Inlet Lighthouse ONA

The portion of the ONA managed by BLM (85.83 acres) would be designated as an ACEC with associated management to preclude all uses that could threaten the R&I values. The management would also include prescriptions for vegetation management that in the long term would lead to the restoration of native vegetation communities and allow a variety of population manipulation methods to bolster recovery of the special status R&I species. The proposed management identifies the objectives for managing the R&I cultural resource values while recreation use continues. In the long term, the management in the Preferred Alternative would protect and prevent irreparable damage to the identified R&I values.

Lathrop Bayou

The Lathrop Bayou tract (185.03 acres) would be designated as an ACEC with associated management to specifically address the proactive measures needed to manipulate the vegetation in such a manner to restore the natural vegetation community and provide habitat for the R&I plant and animal species. In addition to placing restrictions on uses that would not be consistent with the ACEC objectives (e.g., close to oil and gas leasing, recommend for withdrawal from mineral entry), the management identifies the need to use vegetation manipulation, specifically in the form of prescribed fires, to maintain the long-leaf savanna. Finally, the management specifically requires protection of the red-cockaded woodpecker nesting cavities while actions designed to restore the species' habitat are implemented, which would protect R&I values. In the long term, the management in Alternative B would protect and prevent

irreparable damage to the identified R&I values through restoration of the native vegetation communities and associated habitats.

Egmont Key

The Egmont Key tract (55 acres) would be designated as an ACEC with associated management to specifically address the proactive measures needed to protect and prevent irreparable damage to the R&I values. The management specifically addresses threats to the R&I cultural values from increasing recreation use and natural deterioration in the form of vegetation encroachment into historic structures. The management also addresses the biological R&I resources through pest control and eradication, a vegetation manipulation program to reduce non-native species and to specifically manage to restore the natural vegetation communities and habitats. Management associated with the ACEC would provide sufficient protection to protect the R&I cultural, wildlife, and botanical values from potential threats.

4.16.4 Alternative C

Jupiter Inlet Lighthouse ONA

Impacts would be the same as those identified in Alternative B.

Lathrop Bayou

Impacts would be the same as those identified in Alternative B.

Egmont Key

Impacts would be the same as those identified in Alternative B.

4.16.5 Alternative D

Jupiter Inlet Lighthouse ONA

Impacts would be the same as those identified in Alternative B.

Lathrop Bayou

Although 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 vegetation manipulation to maintain or enhance habitats for special status species. In addition, the stipulations for special status species, such as the red-cockaded woodpecker (NSO within 0.5 miles of cluster), would provide a degree of protection to the various R&I components of the tract. The difference in the management is the consistent and consolidated approach to manage the Lathrop Bayou R&I values as a community rather than a collection of individual resources. Without the ACEC, the management could still be applied to protect the R&I values, but the lack of cohesion between the management actions, combined with the lack of a consistent objective for this area, could lead to piecemeal application of the various management actions. While application of the individual measures could provide some protection and prevent some damage, the lack of a cohesive objective for management would not restore the area's habitats within the life of the RMP. The delay in achieving the objectives, combined with the fact that some of the objectives might not be implemented consistently without the shared objectives of the ACEC, could place some of

the federally listed species on a slower course to recovery than that achievable under Alternatives B and C.

Egmont Key

The Egmont Key tract would not be managed as an ACEC, but would be transferred to the USFWS to be managed in accordance with the Comprehensive Conservation Plan for Egmont Key NWR. Because the remainder of the key is already managed by the USFWS, the transfer in ownership would provide consistency in administration, which would assist in the success of vegetation treatments across the key. Management associated with the USFWS Egmont Key NWR would provide protection measures to the R&I cultural, wildlife, and botanical values from potential threats.

4.17 NATIONAL TRAILS

This section presents potential impacts on the Potomac Heritage National Scenic Trail and the Washington-Rochambeau Revolutionary Route National Historic Trail. Existing conditions concerning the two National Trails are described in Chapter 3. Segments of both trails have been proposed along existing trails within the Meadowood SRMA boundary.

4.17.1 Assumptions

The impact analysis for National Trails is based on the assumption that management prescriptions for the two National Trails would apply only to those National Trails.

4.17.2 Alternative A (No Action Alternative)

Potomac National Heritage Scenic Trail

A segment of the Potomac Heritage National Scenic Trail would not be identified on existing trails at Meadowood SRMA in Virginia. With a segment unidentified, there would not be a need to mark or interpret the trail and the public may be unaware of the resource values of the trail.

Washington-Rochambeau Revolutionary Route National Historic Trail

A segment of the Washington-Rochambeau Revolutionary Route National Historic Trail would not be identified on existing trails at Meadowood SRMA in Virginia. With a segment unidentified, there would not be a need to mark or interpret the trail, and the public may be unaware of the resource values and the historical significance of the trail.

4.17.3 Alternative B (Preferred Alternative)

Potomac National Heritage Scenic Trail

Coordinating management of the Potomac Heritage National Scenic Trail with the National Park Service (NPS) would assist in determining the proposed location and alignment of trail segments on existing trails at Meadowood SRMA. Coordination would provide consistent management to preserve the values for which it was designated. Meadowood SRMA is in close proximity to the Potomac River that George Washington considered essential to the nation's development and other segments of the Potomac Heritage NST.

Providing interpretive information the Potomac Heritage National Scenic Trail would increase public appreciation for the trail's values. Increased public appreciation could lead to increased user stewardship, advocacy, appreciation, and protection of the corridor.

Allowing non-motorized uses such as hiking, biking, horseback riding and cross country skiing would provide for a variety of recreation experiences and opportunities.

Washington-Rochambeau Revolutionary Route National Historic Trail

Coordinating management of the Washington-Rochambeau Revolutionary Route National Historic Trail with the National Park Service (NPS) would assist in determining the proposed location and alignment of

trail segments on existing trails at Meadowood SRMA. Coordination would provide consistent management throughout its extent, preserving the values for which it was designated.

Providing interpretive information on 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. This route is unique due to the evidence that was discovered on Meadowood SRMA that verifies the existence of an encampment of troops who used the route now named Washington-Rochambeau Revolutionary Route (W3R). Meadowood SRMA is adjacent to Old Colchester Road, VA Route 611, which is designated the Washington Rochambeau Revolutionary Route.

Allowing non-motorized uses such as hiking, biking, and horseback riding would provide for a variety of recreation experiences and opportunities.

4.17.4 Alternative C

Potomac National Heritage Scenic Trail

Impacts would be the same as those identified in Alternative B.

Washington-Rochambeau Revolutionary Route National Historic Trail

Impacts would be the same as those identified in Alternative B.

4.17.5 Alternative D

Potomac National Heritage Scenic Trail

Impacts would be the same as those identified in Alternative B.

Washington-Rochambeau Revolutionary Route National Historic Trail

Impacts would be the same as those identified in Alternative B.

4.18 SOCIOECONOMICS

This section describes potential socioeconomic impacts from implementing management actions for each resource program. Such impacts may result from specific individual management actions, but can often reflect the collective effect of a number of actions under a particular alternative. Thus, for each alternative, this section presents impacts that may be characterized as resulting from specific management actions of various resource programs, or from various actions taken together. Existing conditions concerning socioeconomics are described in Chapter 3.

Potential economic impacts include changes in employment and income, and in tax revenue to local, state, and federal government entities. Changes in employment and income may cause other socioeconomic impacts, such as changes in population, which may lead to impacts on housing, infrastructure, and government services. These economic impacts may produce social impacts, such as changes in community structure as new people move in to take new jobs. Changes in management of resources may also have direct social implications for residents and visitors by affecting attitudes, opinions, quality of life, and social structures.

While this section is organized by alternative similar to the other resource sections in Chapter 4, it includes additional subheadings. Similar to other resource sections, it includes a subsection listing key assumptions, but it also includes subsections that describe the approaches used for economic and social impact analysis. In addition, there is a subsection for Impacts Common to All Alternatives, before the subsections for each alternative, and in these subsections, the impacts from energy and minerals actions are under one subheading, and impacts from all the other resource programs under another subheading. These discussions address both economic and social impacts. Environmental Justice (EJ) is addressed under Impacts Common to All Alternatives.

4.18.1 Assumptions

The socioeconomic impact analysis is based on the following specific assumptions:

- Estimates of future mineral exploration and development were taken from the RFD report (BLM 2012a). In accordance with the RFD, the level of mineral exploration and development is not expected to vary by alternative. However, differences in stipulations and acreages under various constraints could produce different socioeconomic impacts.
- Actual impacts of mineral and exploration and development could vary if the rate of development or production changed over the study period owing to factors outside the management decisions of BLM. These include national and international energy demand and prices, production factors within the *planning area*, and business strategies of operators.
- Economically relevant laws, policies, and regulations (e.g., mineral access, federal mineral royalty (FMR) rates) will remain as they are today, through the planning period.
- Unless otherwise noted, economic and social trends noted in the Southeastern States Socioeconomic Baseline Report (BLM 2009b) will continue through the planning period.

4.18.2 Economic Impact Analysis Approach

The economic impact analysis uses both quantitative and qualitative approaches. Based on the available information, economic impacts could only be quantified for energy and mineral production uses of BLM FMO or surface tracts. For all other resource programs, economic impacts are characterized qualitatively.

Qualitative economic impact analysis involves identifying the most likely direction of change in economic conditions resulting from a particular management action or a set of management actions expected to have similar effects. For example, based on the type of action, a likely increase or decrease in production values may be identified, or an increase or decrease in tourist expenditures in the *planning area* may be deemed likely. These determinations are based on the nature of the proposed action(s), socioeconomic characteristics of the area under study, patterns observed in other areas, and professional judgment. In the analysis below, these impacts are presented qualitatively for Alternative A and discussed relative to Alternative A for the other alternatives.

Quantitative economic impact analysis requires that sufficient information exists to quantify current conditions and a change in the value of production or in costs or expenditures resulting from a specific management action or set of actions. The analysis below presents quantitative estimates of the economic impacts of leasing FMO for energy and mineral production. Coal leasing and phosphate leasing are addressed under Impacts Common to All Alternatives. Oil and gas leasing is addressed under Alternative A. These are high-level analyses. They were prepared by determining key ratios from state-level data,—e.g., average value of production per producing well, or BLM-administered wells as a percentage of statewide wells—and applying these ratios to various data from the RFD (BLM 2012a) and other sources to estimate economic activity that can be attributed to BLM-administered energy and mineral resources. The figures are largely drawn from the Socioeconomic Baseline Report (BLM 2009b), and the methods are described in detail there. Estimates of BLM-attributed economic activity under Alternative A include jobs, FMR, state severance taxes, and property taxes. Impacts for Alternatives B, C, and D are discussed qualitatively, relative to Alternative A.

Use of an input/output model such as Impact Analysis for Planning (IMPLAN) was not necessary or warranted for this analysis. IMPLAN generates estimates of the economic impacts of inter-industry purchases and consumer re-spending of income—the “multiplier effect.” This additional economic impact information can sometimes assist BLM’s decisionmaking process. In this case, the data that are available or reasonably attainable for the high-level economic analyses in this Draft RMP/EIS do not provide an adequate basis to determine differences between the management alternatives using IMPLAN. Therefore, the multiplier effect is addressed qualitatively below.

4.18.3 Social Impact Analysis Approach

Livelihoods, lifestyles, attitudes, beliefs, values, social structure, culture, and population characteristics affect, and are affected by, management actions such as those made by BLM. In addition, BLM-administered FMO, BLM surface tracts, and BLM management of these resources have emotional meanings to many people.

A number of broad but distinct types of interests, or stakeholders, are affected by management of BLM-administered FMO and BLM surface tracts. These stakeholder categories reflect the different linkages people have to the land. They are characterized by distinct sets of values, opinions, and perceptions about public resources and the effects of various management policies and actions. Some of the key stakeholders with respect to BLM resources considered in this Draft RMP/EIS include:[1]

[1] *Several types of stakeholder categories that are important to BLM resources in the western United States are not considered in this RMP/EIS because the resource uses these interests focus on are not present or notable in this planning area. These include livestock grazing/ranching stakeholders, timber harvest stakeholders, local traditional use stakeholders (e.g., tribes and individuals for whom subsistence use such as meat hunting is important), and outfitter-based recreation users (e.g., hunting guides).*

- Energy and Mineral Development Stakeholders—One interest in BLM resources is associated with people who support the continued development of mineral and energy resources. Individuals and groups in this category believe that the income and jobs generated by these activities are important to the local economy. In addition, they often believe that access to public lands to develop energy and mineral resources should be increased, and careful consideration should be given to how a lengthy administrative or environmental review process affects the cost of development. Many also feel that mineral and energy development is of national importance, and further development can help ease the nation's dependence on foreign resources.
- Split-estate and Surrounding Property Stakeholders—This interest focuses on the effects of BLM resource management on split-estate, adjacent, and nearby properties. People in this category may have diverse reasons for having this interest; e.g., concern that resource extraction uses of BLM land may adversely affect their property values, desire for control of the numbers and activities of recreational users near their property, desire that certain properties be made available for sale, and other factors.
- Conservation Stakeholders—People and groups aligned with the preservation interest tend to value and prioritize the protection of natural resources and general ecosystem health. This can include both local residents and non-locals who emphasize the special scenic and ecological values of an area. They often support increased emphasis on natural values in relation to extractive uses and some recreational uses (e.g., OHVs).
- Recreation Stakeholders—This interest focuses on the belief that recreation on BLM public lands contributes to the overall quality of life for residents and visitors. The recreation community includes diverse groups of people, and changes in recreation management can affect the people who engage in the various activities in very different ways. Thus, this category may have individuals and groups that advocate for specific types of recreational activity.

The social impact analysis uses these categories of stakeholders to differentiate relevant impacts of management actions under each alternative. The analysis is written in terms of impacts on individuals or groups who have interests in a particular stakeholder category. This is not meant to imply that all individuals and social groups fit neatly into a single category; many specific individuals or organizations may have multiple interests and would see themselves reflected in more than one stakeholder category.

The social impact analysis is qualitative and based on the nature of the proposed action(s), socioeconomic characteristics of the area under study, social patterns and impacts observed in other areas, and professional judgment. Where a management action is expected to have impacts on a particular category of stakeholder, these impacts are described. Likely social impacts of management actions on particular types of stakeholders are first identified and characterized for Alternative A. The social impacts of Alternatives B, C, and D are discussed relative to Alternative A.

4.18.4 Impacts Common to All Alternatives

Impacts from Energy and Minerals

Coal

Impacts on socioeconomics from coal leasing and mining would be the same under all alternatives. Coal leasing would only occur on FMO in eastern Kentucky, where it would be limited to underground mining methods. BLM is projecting that beginning in 2014, two parcels of BLM-administered minerals would be leased for coal development in the Dewey Lake area of Floyd County. BLM has preliminary information that the coal production would range from 2,180,000 to 2,300,000 tons of coal annually for the first four

years (beginning in 2014), and between 480,000 and 600,000 tons of coal for the remaining eight years. It is assumed that all this coal would be 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.

Effects and impacts of coal mining could include generation of jobs, income, and fiscal receipts, and social impacts. To determine the number of jobs that could be attributed to the anticipated coal production on 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 State of Kentucky. During this time period, coal mining employed 6,094 people in the coal study area. Thus, the annual 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 is estimated that coal production on BLM-administered minerals would generate between 426 and 428 jobs in the first four years of production and between 89 and 112 jobs for the remaining years of the lease. Table 4-33 shows the projected production and employment generated from coal mining on BLM-administered minerals in the four-county study area.

Table 4-33. Estimated Annual BLM-Attributed Coal Production and Employment, 2014 to 2021

	2014	2015	2016	2017	2018	2019	2020	2021
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

Note: 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 would generate additional revenue receipts for Floyd County, the state, and the federal 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 fiscal year (FY) 06 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 4-34 and Table 4-35.

Assuming that existing coal study area production levels and coal prices would 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.

FMR 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, FMR 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 State of Kentucky would receive about 50 percent of these FMR totals. Table 4-35 and Table 4-36 provide the estimated BLM-attributed revenue receipts for the state government for these two time periods.

Table 4-34. BLM-Attributed Coal Production State Fiscal Receipts Per Year, 2014 to 2017

Type of Payment	BLM Low Estimate	Percentage of Total	BLM High Estimate	Percentage of Total
FMR (State'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%**

Note: 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 4-35. BLM Attributed Coal Production State Fiscal Receipts Per Year, 2018 to 2021

Type of Payment	BLM Low Estimate	Percentage of Total	BLM High Estimate	Percentage of Total
FMR (State'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%**

Note: 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)

The estimates of economic activity given above do not include the multiplier effects of jobs and income in the mining sector. The direct impacts discussed above would result in indirect impacts as the coal mine operator purchased supplies and services from other industries locally (e.g., trucking, metal working, etc.), and induced impacts as persons receiving income from mining sector jobs spent portions of that income locally (e.g., for groceries, home improvement supplies, doctors, etc.). These re-spending effects would support additional jobs and additional tax receipts (e.g., sales taxes on certain goods and services). It should be noted that not all mining sector income would be re-spent locally. Some would go to savings, to profits of firms headquartered in other locations, to purchases of goods and services provided by non-local suppliers, etc.

Coal mining on BLM FMO is not expected to place a strain on housing or community services, because mining would not lead to a large population influx. While coal mining could generate between 406 and 428 jobs in the first four years of production (as estimated above), many of these BLM-attributed jobs would be filled by persons already employed in the local mining industry, taking the "new" jobs as certain other operations wind down. The current mining sector employment is 6,958 persons (BLM 2009b), indicating ample workers potentially available to fill the BLM-attributed coal mining jobs.

Regarding social impacts, changes in social structure would not occur, given the area's long history of coal mining. Persons aligned with the Energy and Mineral Development Stakeholder category would benefit from the jobs and income generated by coal mining. Impacts on Conservation, Recreation, and Surrounding Property Stakeholders would be low because the mining operations would be underground, thereby minimizing aesthetic (visual) impacts and other impacts from mining. It is possible that Surrounding Property Stakeholders could be affected by increased traffic for the mine(s). This would depend on the exact location of mining operations relative to nearby residents, which is unknown at this time.

Phosphate

Impacts on socioeconomics from phosphate leasing would be the same under all alternatives. Phosphate mining and leasing would occur in the high development potential area of central Florida, more specifically in portions of Polk and Hardee counties. The Southeastern States Socioeconomic Baseline report (BLM 2009b) estimates that the anticipated phosphate mining activity on BLM-administered FMO would generate 30 to 150 jobs, and $2.7 to $13.5 million in earnings (payroll). This is based on BLM's phosphate surface and mineral estate historically accounting for between one and five percent of total phosphate mining operations in Florida. As a reference point, 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, according to the BLM Solid Minerals RFD (BLM 2008b). The job figures above do not include the multiplier impact of these jobs within the study area, that is, the indirect and induced jobs supported by direct expenditures and jobs in mining.

With 3.6 million tons of phosphate expected to be produced from BLM-administered federal mineral estate within the planning period, Table 4-36 shows the expected total fiscal receipts associated with production from these federal minerals, as estimated in the Southeastern States Socioeconomic Baseline report (BLM 2009b).

Table 4-36. 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, 3.6 million tons produced over planning horizon.

Impacts from Other Programs

Socioeconomic impacts or effects are not anticipated as a result of implementing management actions for the following resources and resource uses: soil resources, water resources, paleontological resources, and cultural resources.

Socioeconomic effects of implementing management actions for wildland fire could include generation of local economic activity (employment, income, tax receipts) through BLM expenditures on labor and materials for prescribed fire programs. Any such effects would be small, because BLM anticipates the acreages treated in such programs would average no more than 100 acres per year across the entire *planning area*. Management actions for wildland fire could affect the quality of life for Surrounding Property Stakeholders through migration of smoke to surrounding properties, but any such impacts would be very limited given the small acreages to be burned and would be mitigated by implementing management actions for air quality; i.e., managing prescribed fires to minimize impacts of smoke to sensitive areas.

Socioeconomic impacts or effects of implementing management actions for visual resources are probably negligible. Certain VRM class designations, particularly Class I and Class II, can help maintain quality of life for residents and visitors who experience a landscape. Thus, these designation classes typically have beneficial effects on Surrounding Property Stakeholders, Conservation Stakeholders, and Recreation Stakeholders, but may affect Energy and Mineral Development Stakeholders by precluding certain types of development or requiring mitigation. However, none of the management alternatives include designation of any Class I acreage. Only 185 acres are designated Class II under Alternative A, and 92 acres under Alternatives B, C, and D. The difference is not considered notable in socioeconomic terms. It is possible that some Surrounding Property Stakeholders, Conservation Stakeholders, and Recreation Stakeholders would prefer that more acres be placed in the Class I and II categories. All alternatives have roughly the same acreage in Class III. A substantial number of acres with no designation under Alternative A are designated Class IV under Alternatives B, C, and D. From a socioeconomics point-of-view, there is little practical difference between Class IV and no designation.

Socioeconomic impacts or effects of implementing management actions for access and travel management are negligible. For the most part, vehicle use is limited to existing routes of travel or designated roads under all alternatives. It is possible that some Recreation Stakeholders, OHV users in particular, would prefer more open access. However, the BLM surface tracts in the *planning area* do not receive much OHV use.

Environmental Justice

The concept of EJ first became a required consideration for federal agencies 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, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations” (EO 12898, §59 *Federal Register* 7629, 1994).

Subsequently, the CEQ, part of the Executive Office of the President, issued guidance for considering EJ within the NEPA process. This guidance defines a minority population as follows: “Minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis” (CEQ 1997). The guidance states that low-income populations should be identified using the annual statistical

poverty thresholds from the Bureau of the Census. The guidance does not define what constitutes "meaningfully greater." As to "disproportionately high and adverse" effects, the guidance states:

> *Disproportionately high and adverse human health effects: When determining whether human health effects are disproportionately high and adverse, agencies are to consider the following three factors to the extent practicable:*
>
> > *(a) Whether the health effects, which may be measured in risks and rates, are significant (as employed by NEPA), or above generally accepted norms. Adverse health effects may include bodily impairment, infirmity, illness, or death; and*
> >
> > *(b) Whether the risk or rate of hazard exposure by a minority population, low-income population, or Indian tribe to an environmental hazard is significant (as employed by NEPA) and appreciably exceeds or is likely to appreciably exceed the risk or rate to the general population or other appropriate comparison group; and*
> >
> > *(c) Whether health effects occur in a minority population, low-income population, or Indian tribe affected by cumulative or multiple adverse exposures from environmental hazards.*
>
> *Disproportionately high and adverse environmental effects: When determining whether environmental effects are disproportionately high and adverse, agencies are to consider the following three factors to the extent practicable:*
>
> > *(a) Whether there is or will be an impact on the natural or physical environment that significantly (as employed by NEPA) and adversely affects a minority population, low-income population, or Indian tribe. Such effects may include ecological, cultural, human health, economic, or social impacts on minority communities, low-income communities, or Indian tribes when those impacts are interrelated to impacts on the natural or physical environment; and*
> >
> > *(b) Whether environmental effects are significant (as employed by NEPA) and are or may be having an adverse impact on minority populations, low income populations, or Indian tribes that appreciably exceeds or is likely to appreciably exceed those on the general population or other appropriate comparison group; and*
> >
> > *(c) Whether the environmental effects occur or would occur in a minority population, low-income population, or Indian tribe affected by cumulative or multiple adverse exposures from environmental hazards. (CEQ 1997)*

The guidance and the presidential memo that accompanied the EO emphasize that agencies should provide opportunities for effective community participation in the NEPA process, including identifying potential effects and mitigation measures in consultation with affected communities.

Based on the guidance noted above, the following step-wise approach to addressing EJ in this Draft RMP/EIS was used:

1) Identify the locations of EJ populations. Proceed with Step 2 for those locations.

2) For those locations, determine whether management actions in this RMP—alone or cumulatively with other "environmental hazards" (broadly defined, as above)—potentially could adversely *and* significantly affect the EJ population.
   a) If not, no further analysis or action is required, and the assessment is complete for that location.
   b) If there is such potential for a location, proceed to Step 3.
3) Determine whether the potentially adverse and significant impacts on the EJ population have the potential to appreciably exceed such impacts for the general population or other appropriate comparison group.
   a) If not, no further analysis or action is required, and the assessment is complete for that location.
   b) If there is potential for the impacts to be disproportionate, proceed to Step 4.
4) Identify mitigation measures that could be used to minimize impacts on the EJ population.

Step 1 was accomplished in the Socioeconomic Baseline Report (BLM 2009b). In that analysis, "meaningfully greater" was defined to identify an EJ population if the percentage of population in minority and/or poverty status in the socioeconomic study area (the affected area) is at least 10 percentage points higher than in the reference population (the comparison group). This threshold was chosen based on experience evaluating EJ indicators and that this threshold defines a percentage that would represent a significant difference between the affected and reference populations. With respect to Step 2, the only management actions under this RMP that could potentially have both adverse and significant health or environmental impacts are energy and mineral development actions. This is based on the analyses for Impacts Common to All Alternatives (above) and for impacts of the four Management Alternatives (below). Steps 3 and 4, as needed, are addressed based on the particulars of each situation. The results of the analysis are summarized below for each state.

Arkansas

Three counties in the socioeconomic study have potential EJ populations. One has no projected well development, one has only one well per year, and one (St Francis County) has four wells per year, which *potentially* could have significant adverse impacts if localized on an EJ population. Of the 15 counties with one or more annual wells projected on BLM-administered FMO, five have four or more wells, including St Francis County. Therefore, at a county level, it does not appear that any impacts, if significant, would fall disproportionately on EJ populations. However, the locations of the projected wells in St. Francis County are not yet known, and it is possible that sub-county pockets of minority or low income populations could be disproportionately affected. EJ population locations should be further considered for St. Francis County at the implementation level, including sub-county analysis, to identify any disproportionate impacts to EJ populations and to identify mitigation measures, if needed, to reduce impacts (e.g., dust, noise, traffic, groundwater quality) to these populations. There are no issues with cumulative impacts on EJ populations because in the three counties with potential EJ populations, the wells on BLM FMO are the only wells projected.

Florida

One county in the four-county socioeconomic study for FMO in Florida is identified as having potential EJ populations: Hardee County. This county is expected to see development of the more than 10,000-acre South Fort Meade phosphate mine expansion. BLM administers only 602 acres of FMO in that area, but considered cumulatively with the rest of the mine expansion, there is potential for significant adverse impacts. These impacts would occur mainly as a result of the disruptive open-pit nature of phosphate mining: there would be substantial aesthetic impacts on adjacent property owners and local residents, and probably also impacts on surrounding property values. Thus, it is necessary to further consider the

potential for impacts to EJ populations on a more localized level. This is possible because the approximate location of the mine expansion is known.

Maps of the location of BLM FMO in Hardee County that is also in the phosphate high potential area and the vicinity of the mine expansion were compared with maps of the distribution of low income (below the poverty level), minority (Hispanic or Latino), and non-minority (White alone, not Hispanic or Latino) populations at the Census Block Group level from the 2000 Census. County-level demographics were used as the comparison group. The results are shown in Table 4-37.

Table 4-37. Environmental Justice Indicators, 2000 Census

Demographic Characteristic	Percentage of Total Population	
	Applicable Census Block Groups	Hardee County
Below Poverty Level	9.5–26.9	24.6
Hispanic or Latino (of Any Race)	14.3–30.9	35.7
White Alone, Not Hispanic or Latino	60.0–78.3	54.6

Source: U.S. Census, 2000, data sets SF 1 and SF 3.

Table 4-37 shows that the areas with BLM FMO in the vicinity of the phosphate mine expansion do not have populations that are below the poverty level or minority populations that are greater than 10 percentage points greater than the percentage for the comparison group. Conversely, the non-minority population percentages for the relevant census block group are not greater than the percentage for the comparison group. On the basis of this data, it does not appear that there are EJ populations in the area that would be most affected by the phosphate mine expansion. However, it is possible that the demographics of the affected area could have changed since the 2000 census. Therefore, it is recommended that an analysis to identify any current EJ populations and issues be conducted at the implementation level.

Kentucky

The statewide oil and gas socioeconomic study area is not identified as a potential EJ population, but EJ populations could exist at a more local level. However, only 3.1 wells statewide are projected to be drilled annually on BLM-administered FMO (29 completed wells over 10 years). No single county is projected have more than two wells over 10 years. Given this level of activity, significant adverse impacts on local EJ populations are unlikely. Looked at in terms of potential cumulative impacts on EJ populations, 382 wells are projected statewide annually. The three wells on BLM FMO represent only 0.78 percent of the total activity. The contribution of these wells to any cumulative impacts would be negligible.

For the coal socioeconomic study area, all four counties—Floyd, Johnson, Martin, and Pike counties—have potential EJ populations. However, it is unlikely there would be any disproportionately high and adverse impacts. The mining would be conducted underground; therefore, aesthetic impacts on nearby properties and local residents would be minimized. Any other health or environmental impacts resulting from coal mining would be mitigated by environmental and mining regulations.

Louisiana

Three parishes (Bienville, Caddo, and Red River) in the statewide socioeconomic study area have potential EJ populations. Each of these parishes has only three wells, or fewer, per year projected to be developed. At this level of activity, it is unlikely there would be any significant adverse impacts on EJ populations. In terms of potential cumulative impacts on EJ populations, these counties are projected to have from 44 to 225 wells developed per year. Thus, the contribution of wells on BLM FMO to any cumulative impacts would be probably negligible.

Tennessee

Only two wells are projected on BLM FMO over the planning period. It is very unlikely there would be significant adverse impacts on any EJ populations independently or cumulatively.

Virginia

Three counties in the four-county gas study area have potential EJ populations. Only 2.1 wells annually are projected on BLM-administered FMO in one of these counties (Dickenson). At this rate, significant adverse impacts on any localized EJ populations would be unlikely. Further, the contribution of wells on BLM FMO to any cumulative EJ impacts would be small, if any. Wells on BLM FMO represent only 1.6 percent of the total projected wells in Dickenson County.

Summary of Potential Environmental Justice Issues

Based on the analysis conducted for this Draft RMP/EIS, there do not appear to be EJ issues that would need to be mitigated in Kentucky, Louisiana, Tennessee, and Virginia. The potential for EJ issues exists in St Francis County, Arkansas, but cannot be determined in the context of this Draft RMP/EIS because there is insufficient information on well locations. The potential for EJ issues in this county should be examined further at the implementation level. There do not appear to be EJ issues with BLM FMO in the vicinity of the South Fort Meade phosphate mine expansion in Florida. However, this tentative conclusion is based on dated demographic information. Given the rate of population growth and demographic changes occurring in Florida, the potential for EJ issues associated with phosphate mining in Hardee County should be examined further at the implementation level.

4.18.5 Alternative A (No Action Alternative)

Impacts from Energy and Minerals

Oil and Gas

Substantial BLM-administered oil and gas leasing is only expected in four states: Arkansas, Kentucky, Louisiana, and Virginia. Economic indicators such as jobs, FMR, state severance taxes, and property taxes were estimated by state for the level of oil and gas well development and production projected in the 2012 revised RFD Scenario for Fluid Minerals report. The methodologies for these estimates are explained in the Southeastern States Socioeconomic Baseline report (BLM 2009b). Table 4-38 summarizes the estimates. Some indicators were not estimated owing to lack of data or because of methodological complexity (e.g., property tax calculations are sometimes extremely complex because of local variations in rates, exemptions from taxes, etc.).

Table 4-38 shows that oil and gas leasing at the levels predicted in the RFD would generate considerable economic benefits for the four states during the planning period. This is particularly true for Arkansas and

Louisiana, which have much higher levels of projected oil and gas development on BLM-administered FMO than Kentucky and Virginia.

Oil and gas development and production on BLM FMO is not expected to lead to large population influxes that would place a strain on local housing, infrastructure, or community services. The new, BLM-attributed jobs would occur over several large areas: wells would be distributed across 15 counties in Arkansas, 21 counties in Kentucky, 22 parishes in Louisiana, and two counties in Virginia. The largest single concentrations are 10 wells annually in Van Buren County, Arkansas; six wells annually in both Cleburne County, Arkansas, and in Bossier Parish in Louisiana; five wells annually in Plaquemines Parish, Louisiana; and four wells annually in both St. Francis County and White County, Arkansas. These are already very active oil and gas production areas. It is likely that some or many of the BLM-attributed jobs would be filled by workers moving from other, completed wells to the new BLM FMO wells, and therefore the net gain in jobs and population would be relatively small. Most other counties have only one or two wells expected annually, or even just one or two wells over 10 years in the case of Kentucky and Montgomery County, Virginia.

With respect to social impacts, changes in social structure would probably not occur, given that any BLM-attributed population gains would be small, and the areas that would see the most BLM-attributed new wells are already active oil and gas production areas. Persons aligned with the Energy and Mineral Development Stakeholder category would benefit from the jobs and income generated by the oil and gas development and production. Persons aligned with the Conservation Stakeholder category might feel that oil and gas development at the levels projected in some counties affects their values and interests. Some Surrounding Property Stakeholders might feel that their properties and interests are affected. This would depend on the exact location of new oil and gas wells relative to nearby residents, which is unknown at this time.

Table 4-38. Selected Economic Indicators for BLM-Attributed Oil and Gas Development and Production Economic Activity

	Arkansas	Kentucky	Louisiana	Virginia[1]
Existing BLM Production Wells	173	Not Used in Estimates	596	Not Used in Estimates
New BLM Production Wells Annually	44	2.9	32	2.1
Total BLM-Attributed Jobs (Based on Cumulative Production Wells)	210 in 2007 to 936 in 2017	Not Estimated	287 in 2007 to 427 in 2017	Not Estimated
Annual New BLM-Attributed Jobs (Based on New BLM Production Wells Each Year)	70 in 2008 to 211 in 2012 then 15 in 2013-17[2]	4	12 in 2008 to 17 in 2017	1.6
Total Federal FMR Over 10 Years (2008–2017)	**$49,894,000**	**Not Estimated**	**$410,560,000**	**Not Estimated**
Annual FMR	**$5,182,800 in 2007 to $6,255,700 in 2017**	**$31,500 at end of 10 years (all 29 wells producing)**	**$21,410,000 in 2007 to $48,670,000 in 2017**	**$59,000 at end of 10 years (all 21 wells producing)**
Total State Severance Taxes Over 10 Years (2008–2017)	**$11,015,000**	**Not Estimated**	**$120,490,000**	**Not Estimated**
Annual Severance Taxes	**$9,661 in 2007 to $2,111,300 in 2017[3]**	**$43,100 at end of 10 years (all 29 wells producing)**	**$6,770,000 in 2007 to $14,280,000 in 2017**	**$245,600 at end of 10 years (all 21 wells producing)**

	Arkansas	Kentucky	Louisiana	Virginia[1]
Total Property Taxes Over 10 Years (2008–2017)	**$23,139,900**	**Not Estimated**	**Not Estimated**	**Not Estimated**
Annual Property Taxes	**$172,995 in 2007 to $3,838,700 in 2017**	**Not Estimated**	**Not Estimated**	**Not Estimated**

Source: BLM 2009b.

[1] Estimates of BLM-attributed economic activity in the Southeastern States Socioeconomic Baseline Report were based on 2.8 new production wells per year. That report's figures have been recalculated here for 2.1 wells, in accordance with the 2009 revised RFD (BLM 2009a).

[2] Most jobs are in drilling and completion of wells (the "mining support" sector) versus production once a well is completed (the "extraction" sector). Based on recent trends, it is assumed that mining support activities would continue to ramp up at a high rate from 2008 to 2012, and further assumed that from 2013 on, the sector would be developing the same number of wells annually and thus would add no new jobs. In the extraction sector, 15 new jobs would be added, with each set of 44 new wells put into production annually.

[3] Growth in Arkansas severance taxes from the low 2007 figure is due to a new state severance tax that went into effect in 2009 and increases in that tax rate over time, as well as growth in gas production.

Impacts from Other Programs

Socioeconomic effects of implementing management actions for vegetation, fish and wildlife, and special status species under Alternative A could include generation of local economic activity (employment, income, tax receipts) through BLM expenditures on labor and materials for managing these resources. This activity could result from:

- Vegetation: prescribed burning, mechanical alteration, chemical treatment, and manual and biological controls for the Lathrop Bayou, Jupiter Inlet Lighthouse ONA, and the Meadowood SRMA surface tracts
- Fish and Wildlife: wildlife management program at the Lathrop Bayou, Jupiter Inlet Lighthouse ONA, and the Meadowood SRMA surface tracts and custodial management of other retained BLM tracts
- Special Status Species: habitat improvement actions (e.g., prescribed burning, manual and mechanical alteration, and chemical treatment) on the Lathrop Bayou, Jupiter Inlet Lighthouse ONA, and the Meadowood SRMA surface tracts.

Any such economic activity effects would be small. BLM anticipates the acreages treated under the vegetation, fish and wildlife, and special status species resource programs would average no more than 100 acres per year across the entire *planning area*. Conservation Stakeholders would benefit somewhat, because these programs typically align with their interests. Other stakeholders would not be substantially affected.

Socioeconomic effects and impacts would occur from implementing management actions for recreation management. Recreation provides quality of life benefits (i.e., stress relief, bonding with family and friends, solitude, open space, scenic values) to local residents and visitors. Recreation also has economic impacts: to the extent that recreational users of BLM parcels make expenditures within the local or regional area, this supports income and jobs for others. These various benefits are expected to continue under Alternative A and to grow somewhat as recreational usage increases. Under this and all alternatives, management of areas outside designated SRMAs would not change or vary substantially. Alternative A would designate Big Saline Bayou, Louisiana, and Meadowood, Virginia, as SRMAs.

Designations of specific land areas often lead to increased usage. If this occurred for either or both SRMAs, economic benefits would increase if spending associated with visiting the site increased, particularly from any longer-distance visitors. To the extent SRMA designation results in increased BLM investments in facilities, site maintenance, and other recreational activity support, the quality of the recreational experience for visitors would increase. This would benefit Recreation Stakeholders. Other stakeholders would not be substantially affected.

Socioeconomic effects and impacts could occur from implementing management actions for lands and realty, but their magnitude would be very low given the scale of proposed changes. Under Alternative A, 77.27 acres, in three tracts in Arkansas and one tract in Florida, would be available for disposal (or exchange). This is approximately three percent of the current BLM surface tracts in the *planning area*. Disposal of BLM lands to local governments or private parties may further local economic development or serve other important social purposes such as provision of special recreational areas, but the specific impacts in these cases cannot be determined from the currently available information. Disposal would result in the loss to local government of Payments In Lieu of Taxes (PILT) by the Federal Government but would also result in payments of property taxes to local government if a parcel went into private ownership. Stakeholders who would like to see BLM surface tracts made available to the private sector to change the parcel's tax status and use would probably believe this alternative would not provide for enough disposal, while those stakeholders (e.g. Conservation Stakeholders) who believe that retention of federal lands is important to maintaining open space and other natural characteristics would feel this alternative was consistent with their values. Other lands and realty actions would include transfer of 80 acres in Arkansas and 3.6 acres in Florida to the USFS and USFWS, respectively, which could improve their management through incorporation into larger nearby federal land areas. Under this and all alternatives, the 22-acre Lake Marion tract in Florida would be exchanged to the State of Florida, assisting the management of local state lands. ROWs and other land use proposals for BLM surface tracts would be processed on a case-by-case basis in this alternative. ROWs and other land use permits could help support community and economic development, but any benefits or impacts are situation-specific and therefore cannot be determined at the RMP level.

4.18.6 Alternative B (Preferred Alternative)

Impacts from Energy and Minerals

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 oil and gas leasing is not expected to differ from Alternative A. The RFD projections of well numbers apply to all alternatives. However, differences in stipulations and constraints on leases could result in wells being moved to different locations within a lease (as constrained by 43 CFR 3101.1-2), and oil and gas developers and operators could face different costs. Alternative B specifies stipulations such as seasonal limitations, CSU, and NSO, across the *planning area*, while Alternative A only specifies stipulations for Florida (based on the existing Florida RMP) and applies stipulations to new oil and gas leases on a case-by-case basis to protect sensitive resources. To the extent Alternative B results in more or less stringent stipulations, costs for developing and producing oil and gas might be higher or lower than under Alternative A. For example, a stipulation of NSO could result in a need for more expensive horizontal drilling instead of vertical drilling to access a particular resource.

Impacts from Other Programs

Socioeconomic effects of implementing management actions for vegetation, fish and wildlife, and special status species under Alternative B would be essentially the same as those identified under Alternative A. Alternative B would allow somewhat more vegetation/habitat treatment activity than Alternative B. To

the extent BLM expenditures on labor and materials for managing these resources are greater, the resulting local economic activity would be greater.

Socioeconomic effects and impacts from implementing management actions for recreation management would increase under this alternative relative to Alternative A. The two SRMAs designated under Alternative A would see increased investment and management under Alternative B, resulting in increased social benefits from recreation. For instance, at the Meadowood SRMA, BLM would coordinate with other federal agencies to identify and establish trail corridors for the Washington-Rochambeau Trail and the Potomac Heritage National Scenic Trail and would actively manage these corridors, possibly including construction of trail segments, access points, and interpretation facilities. At the Big Saline Bayou SRMA, BLM would improve the boating access point. BLM would also limit OHV use to designated routes. This may affect certain OHV users, but could also reduce conflicts between motorized and non-motorized recreationists. Egmont Key and Jupiter Inlet Lighthouse ONA would also see increased investments and management that would improve the quality of recreational experiences and could lead to increased economic activity in the local area owing to increased visitation.

Socioeconomic effects and impacts of implementing management actions for lands and realty would be essentially the same for land tenure adjustments as those identified under Alternative A. The greatest difference is that 11 additional acres, almost entirely in Arkansas, would be available for disposal. This could provide slightly more opportunities for local economic development and generation of property tax revenues. In contrast to Alternative A, all surface tracts would be ROW avoidance areas. This potentially could affect some private party or local government community or economic development actions, but given the small size of most BLM surface tracts, it is unlikely these actions would be precluded or severely affected because alternative ROW routes could likely be found.

4.18.7 Alternative C

Impacts from Energy and Minerals

Socioeconomic effects and impacts of implementing management actions for energy and minerals would be essentially the same as those identified under Alternative A. Differences in stipulations and constraints on leases under this alternative could result in wells being moved to different locations within a lease (as constrained by 43 CFR 3101.1-2), and oil and gas developers and operators could face different costs, as explained for Alternative B. Alternative C has slightly more acreage under seasonal limitations, CSU, and NSO, than Alternative B, and therefore might result in slightly higher costs.

Impacts from Other Programs

Socioeconomic effects of implementing management actions for vegetation, fish and wildlife, and special status species would be the same as those identified under Alternative B.

Socioeconomic effects and impacts from implementing management actions for recreation management would be the same as under Alternative B. The differences in recreation management actions would be negligible from a socioeconomic point of view.

Socioeconomic effects and impacts of implementing management actions for lands and realty would be the same for land tenure adjustments as those identified under Alternative A, except that the land available for disposal would be reduced by 50 acres. Stakeholders who would like to see BLM surface tracts made available to the private sector to change the parcel’s tax status and use would find this alternative least favorable in this respect, while Conservation Stakeholders who believe that retention of Federal lands is important to maintaining open space and other natural characteristics would find it most

favorable. Socioeconomic effects and impacts of management actions for ROW routes would be the same as those identified under Alternative B.

4.18.8 Alternative D

Impacts from Energy and Minerals

Socioeconomic effects and impacts of implementing management actions for energy and minerals would be the same as those identified under Alternative A. Differences in stipulations and constraints on leases under this Alternative Could result in wells being moved to different locations within a lease (as constrained by 43 CFR 3101.1-2), and oil and gas developers and operators could face different costs, as explained for Alternative B. Alternative D has slightly less acreage under seasonal limitations, CSU, and under NSO, than Alternative B, and therefore might result in slightly lower costs. Alternative D would probably have lower costs than Alternative C, as the acreage stipulated as NSO is about 20 percent less.

Impacts from Other Programs

Socioeconomic effects of implementing management actions for vegetation, fish and wildlife, and special status species would be the same as those identified under Alternative A.

Socioeconomic effects and impacts from implementing management actions for recreation management would be similar to elements of Alternative A, except the increased investments and management in the Jupiter Inlet Lighthouse ONA would occur, which would improve the quality of recreational experiences and could lead to increased economic activity in the local area owing to increased visitation.

Socioeconomic effects and impacts of implementing land tenure adjustment management actions for lands and realty would differ from those identified under Alternative A. The land available for disposal would be increased by 539 acres, representing approximately 21 percent of the entire surface tract acreage within the *planning area*. This could provide more opportunities for local economic development and generation of property tax revenues. Stakeholders who would like to see BLM surface tracts made available to the private sector to change parcel tax status and use would find this alternative most favorable in this respect, while Conservation Stakeholders who believe that retention of federal lands is important to maintaining open space and other natural characteristics would find it least favorable. Almost all of the acreage available for disposal would be in Arkansas, so that state would see the most socioeconomic effects and impacts from lands and realty management actions. Under this alternative, the 55-acre Egmont Key tract in Florida would be transferred to the USFWS to be managed in accordance with the Comprehensive Management Plan for Egmont Key NWR. Management of this parcel would probably not change in ways that would have substantially different socioeconomic effects and impacts compared with the other alternatives. The socioeconomic effects and impacts of management actions for ROW routes would be the same as those identified under Alternative B.

4.19 CUMULATIVE IMPACTS

Cumulative impacts are the effects on the environment that result from the impact of implementing any one of the alternatives of the Draft RMP/EIS in combination with other actions outside the scope of this plan, either within the *planning area* or outside it. The CEQ regulations for implementing NEPA define cumulative impacts as:

> *"…the impact on the environment which results from the incremental impact of the action when added to other past, present, or reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." (40 CFR 1500–1508)*

Cumulative impact analysis is required to evaluate the environmental conditions that result from many different actions that act together. The real effect of any single action cannot be determined by considering that action in isolation but must be determined by considering the likely result of that action when acting in conjunction with many others. Management decisions may well be influenced by activities and conditions on intermingled non-public lands and on adjacent lands beyond the *planning area* boundary. Therefore, assessment data and information may span multiple scales, land ownerships, and jurisdictions. These involve determinations that are often complex and to some degree subjective.

The analysis of cumulative impacts serves to place the projected incremental impacts from the RMP alternatives in the context of past, present, and future impacts. Combining the projected impacts of RMP alternatives with past, present, and future impacts necessarily involves projections and limited analyses, to the extent possible. Analyses are limited and qualitative in nature because of the inability to isolate the specific contribution of all past and present impacts from non-federal lands, challenges of predicting potential impacts for reasonably foreseeable future actions, the broad programmatic and strategic nature of RMP alternatives, unknown nature and pace of resource uses and technological changes that could occur, and changing circumstances related to agency priorities, policies, and the economy.

4.19.1 Impact Assessment Methodology

The cumulative impacts discussion that follows considers the alternatives in the context of the broader human environment. Because of the programmatic, broad-scale nature of this RMP, this assessment is broad and generalized to address potential effects that could occur from a hypothetical management scenario when combined with other activities or projects.

Cumulative impacts are commonly examined at a more qualitative and less detailed level than are the direct and indirect impacts presented previously in this chapter because of the wide geographic scope of a cumulative impact assessment and the variety of activities assessed. This analysis includes discussion of factors that have created the current environment described in Chapter 3, Affected Environment. These past actions are considered cumulatively with the alternatives of this RMP. Factors that could be expected to influence that environment in the future are also considered.

The spatial boundaries of each resource cumulative analysis, known as the cumulative impact analysis area, vary by resource and are larger for resources that are mobile or migrate compared with resources that are stationary. In some cases, spatial boundaries may be contained within the *planning area* or an area of the *planning area*. Evaluation of potential impacts considers incremental impacts that may occur resulting from the proposed project, while also considering impacts from past, present, and reasonably foreseeable future actions. Reasonably foreseeable future actions are those future action activities that

have been committed to or that are known proposals that could take place within the planning period. Reasonably foreseeable future action scenarios are projections made only for the prediction of future impacts; they are not actual planning decisions or resource commitments.

Projections are based on current conditions and trends and represent a best professional estimate. Unforeseen changes in such factors as economics; demand; and federal, state, and local laws and policies, could result in different outcomes than those projected for this analysis.

4.19.2 Activities Considered

Projects and activities considered in the cumulative analysis were identified through discussions with agency officials and review of publicly available materials and websites. Activities considered include those that are similar to those identified in the *decision area*, including mineral development, and surface management of natural resources. Also considered is a composite representation of activities on private land, as represented by long-term trends in land development.

Mineral Development

An estimated 38,755 wells could be developed across six of the nine states in the *planning area* over the next 15 years (Table 4-39). Approximately 77 percent (29,914 wells) are projected to be developed in Arkansas and Louisiana. The fewest number of wells is projected to occur in Tennessee.

Table 4-39. Projected Number of Wells and Acres of Disturbance by State

State	Total Projected Wells	Estimated Total Acres of Surface Disturbance Initial (Residual)	Projected BLM Wells	Estimated BLM Acres of Surface Disturbance Initial (Residual)	Percentage of Disturbance from BLM Wells Initial (Residual)
Arkansas	12,120	71,657 (22,739)	440	2,608 (834)	3.64% (3.67%)
Florida	230	1,397 (396)	3	21 (6)	1.50% (1.52%)
Kentucky	4,290	19,452 (6,921)	29	139 (52)	0.71% (0.75%)
Louisiana	17,794	107,847 (32,946)	320	2,082 (687)	1.93% (2.09%)
Tennessee	191	1,082 (261)	2	14 (4)	1.29% (1.53%)
Virginia	4,130	20,123 (11,393)	21	100 (41)	0.50% (0.36%)
Total	**38,755**	**221,558 (74,656)**	**815**	**4,964 (1,624)**	**2.18% (0.00%)**

Source: BLM 2012

In the eastern Kentucky coal region, a total of 370 mines produced 65 million tons of coal in 2011 (KEEC 2012). Under further consideration of coal leasing in eastern Kentucky, three new BLM-issued coal leases

of FMO would be expected. Estimated production from the leases would be as high as 2.3 million tons per year during the first four years, declining to about half a million tons per year thereafter. Based on a total annual production of 65 million tons in eastern Kentucky, the annual production from BLM-issued leases on FMO would range from about 3.5 to 0.7 percent of total production in the region.

In the area with high potential for phosphate development (see Map 3-15), mining disturbs a total of approximately 5,000 to 6,000 acres per year (FDPE 2013). Over about a 20-year period, it is expected that a total of 1,885 acres of FMO would be mined from leases issued by BLM. The area disturbed from the BLM leases would average about 100 acres per year, representing about two percent of the total area disturbed from phosphate mining.

Surface Management on Federal Lands

Because the RMP alternatives include BLM surface management actions on tracts in Arkansas, Florida, Louisiana, and Virginia, the cumulative impact analysis considers the surface management activities of other federal land management agencies in those states. Table 4-40 shows the amounts of land administered by the four principal federal land management agencies—USFS, NPS, USFWS, and BLM. This information serves to illustrate the relative magnitude of expected BLM surface management actions and impacts in the region. With 2,991 acres, BLM FMO represents just 0.03 percent of the total acreage of federal surface ownership. While the types of management actions would vary by agency, there is commonality. For example, BLM expects to conduct prescribed burns on an annual average of 100 acres, which would be 0.01 percent of the 799,234 acres burned by the four agencies in 2009 (USDA 2010).

Table 4-40. Lands in Arkansas, Florida, Louisiana, and Virginia Administered by the Four Federal Land Management Agencies (Acres)

State	USFS	NPS	USFWS	BLM	Total
Arkansas	2,598,743	98,320	373,051	1,075	3,071,189
Florida	1,176,222	2,437,499	278,430	374	3,892,525
Louisiana	604,373	17,531	564,117	738	1,186,759
Virginia	1,664,467	304,289	129,566	804	2,099,126
Total	**6,043,805**	**2,857,639**	**1,345,164**	**2,991**	**10,249,599**

Source: U.S. Congressional Research Service (USCRS 2012)

Development on Private Land

Private land development across the *planning area*, including residential, industrial, commercial, and institutional developments, and administrative sites; cemeteries, airports, golf courses, sanitary landfills, sewage and treatment plants; as well as highways, railroads, and other transportation facilities and transportation projects, create soil disturbance and vegetation loss. The 2007 National Resources Inventories (NRI) provide for estimates of land use conversion to these uses over time (USDA 2009). Comparison with the NRI data will put the proposed actions of the Draft RMP (e.g., the oil and gas RFD) in context for cumulative impact analysis. Long-term trends in land use by state, including conversion of non-federal land to “Developed Land” are shown in Table 4-41, with data in five-year increments for the period 1982 through 2007. The increase in developed land over time can be seen by scanning down the “Developed” land column.

The NRI data indicate that the acres of non-federal developed land in Arkansas, Florida, Kentucky, Louisiana, Tennessee, and Virginia increased. Across the six states, the acres of developed land increased by more than 7.6 million acres from 1982 to 2007, an average of 305,900 acres per year. Arkansas had the lowest percentage increase of 47 percent, and Florida had the highest percentage increase of 99 percent

Table 4-41. Developed Surface Area of Non-Federal and Federal Land and Water Areas, by State and Year (data per 1,000 acres)

State	Year	Federal Land	Water Areas	Non-Federal Land			Total Surface Area
				Developed	Rural	Total	
Arkansas	1982	3,041.7	818.8	1,232.2	29,944.2	30,176.4	34,036.9
	1987	3,049.1	852.9	1,272.8	28,862.1	30,134.9	34,036.9
	1992	3,102.5	859.2	1,338.7	28,736.5	30,075.2	34,036.9
	1997	3,102.8	884.9	1,528.4	28,520.8	30,049.2	34,036.9
	2002	3,104.2	897.6	1,687.2	28,347.9	30,035.1	34,036.9
	2007	3,104.2	902.1	1,809.3	28,221.3	30,030.6	34,036.9
Florida	1982	3,630.9	3,041.4	2,771.8	28,089.6	30,861.4	37,533.7
	1987	3,656.2	3,048.8	3,081.9	27,746.8	30,828.7	37,533.7
	1992	3,784.2	3,076.0	3,677.3	26,996.2	30,673.5	37,533.7
	1997	3,784.2	3,071.4	4,386.2	26,309.9	30,678.1	37,533.7
	2002	3,784.2	3,096.2	4,945.7	25,707.6	30,653.3	37,533.7
	2007	3,784.2	3,133.6	5,515.2	25,100.7	30,615.9	37,533.7
Kentucky	1982	1,107.1	585.4	1,124.0	23,046.9	24,170.9	25,863.4
	1987	1,148.5	589.6	1,312.5	22,812.8	24,125.3	25,863.4
	1992	1,187.2	605.4	1,470.1	22,600.7	24,070.8	25,863.4
	1997	1,187.2	613.1	1,703.0	22,360.1	24,063.1	25,863.4
	2002	1,295.4	625.8	1,952.4	21,989.8	23,942.2	25,863.4
	2007	1295.4	630.9	2,093.1	21,844.0	23,937.1	25,863.4
Louisiana	1982	1,180.7	3,684.1	1,232.1	25,279.9	26,512.0	31,376.8
	1987	1,239.7	3,730.5	1,381.3	25,025.3	26,406.6	31,376.8
	1992	1,308.1	3,769.3	1,454.6	24,844.8	26,299.4	31,376.8
	1997	1,308.1	3,779.7	1,594.7	24,694.3	26,289.0	31,376.8
	2002	1,310.0	3,822.4	1,738.7	24,505.7	26,244.4	31,376.8
	2007	1,310.0	3,924.2	1862.8	24,279.8	26,142.6	31,376.8
Tennessee	1982	1,212.7	758.9	1,640.0	23,362.0	25,002.0	26,973.6
	1987	1,233.7	760.8	1,875.1	23,104.0	24,979.1	26,973.6
	1992	1,232.2	769.0	2,157.9	23,814.5	24,972.4	26,973.6
	1997	1,232.2	773.9	2,606.3	22,361.2	24,967.5	26,973.6
	2002	1,302.6	784.3	2,811.6	22,075.1	24,886.7	26,973.6
	2007	1,302.6	790.8	3,038.3	21,841.9	24,880.2	26,973.6

State	Year	Federal Land	Water Areas	Non-Federal Land			Total Surface Area
				Developed	Rural	Total	
Virginia	1982	2,608.3	1,917.8	1,841.9	20,719.1	22,561.0	27,087.1
	1987	2,626.2	1,920.2	2,082.7	20,458.0	22,540.7	27,087.1
	1992	2,646.4	1,927.9	2,285.3	20,227.5	22,512.8	27,087.1
	1997	2,646.4	1,929.1	2,627.7	19,883.9	22,511.6	27,087.1
	2002	2,646.4	1,934.4	2,901.3	19,605.0	22,506.3	27,087.1
	2007	2,646.4	1,943.1	3,101.2	19,396.4	22,497.6	27,087.1
Total	1982	12,781.4	10,806.4	9,842.0	150,441.7	159,283.7	182,871.5
	1987	12,953.4	10,902.8	11,006.3	148,009.0	159,015.3	182,871.5
	1992	13,260.6	11,006.8	12,383.9	147,220.2	158,604.1	182,871.5
	1997	13,260.9	11,052.1	14,446.3	144,130.2	158,558.5	182,871.5
	2002	13,442.8	11,160.7	16,036.9	142,231.1	158,268.0	182,871.5
	2007	13,442.8	11,324.7	17,419.9	140,684.1	158,104.0	182,871.5

Notes: The following are definitions from the NRI:

Developed Land. A combination of land cover/use categories, large urban and built-up areas, small built-up areas, and rural transportation land.

Large Urban and Built-up Areas. A land cover/use category composed of developed tracts of at least 10 acres—meeting the definition of urban and built-up areas.

Rural Transportation Land. A land cover/use category that consists of all highways, roads, railroads, and associated ROWs outside urban and built-up areas; also includes private roads to farmsteads or ranch headquarters, logging roads, and other private roads (field lanes are not included).

Small Built-up Areas. A land cover/use category consisting of developed land units of 0.25 to 10 acres that meet the definition of urban and built-up areas.

Urban and Built-up Areas. A land cover/use category consisting of residential, industrial, commercial, and institutional land; construction sites; public administrative sites; railroad yards; cemeteries; airports; golf courses; sanitary landfills; sewage treatment plants; water control structures and spillways; other land used for such purposes; small parks (smaller than 10 acres) within urban and built-up areas; and highways, railroads, and other transportation facilities if they are surrounded by urban areas. Also included are tracts smaller than 10 acres that do not meet the above definition but are completely surrounded by urban and built-up land. Two size categories are recognized in the NRI: areas of 0.25 acre to 10 acres, and areas of at least 10 acres.

Source: U.S. Department of Agriculture (USDA) 2009

4.19.3 Air Quality

The cumulative impacts on air quality are evaluated by comparing the BLM site emissions with statewide emissions. For the States of Arkansas, Florida, Kentucky, Louisiana, Tennessee, and Virginia in the Southeast RMP area, comprehensive emissions are available for NO_x, SO_2, CO, PM_{10}, and VOCs in each state. These emissions can be obtained from the state regulatory agencies and usually include regulated sources only. (Exceptions are Arkansas and Tennessee, which include area and some fugitive sources.)

Using the latest available information from the state agencies and EPA, Table 4-42 shows a comparison between each state's total emissions and the BLM-induced emissions as a result of the proposed action. Based on these data, emissions from activities associated with potential oil and gas development, minerals mining, and prescribed burning on BLM-administered surface tracts would not considerably contribute to cumulative air quality emissions within the region (Table 4-42) or GHG emissions. These impacts would be the same for all alternatives.

BLM-authorized activities would have negligible contributions to GHG emissions in comparison with the estimated U.S. emissions of CO_2 in 2006 (5,983.1 teragrams of CO_2 equivalent [Tg CO_2 Eq.][2]) (EPA 2008). These impacts would be the same for all alternatives.

Table 4-42. Comparison of Potential BLM Emissions with Cumulative Emissions for the Southeast RMP States

State	NO_x Emissions (Tons/Yr)	SO_2 Emissions (Tons/Yr)	PM_{10} Emissions (Tons/Yr)	CO Emissions (Tons/Yr)	VOC Emissions (Tons/Yr)
Arkansas					
Arkansas Statewide Total[a]	239,143	119,592	338,078	1,732,395	379,939
Arkansas BLM Total	956	5	40	1,723	1,907
Percentage Contribution to Statewide Emissions	0.4	0.004	0.1	0.1	0.5
Florida					
Florida Statewide Total[b]	707,277	409,889	687,353	6,596,483	1,061,801
Florida BLM Total	0	3	7,489	288	0
Percentage Contribution to Statewide Emissions	0	0.001	1.1	0.004	0
Kentucky					
Kentucky Statewide Total[c]	181,939	388,636	20,643	76,426	36,085
Kentucky BLM Total	110	0	2	205	187
Percentage Contribution to Statewide Emissions	0.06	0.003	0.01	0.3	0.5
Louisiana					
Louisiana Statewide Total[d]	184,059	229,512	28,872	127,768	80,653
Louisiana BLM Total	784	5	25	1,469	1,697
Percentage Contribution to Statewide Emissions	0.4	0.002	0.1	1.1	2.1
Tennessee					
Tennessee	457,717	389,439	389,439	2,182,630	435,297

[2] Carbon comprises 12/44ths of carbon dioxide by weight. One Tg is equal to 1012 grams or one million metric tons.

State	NO_x Emissions (Tons/Yr)	SO_2 Emissions (Tons/Yr)	PM_{10} Emissions (Tons/Yr)	CO Emissions (Tons/Yr)	VOC Emissions (Tons/Yr)
Statewide Total[e]					
Tennessee BLM Total	52	0	1	102	54
Percentage Contribution to Statewide Emissions	0.01	0	0.03	0.005	0.01
Virginia					
Virginia Statewide Total[f]	59,215	128,439	10,501	28,715	19,288
Virginia BLM Total	75	0	7	142	105
Percentage Contribution to Statewide Emissions	0.1	0	0.07	0.5	0.5

[a.] Arkansas National Emissions Inventory (2005) email from David Lyon 12/11/2009 (Data are for all sources including non-regulated sources.)

[b.] Florida SIP Emission Estimates (MACTEC,2008)

[c.] Kentucky Division for Air Quality (KDAQ) 2009b. (Data are for regulated sources for 2007.)

[d.] Louisiana Department of Environmental Quality (LDEQ) 2008b. (Data are for regulated sources for 2008.)

[e.] EPA 2005. (Data are for all sources including non-regulated sources.)

[f.] Virginia Department of Environmental Quality (VDEQ) 2009. (Data are for regulated sources.)

In addition to the impact of the proposed activities on statewide emissions, the impact on designated nonattainment areas was reviewed. Table 4-43 shows the designated nonattainment areas for the southeastern states. All states except Florida have areas in nonattainment for either ozone or $PM_{2.5}$. All of the nonattainment areas are located in the urbanized potions of the states. It is anticipated that the relatively small amount of emissions from the proposed activities would not significantly affect the nonattainment areas and would not interfere with attainment plans or the SIPs for each area.

Table 4-43. Southeastern States Nonattainment Areas

State	County	Pollutant	Location
Arkansas	Crittenden Co	*8-Hr Ozone*	Memphis, TN-AR
Kentucky	Boone Co	*8-Hr Ozone*	Cincinnati- Hamilton, OH-KY
		$PM_{2.5}$ 1997	
	Boyd Co	*$PM_{2.5}$ 1997*	Huntington-Ashland, WV-KY-OH
	Bullitt Co	*$PM_{2.5}$ 1997*	Louisville, KY-IN
	Campbell Co	*8-Hr Ozone*	Cincinnati-Hamilton, OH-KY-IN
		$PM_{2.5}$ 1997	
	Jefferson Co	*$PM_{2.5}$ 1997*	Louisville, KY-IN
	Kenton Co	*8-Hr Ozone*	Cincinnati-Hamilton, OH-KY-IN
		$PM_{2.5}$ 1997	
	Lawrence Co	*$PM_{2.5}$ 1997*	Huntington-Ashland, WV-KY-OH

State	County	Pollutant	Location
Louisiana	Ascension Par	*8-Hr Ozone*	Baton Rouge, LA
	East Baton Rouge Par	*8-Hr Ozone*	Baton Rouge, LA
	Iberville Par	*8-Hr Ozone*	Baton Rouge, LA
	Livingston Par	*8-Hr Ozone*	Baton Rouge, LA
	West Baton Rouge Par	*8-Hr Ozone*	Baton Rouge, LA
Tennessee	Anderson Co	*8-Hr Ozone*	Knoxville-Sevierville-La Follette, TN
		$PM_{2.5}$ 1997	
		$PM_{2.5}$ 2006	
	Blount Co Knoxville, TN	*8-Hr Ozone*	Knoxville-Sevierville-La Follette, TN
		$PM_{2.5}$ 1997	
		$PM_{2.5}$ 2006	
	Cocke Co	*8-Hr Ozone*	Knoxville, TN
		$PM_{2.5}$ 1997	Chattanooga, AL-TN-GA
	Hamilton Co	*8-Hr Ozone*	Knoxville, TN
	Jefferson Co Knox Co	*8-Hr Ozone*	Knoxville-Sevierville-La Follette, TN
		$PM_{2.5}$ 1997	
		$PM_{2.5}$ 2006	
	Loudon Co	*8-Hr Ozone*	Knoxville-Sevierville-La Follette, TN
		$PM_{2.5}$ 1997	
		$PM_{2.5}$ 2006	
	Roane Co Knoxville, TN	*$PM_{2.5}$ 1997*	Knoxville-Sevierville-La Follette, TN
		$PM_{2.5}$ 2006	
	Sevier Co	*8-Hr Ozone*	Knoxville, TN
	Shelby Co	*8-Hr Ozone*	Memphis, TN-AR
Virginia	Alexandria	8-Hr Ozone	Washington, DC-MD-VA
		$PM_{2.5}$ 1997	
	Arlington Co	*8-Hr Ozone*	Washington, DC-MD-VA
		$PM_{2.5}$ 1997	
	Fairfax	*8-Hr Ozone*	Washington, DC-MD-VA
		$PM_{2.5}$ 1997	
	Fairfax Co	*8-Hr Ozone*	Washington, DC-MD-VA
		$PM_{2.5}$ 1997	
	Falls Church	*8-Hr Ozone*	Washington, DC-MD-VA
		$PM_{2.5}$ 1997	
	Loudoun Co	*8-Hr Ozone*	Washington, DC-MD-VA
		$PM_{2.5}$ 1997	
	Manassas	*8-Hr Ozone*	Washington, DC-MD-VA
		$PM_{2.5}$ 1997	
	Manassas Park	*8-Hr Ozone*	Washington, DC-MD-VA
		$PM_{2.5}$ 1997	
	Prince William Co	*8-Hr Ozone*	Washington, DC-MD-VA
		$PM_{2.5}$ 1997	

4.19.4 Soil Resources

The cumulative impact analysis boundary for soil resources includes the entire *planning area*. Surface disturbing activities occurring within the *planning area* are not expected to affect soil resources outside the *planning area*.

Accelerated erosion resulting from BLM past, present, and future actions would combine with similar impacts caused by other agencies, groups, and individuals to create cumulative impacts on soil resources within the *planning area*. Increases in mineral development, construction activities, and the conversion of land to developed landscapes would collectively result in the removal of vegetation, long-term reduction in vegetation cover, and disturbance of soils. This would expose soils to the erosive forces of wind and water, destabilize soils, and increase overland flow, which in turn could result in accelerated erosion. Accelerated erosion could mobilize soils and remove nutrient-rich topsoil, and thereby reduce soil productivity and vegetation growth rates. Similar cumulative impacts would occur from recreational activities within the *planning area*. Although such activities would not necessarily remove vegetation, they could result in a general degradation of vegetation cover and soil compaction.

Surface disturbance would occur from BLM-authorized mineral development on FMO, including fluid minerals and phosphate. The initial disturbance of 4,964 acres from oil and gas development on BLM-administered FMO across the *decision area* would comprise approximately two percent of the 221,558 acres of total surface disturbance expected from all oil and gas development in the six-state area over the next 10 years. This would combine with disturbance from phosphate mining of 802 acres of FMO in Florida. Mining this phosphate over the next 10 years would represent about two percent of the total disturbance from all Florida phosphate mining in the five-county high potential area, assuming that mining continues at approximately 5,000 acres per year. Surface disturbance from energy and mineral development would contribute to the impacts from all other land development actions. From 1982 to 2007, the NRI indicates an average annual increase of 303,116 acres of developed land in the six-state area. The total surface disturbance from energy and mineral development on FMO would be a very small fractional percentage of total development, as indicated by the NRI. Impacts from BLM management actions on surface tracts would also contribute to cumulative impacts. Considering there are fewer than 3,000 acres of BLM surface tracts, however, these would be very minor in the context of the *planning area* with more than 182 million acres, including more than 10 million acres under the administration of other federal land management agencies.

Under all RMP alternatives, site-specific mitigation and BMPs for BLM-authorized activities on FMO would reduce impacts on soil resources. In addition, proposed stipulations designed to protect wetlands and aquatic habitats would reduce sediment and delivery potential by preventing or limiting surface disturbing activities in proximity to streams and other water sources. The buffer would be 250 feet in Alternative B (the Preferred Alternative), increase to 500 feet in Alternative C, and decrease to 100 feet in Alternative D.

In Alternatives B and C, the majority of the BLM surface tracts would be retained and managed to meet resource objectives for habitat management, which would maintain or improve soil and watershed conditions. In Alternatives A and D, less intensive management would occur, and more tracts would be available for disposal, which could potentially result in degradation of soil and watershed condition, as well as possible impacts from development of tracts after disposal.

4.19.5 Water Resources

The cumulative impact analysis boundary for water resources includes the entire *planning area* and the fourth-order watersheds (eight-digit hydrological unit code [HUC]) that extend outside the *planning area*

boundary. Surface-disturbing activities occurring within the *planning area* are not expected to affect water resources within watersheds entirely outside the *planning area*.

Increased degradation of watershed resources and water quality resulting from BLM past, present, and future actions would combine with similar impacts caused by other agencies, groups, and individuals to create cumulative impacts on water resources. Energy and mineral development, construction activities, agriculture, and the conversion of land to developed landscapes, would collectively result in the removal of vegetation, long-term reduction in overall vegetation cover, and disturbance of soils. This would increase overland flow, result in accelerated soil erosion, and decrease the ability of watersheds to buffer high flows and filter water, sediment, and nutrients. Soil mobilized by wind and water erosion would be transported downslope and to nearby water bodies, which would increase sediment and nutrient loads to streams, rivers, lakes, and reservoirs and thereby degrade water quality. Increases in overland flow also would directly increase the amount of water transported to streams and rivers, which could lead to increased downcutting, widening, and overall degradation of stream channels. Similar cumulative impacts would occur from recreational activities within the *planning area*. Although such activities would not necessarily remove vegetation, they could result in a general degradation of vegetation cover and soil compaction. Similar to surface-disturbing activities, loss of cover and soil compaction could lead to increased overland flow, accelerated erosion, and degradation of water quality and stream channel structure.

Surface disturbance would occur from BLM-authorized mineral development, including fluid minerals and phosphate. The initial disturbance of 4,964 acres from oil and gas development on BLM-administered FMO across the *decision area* would comprise approximately two percent of the 221,558 acres of total surface disturbance expected from all oil and gas development in the six-state area over the next 10 years. This would combine with disturbance from phosphate mining of 802 acres of FMO in Florida. Mining this phosphate over the next 10 years would represent about two percent of the total disturbance from all Florida phosphate mining in the five-county area, assuming that mining continues at approximately 5,000 acres per year. Surface disturbance from energy and mineral development would contribute to the impacts from all other land development actions. From 1982 to 2007, the NRI indicates an average annual increase of 303,116 acres of developed land in the six-state area. The total surface disturbance from energy and mineral development on FMO would be a very small fractional percentage of total development, as indicated by the NRI. Impacts from BLM management actions on surface tracts would also contribute to cumulative impacts. Considering there are fewer than 3,000 acres of BLM surface tracts, however, these would be very minor in the context of the *planning area* with more than 182 million acres, including more than 10 million acres under the administration of other federal land management agencies.

Cumulative impacts on groundwater resources from oil and gas development would also occur. Oil and gas wells would have the potential to affect groundwater quality and quantity through withdrawal, injection, and unintentional leakage and spills. Proper well design, construction, drilling, and completion methods would reduce these impacts but would not entirely eliminate them. Hydraulic fracturing is used to enhance recovery by enlarging fractures through which oil and gas can be drawn to a wellbore and brought to the surface. After fluids are injected at high pressures to expand fractures, injected fracture fluids and some formation water flows back to the surface and is removed to allow gas and/or oil to flow into the wellbore. From an investigation in the Fayetteville Shale area, where most of the hydraulic fracturing from BLM-approved wells is expected to occur, oil and gas operations were not found to be a source of methane in shallow groundwater (Kresse et al. 2012). Produced and flowback water from oil and gas operations would be managed in accordance with Onshore Order No. 7 and BMPs (see Appendix D.) 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 UIC program. Any surface disposal from oil and gas or operations or coal mining would require a permit under the NPDES program.

Accidental leakage of drill fluids, hazardous waste spills, or leakage from reserve pits could be introduced into the groundwater as well. Although potential impacts on groundwater from accidental leaks would be reduced through the implementation of federal, state, and local regulations that require site characterization and corrective action for hazardous waste and spills, such impacts would not be eliminated.

Under all alternatives, water resources would be protected owing to management in accordance with site-specific mitigation and BMPs for surface-disturbing activities that would reduce impacts on water resources. In addition, proposed stipulations designed to protect wetlands and aquatic habitats would provide protection for watershed and water quality by preventing or limiting surface disturbing activities in proximity to wetlands, streams, and other water sources. The buffer would be 250 feet in Alternative B (the Preferred Alternative), increase to 500 feet in Alternative C, and decrease to 100 feet in Alternative D.

In Alternatives B and C, the majority of the BLM surface tracts would be retained and managed to meet resource objectives for habitat management, which would maintain or improve watershed conditions. In Alternatives A and D, less intensive management would occur, and more tracts would be available for disposal, which could potentially result in degradation of watershed condition, as well as possible impacts from development of tracts after disposal.

4.19.6 Vegetation

The cumulative impact analysis boundary for vegetation resources includes the entire *planning area*. Surface disturbing activities occurring within the *planning area* are not expected to affect vegetation outside the *planning area*.

Past, present, and future BLM actions would combine with similar impacts caused by other agencies, groups, and individuals to create cumulative impacts on vegetation within the *planning area*. Increases in mineral development, construction activities, and the conversion of land to developed landscapes would collectively result in the removal of vegetation.

Native plant communities and priority vegetation species would be affected by BLM-authorized energy and mineral development on FMO in six states. A total of 4,964 acres of oil and gas related surface disturbance is expected to occur over the next 10 years, with 90 percent of the disturbance in Arkansas and Louisiana. Much of the disturbed acreage (3,340 acres) is expected to be available for interim restoration after wells are completed, although in restoration areas, there is an increased potential for lowered productivity as a result of accelerated erosion, soil compaction, and contamination from accidental spills and leaks. Within the matrix of native vegetation communities, there is potential for BLM-authorized actions to affect remnant and rare plant communities and priority plant species. Sites would be reclaimed after mining, but in some cases, it is unlikely that these sites could be fully restored because of changes in soil structure and topography. Surface disturbing activities are also likely to increase the potential for invasive plant species to spread within a site and for new species to be introduced. An additional 802 acres would be mined for phosphate in central Florida, and 1,083 acres leased for future mining. Phosphate mining would remove vegetation and overburden. Post-mining reclamation is not expected to replace pre-mining vegetation communities, particularly forested communities. Impacts from surface management actions on BLM surface tract would also contribute to cumulative impacts. Considering there are fewer than 3,000 acres of BLM surface tracts, these would be very minor, in the context of the *planning area* of more than 182 million acres, including more than 10 million acres under the administration of other federal land management agencies.

The expected disturbance on FMO from oil and gas development is 4,964 acres, or about two percent of the total projected disturbance of 221,558 acres from all oil and gas development in all of the six states. Even in the counties where BLM is projecting the most intensive drilling, the total would be a fraction of the overall projected drilling. For instance, in Van Buren County, Arkansas, where BLM is projecting the highest number of wells for a single county, BLM drilling on FMO would total approximately eight percent, or 100 out of 1,290 projected wells. In addition, phosphate mining on FMO in Florida is expected to be about two percent of all phosphate mining in the area with high development potential. Across the six states with expected mineral development, land conversion and other surface disturbing activities result in the direct loss of vegetation. Based on historical NRI data, the average annual increase in developed land (1982-2007) in the six-state area was 303,166 acres. This would project to more than three million acres for a 10-year period. Projected disturbance from BLM-authorized development on FMO would clearly be a very small fractional percentage of the total surface disturbance expected in the *planning area*. The amount of disturbance that would affect native vegetation communities, however, is unknown.

Impacts from surface management actions on BLM surface tract would also contribute to cumulative impacts. Considering there are fewer than 3,000 acres of BLM surface tracts, these would be very minor for most vegetation communities, in the context of the *planning area* of more than 182 million acres, including more than 10 million acres under the administration of other federal land management agencies. However, several surface tracts with vegetation communities are rare or significantly reduced from historic distribution. These tracts also support several endemic priority plant species associated with these habitats and are generally identified for retention and management under Alternatives B and C.

Mineral leasing stipulations applied in Alternative A (Florida only) and Alternatives B and C would shift oil and gas surface disturbing activities away from sensitive vegetation communities. Some of the stipulations would protect specific vegetation types, such as native grasslands, glades, and Florida scrub that would be difficult to restore. Wetland and riparian vegetation would also be protected by a stipulation restricting oil and gas development from wetlands, streams, and other water sources; the buffer would be 250 feet in Alternative B (the Preferred Alternative), increase to 500 feet in Alternative C, and decrease to 100 feet in Alternative D. Shifting oil and gas development away from these communities would not reduce the overall number of wells or the amount of disturbance projected, but would avoid impacts on some of the most sensitive vegetation communities.

In Alternatives B and C, the majority of the BLM surface tracts would be retained and managed to meet resource objectives, including desired vegetation communities. In Alternatives A and D, less intensive management would occur, and more tracts would be available for disposal, which could potentially result in degradation of vegetation communities, as well as possible impacts from development of tracts after disposal.

4.19.7 Fish and Wildlife

The cumulative impact analysis boundary for wildlife resources includes the entire *planning area*. Surface disturbing activities occurring within the *planning area* are not expected to affect wildlife outside the *planning area*.

Past, present, and future BLM actions would combine with similar impacts caused by other agencies, groups, and individuals to create cumulative impacts on wildlife within the *planning area*. Increases in mineral development, construction activities, and the conversion of land to developed landscapes would collectively result direct loss of habitat, displacement of fish and wildlife, and habitat degradation. There is potential to impact many of the priority species associated with aquatic or wetland habitats, specific habitats such as caves, or habitats now severely reduced from the historic levels, such as native prairies,

natural fire-maintained mature pine forests, and Florida scrubs. Additional habitat could be degraded in the vicinity of oil and gas wells and facilities through accidental spills or leaks, and the increased potential for invasive plant species to become established and/or spread.

Wildlife, including priority species, game, species, and migratory birds would be affected by BLM-authorized energy and mineral development on FMO in six states. The initial disturbance of 4,964 acres from oil and gas development on BLM-administered FMO across the *decision area* would comprise approximately two percent of the 221,558 acres of total surface disturbance expected from all oil and gas development in the six-state area over the next 10 years. Most of the expected oil and gas on FMO would be on private surface; some, however, would occur on federal or state-owned facilities, including some established because of high resource values, including wildlife. (See Appendix L for a list of federal and state surface management agencies.) Much of the disturbed acreage on FMO (3,340 acres) is expected to be available for interim restoration after wells are completed, although these areas would be of limited use to wildlife while the well was in production. Impacts from oil and gas development would combine with disturbance from phosphate mining of 802 acres of FMO in Florida. Mining this phosphate over the next 10 years would represent about two percent of the total disturbance from all Florida phosphate mining in the five-county area, assuming that mining continues at approximately 5,000 acres per year. Surface disturbance from energy and mineral development would contribute to the impacts from all other land development actions. From 1982 to 2007, the NRI indicates an average annual increase of 303,116 acres of developed land in the six-state area. The total surface disturbance from energy and mineral development on FMO would be a very small fractional percentage of total development, as indicated by the NRI. Impacts from BLM management actions on surface tracts would also contribute to cumulative impacts. Considering there are fewer than 3,000 acres of BLM surface tracts, however, these would be very minor in the context of the *planning area* with more than 182 million acres, including more than 10 million acres under the administration of other federal land management agencies.

Mineral leasing stipulations applied in Alternatives A (Florida only), B, and C would shift oil and gas surface disturbing activities away from particularly sensitive habitats and habitats that support some priority wildlife species. Many of the priority wildlife species potentially affected occur in wetland and aquatic habitats. In Alternative B, there would be 250-foot buffer from wetlands, streams, and other water sources. The buffer would increase to 500 feet in Alternative C and decrease to 100 feet in Alternative D.

In Alternatives B and C, the majority of the BLM surface tracts would be retained and managed to meet resource objectives for habitat management, which would maintain or improve wildlife habitat conditions. In Alternatives A and D, less intensive management would occur, and more tracts would be available for disposal, which could potentially result in degradation of habitat condition, as well as possible impacts from development of tracts after disposal.

4.19.8 Special Status Species

The cumulative impact analysis boundary for special status species includes the entire *planning area*. Surface disturbing activities occurring within the *planning area* are not expected to affect species occurring only outside the *planning area*.

Within the *planning area*, there are hundreds of federally listed, proposed, or candidate species. In most cases, these species have been listed because of cumulative impacts, most often linked to habitat loss, habitat degradation from pollution, and suppression of natural fire regimes; or invasive plant species, disease, and over-exploitation; or competition or predation by exotic species. The projected BLM energy and mineral development has the potential to contribute to some degree to the cumulative threats to many of these species. Within this *planning area*, BLM actions represent a small percentage of overall energy and mineral actions, and even within each of these species' ranges, in most cases. The disturbance of

4,964 acres from oil and gas development on BLM-administered FMO across the *decision area* would comprise approximately two percent of the 221,558 acres of total surface disturbance expected from all oil and gas development in the six-state area over the next 10 years. This would combine with disturbance from phosphate mining of 802 acres of FMO in Florida. Mining this phosphate over the next 10 years would represent about two percent of the total disturbance from all Florida phosphate mining in the five-county area, assuming that mining continues at approximately 5,000 acres per year. Surface disturbance from energy and mineral development would contribute to the impacts from all other land development actions. From 1982 to 2007, the NRI indicates an average annual increase of 303,116 acres of developed land in the six-state area. The total surface disturbance from energy and mineral development on FMO would be a very small fractional percentage of total development, as indicated by the NRI. However, within this larger context, there is potential for BLM actions to contribute more substantially to threats to individual species.

Mineral leasing stipulations applied in Alternative A (Florida only), B, and C have been proposed to avoid adverse effects on special status species from BLM-authorized energy and mineral development, particularly in those areas where BLM is anticipating development. These mineral leasing stipulations would exclude oil and gas surface disturbing activities from critical habitat, hibernacula, and summer and maternal roost sites for special status bats; require setbacks from karst surface features; and prohibit reinjection of produced waters in karst regions. Some habitats that support special status species would be excluded from surface occupancy, including Florida scrubs and native grasslands and prairies, as well coastal dunes and strand habitats. No leasing would be allowed on some BLM tracts that support special status species, including the Jupiter Inlet Lighthouse ONA and Lathrop Bayou HMA/ACEC. In addition, standard setbacks and protocols would be implemented for bald eagle and red-cockaded woodpecker. Some habitats would require specific surveys and restrictive buffers for species such as red-cockaded woodpecker, gopher tortoise, and Louisiana pine snake. Throughout the *planning area*, aquatic habitats and wetlands would be excluded from surface disturbance. In Alternative B, there would be a 250-foot buffer from wetlands, streams, and other water sources. The buffer would increase to 500 feet in Alternative C and decrease to 100 feet in Alternative D. There are provisions to extend that buffer as needed to meet site conditions, if the slope is more than 10 percent.

Impacts from BLM management of 3,000 acres of surface tracts in four states would also contribute to cumulative impacts where these special status species occur or have potential to occur on these tracts. BLM actions to protect and improve habitat, or implement recovery actions, can benefit special status species on these tracts. Likewise, the lack of management in most cases would result in adverse impacts from increasing invasive species, lack of fire in fire-adapted habitats, and harassment in areas of high public use. Across all alternatives, two tracts (Jupiter Inlet Lighthouse ONA and Lathrop Bayou HMA), where habitat is being actively managed to support special status species (four-petal pawpaw, perforate lichen, West Indian manatee, Florida scrub jay, gopher tortoise, Johnson's seagrass, red-cockaded woodpecker, Florida skull cap, Godfrey's butterwort, and white birds-in-the-nest), would be retained and the current management direction would continue. Six other tracts that are known or likely to support special status species would be retained in all alternatives or transferred to the USFWS or the State of Florida, or made available for exchange to benefit the NWR system. In Alternatives B and C, retained tracts would be managed by BLM to support the recovery of these species, to the extent possible on these small acreages. However, in Alternatives A and D, the lack of management on BLM retained tracts could result in an adverse effect on Louisiana black bear, Key deer, Lower Keys marsh rabbit, Lower Florida Keys rice rat, bald eagle, wood stork, piping plover, roseate tern, loggerhead sea turtle, green sea turtle, green sea turtle, gopher tortoise, sand skink, and Carter's mustard.

In cases where these stipulations are not sufficient to avoid adverse effects on special status species or designated critical habitat, BLM would confer or consult with USFWS or National Marine Fisheries Service to resolve potential conflicts prior to approving an action. Terms and conditions of incidental take

permits and reasonable and prudent measures would be added as conditions of approval to subsequent permits or authorizations.

4.19.9 Wildland Fire

The cumulative impact analysis boundary for wildland fire includes the entire *planning area*. Because of noncontinuous fuels, significant fuel breaks (e.g., state and county roads), a relatively low level of BLM-sponsored activity, and the presence of small BLM surface tracts, BLM-sponsored management activities occurring within the *planning area* would not be expected to affect wildland fire outside the *planning area*.

Impacts on wildland fire size, intensity, frequency, and suppression activities resulting from BLM past, present, and future actions would combine with similar impacts caused by other agencies, groups, and individuals to create cumulative impacts on wildland fire management within the *planning area*. Increases in mineral development, construction activities, the conversion of land to developed landscapes, and fire suppression activities within the *planning area* would collectively result in further modification of the composition and structure of vegetation. This would alter the fire regime and potentially increase the size and intensity of wildland fires. Degraded vegetation communities and human-altered landscapes are less capable of slowing the spread of wildland fire and generally fuel high-intensity fires compared with natural, healthy communities and landscapes. However, developed areas and associated roads and ROW corridors could also provide increased accessibility to remote areas for fire suppression equipment and provide fuel breaks during wildland fire events.

Increases in recreation activities, mineral development, construction activities, and general land use would increase human presence within the *planning area* and consequently increase the number of potential ignition sources. This increased level of activity would directly increase the probability of wildland fire occurrence and the need for federal, state, and local agencies to suppress wildland fires to protect life, property, and sensitive resources.

4.19.10 Cultural Resources

The cumulative impact analysis boundary for cultural resources includes the entire *planning area*. Impacts associated with resource decisions from this RMP, combined with other past, present, and reasonably foreseeable actions, could produce cumulative impacts on cultural resources. The types of effects on cultural resources that have occurred in the past include destruction of cultural resources, loss of integrity as a result of physical or other disturbances, loss of setting, degradation from natural processes such as erosion and weathering, incremental disturbance from use or access, and effects from vandalism and unauthorized collection. Current and future trends include population growth, and land development, increased energy and mineral development, and recreation use.

For actions that could affect cultural resources on federal land or actions that are funded, licensed, or permitted by the federal government, compliance is required with the NHPA and other laws, statutes, and regulations. For BLM actions taken to implement RMP decisions, consideration of the effects of undertakings on protected cultural resources would be required. Required inventories prior to surface disturbance would increase the number of identified sites and decrease the potential for damage from surface disturbing activities. Actions by other federal agencies, as well as state agency actions using federal funds or needing a federal permit, require cultural resource review; consideration of the effects of the undertakings on protected cultural resources would be required, and most adverse effects would be resolved. However, agricultural, mineral, and urban development and associated infrastructure on private lands are not required to follow the same cultural protection laws. Development or actions on lands that are not protected by federal or other cultural resource statutes and regulatory protections could lead to loss

of these resources and the related heritage and knowledge that they contain. Cumulatively, this makes the portions of the *planning area* administered by BLM very important culturally, because their management, including required protection, would help preserve remaining cultural resources. Proactive planning measures under Alternatives B (the Preferred Alternative) and C would improve current management of cultural resources in the *decision area*.

4.19.11 Paleontological Resources

The cumulative impact analysis boundary for paleontological resources includes the entire *planning area*. Impacts associated with resource decisions from this RMP, combined with other past, present, and reasonably foreseeable actions, could produce cumulative impacts on paleontological resources. Land management of adjacent federal lands would provide protection for paleontological resources throughout those portions of the *decision area* administered by BLM. However, agricultural, mineral, and urban development and associated infrastructure on private lands are not required to follow the same paleontological protection laws. Any surface disturbance associated with projects such as these could result in the loss of paleontological localities and values. Cumulatively, this makes the portions of the *planning area* administered by BLM very important paleontologically, because their protection and maintenance would preserve the remaining paleontological resources in a largely undisturbed condition.

Although it is expected that some fossils could be destroyed in the course of legitimate uses of public lands, mitigation measures could bring paleontologists to areas where fossils had not been previously studied. Thus, fossils that would otherwise have disintegrated over time as a result of weathering and erosion could be collected, placed in repositories, and protected in perpetuity. Beyond mineral development, cumulative impacts on paleontological resources could occur through incremental degradation of the resource base from a variety of sources, reducing the information and interpretive potential of the paleontological resource values. Mineral development on lands that are not protected by federal laws or policies protecting paleontological resources could decrease the regional resource base, increasing the scientific value of the paleontological resources within the *decision area*.

4.19.12 Visual Resources

The cumulative impact analysis boundary for visual resources includes the entire *planning area*. Cumulative impacts on visual resources would occur primarily from activities that affect the visual quality of the area. Such impacts would result from commercial and residential development on adjacent lands, mineral-development activities, ROW development, increased recreational activity, and actions associated with management of vegetation communities and fish and wildlife habitat.

The Meadowood SRMA, Jupiter Inlet Lighthouse ONA, and various tracts in Florida and Louisiana would be the most affected by commercial and residential development. These are areas where rapid growth and loss of adjacent open space cumulatively affect the visual resources within these tracts. Tracts in areas with less commercial and residential development, such as tracts in Arkansas, could be affected by agricultural or mineral development on adjacent lands.

Surface-disturbing activities associated with mineral development and ROWs would create visual intrusions that could alter the landscape setting and degrade visual quality. Closing or limiting areas to motorized recreation uses and implementing restrictions designed to protect sensitive resources would help to maintain the visual quality in restricted areas. Efforts to maintain and improve vegetation communities and fish and wildlife habitat would indirectly enhance visual quality through improvement of the visual landscape.

BLM surface and FMO tracts comprise a small part of the viewsheds throughout the *planning area*. Past, present, and future actions on non-public lands within the same viewsheds as the BLM-administered lands would generally have a greater impact on the visual characteristics of the entire viewshed than actions on the BLM-administered portions. Visually, this increases the importance of the undeveloped BLM-administered lands in maintaining visual characteristics within the area.

4.19.13 Energy and Minerals

The cumulative impact analysis boundary for energy and minerals includes the *planning area*. Impacts on energy and minerals would occur from management actions proposed under Alternatives A, B, C, and D. While the alternatives include varying levels of environmental protection, they would not be expected to change the amount of project development, as shown for oil and gas development in Table 4-43.

Table 4-44. Percentage of BLM Wells Over 10 Years

State	Total Projected Wells	Projected BLM Wells	Percentage of BLM Wells
Arkansas	12,120	440	3.6%
Florida	230	3	1.3%
Kentucky	4,290	29	0.7%
Louisiana	17,794	320	1.8%
Tennessee	191	2	1.0%
Virginia	4,130	21	0.5%
Total	**38,755**	**815**	**2.1%**

The percentage of BLM wells varies from 0.5 percent in Virginia to 3.6 percent in Arkansas. Across the *planning area*, 815 wells of the total projected number of 38,755 wells (2.1 percent) will occur on FMO. Based on the comparison of the total projected wells and the projected number of BLM wells, there is a minor incremental effect from development on BLM FMO.

Similarly, the incremental impact from coal leasing would also be minor. In 2008, 151.3 million tons of coal were produced from mines in the *planning area* (Energy Information Agency [EIA] 2010). Currently, the one active federal coal mine produced about 350,000 tons of federal coal in 2008. The projected additional federal coal mine would produce between 2.2 and 2.3 million tons for the first four years and between 480,000 and 600,000 tons for the remaining years of the lease. This additional mine would account for approximately 1.5 percent of total production in the *planning area* during the first four years and 0.4 percent during the remaining years of the lease. Based on this comparison, the production of coal from the additional federal mine would have a minor incremental effect.

The projection for phosphate mining is to expand the size of the existing South Fort Meade Mine to 10,885 acres. Approximately 602 acres or five percent of the 10,885 acres is federal minerals. The incremental effect of mining phosphate would be minor in comparison to the other phosphate mining activities.

Past, present, and other future actions would not be expected to affect the potential for energy and mineral development within the *planning area*. Therefore, cumulative impacts on energy and minerals would be the same as those discussed above in Section 4.12.

4.19.14 Recreation Management

The cumulative impact analysis boundary for recreation management includes the entire *planning area*. Recreation opportunities on public lands often depend on whether the adjacent private landowner allows access to the public surface. Additionally, on tracts where BLM administers the mineral resources, development actions could affect surface recreational experiences and opportunities not managed by BLM. Although the BLM management actions and disposal actions under the alternatives could have localized impacts on recreation experience, no significant cumulative impacts would be anticipated because of the small size and scattered nature of BLM-administered surface tracts. Much of the access to the scattered BLM tracts is controlled by other surface owners. Cumulative projects and activities (continued mineral development and other construction projects) could lead to more travel opportunities associated with increased route construction to support mineral development, but there would also be a reduction in primitive/non-motorized recreation opportunities. Minerals development on BLM-administered surface tracts open to recreation could result in impacts on recreation by detracting from the recreational setting. Energy and mineral exploration and development activities would have short-term effects on the quality of the setting because of drilling activities and long-term impacts from road construction, vegetation removal, and the presence of a well and any associated maintenance activities. In areas where commercial and residential development is increasing (e.g., Meadowood SRMA and some tracts in Florida), the importance of maintaining open space and locations for passive recreation (e.g., viewing natural landscapes) becomes more important.

4.19.15 Travel and Access Management

The cumulative impact analysis boundary for travel and access management includes the entire *planning area*. Travel opportunities on public lands often depend on whether the adjacent private landowner allows access to the public lands. Although the BLM management actions and disposal actions under the alternatives could have localized impacts on travel opportunities, no significant cumulative impacts would be anticipated because of the small size and scattered nature of BLM-administered surface tracts. Much of the access to the scattered BLM tracts is controlled by other surface owners. Cumulative projects and activities (continued mineral development and other construction projects) could lead to more travel opportunities associated with increased route construction to support mineral development.

4.19.16 Lands and Realty

Population growth throughout the *planning area* is expected to result in continued demand for additional development land, and associated ROWs for roads, pipelines, and power lines. As in the past, however, future demand is expected to be met by the predominance of privately owned land throughout the *planning area*. The land tenure adjustments proposed across all RMP alternatives would have minimal cumulative impact on land available for development, and restrictions on ROWs under Alternatives B, C, and D would have a negligible cumulative effect by reducing routing options and possibly increasing construction costs for ROW development.

4.19.17 Areas of Critical Environmental Concern

Cumulative impacts from the implementation of other resource decisions within and outside the *decision area* on existing and proposed ACECs would be minimal, with the exception that it is the cumulative actions associated with former management and past development within and surrounding these areas that have made them eligible for consideration as ACECs. Because of adjacent land uses, these comparatively small areas have become affected by non-native species and have become some of the last habitats for a wide variety of threatened and endangered special status species. The nature of the R&I values associated

with the proposed ACECs tends to result in impacts that occur quickly but recover slowly. As such, the existing affected condition would result in a cumulative increase in the potential for irreparable damage to R&I values. In addition, future population growth, development on adjacent lands, and increased recreation use may, over time, further increase the potential for degradation of the important and relevant resources. Cumulatively, combining the management in the alternatives with the past, present, and future management actions for these areas, the proposed ACEC designations would provide a great degree of protection to the R&I values that would not have otherwise been available. The potential for cumulative impacts on R&I values would be greatest in Alternatives A and D, which do not propose ACEC designation for Lathrop Bayou and Egmont Key.

4.19.18 National Trails

Management actions within the Meadowood SRMA would affect the Potomac National Heritage Scenic Trail, and the Washington-Rochambeau Revolutionary Route National Historic Trail under Alternatives A, B, C, and D. Past, present, and other future actions would not affect the location, siting, or use of other National Trails within the *planning area*. Therefore, cumulative impacts on National Trails would be the same as those discussed above in Section 4.17.

4.19.19 Socioeconomics

The greatest potential for cumulative socioeconomic impacts is associated with energy and mineral development in the states within the *planning area*. In several cases, substantial amounts of energy and mineral development are taking place on private and federal mineral estate.

Wells on BLM-administered FMO comprise a very small proportion of forecasted oil and gas development in the states within the *planning area*, ranging from 0.5 percent to 3.6 percent. Historically as well, BLM FMO wells have comprised a small percentage of oil and gas development. Because the BLM-administered FMO oil and gas wells comprise such a small portion of the total wells in the various states, cumulative socioeconomic impacts that could be attributed to the anticipated BLM wells are also small. Further, many of the cumulative socioeconomic effects and impacts associated with oil and gas development are already occurring in the region and would be perpetuated in the future. For instance, oil and gas activity is generating employment opportunities and labor earnings for communities that support these types of activities.

Coal development is expected to only occur on the BLM-administered minerals in Kentucky, with potential development of 0.48 to 2.3 million tons of coal produced per year. This compares with 37 million tons of coal produced in the four-county coal socioeconomic study area in 2006, and 115 million tons produced statewide in 2007. Thus, assuming regional and statewide production rates remain at the noted figures, BLM-administered coal would make up a small portion of total production, up to 6.2 percent regionally and 2.0 percent statewide. Cumulative socioeconomic impacts that could be attributed to the anticipated development of BLM-administered minerals would also be small. In addition, coal mining has long been a feature of the local economy and social structure. Cumulative socioeconomic impacts associated with coal development—jobs, income, fiscal receipts, traffic associated with mines, etc.—are already occurring in the region and would be perpetuated in the future.

Phosphate development will be limited to BLM-administered minerals in Florida. These minerals would be developed as part of the South Fort Meade Mine expansion, which encompasses 10,885 acres. Based on this acreage and typical recovery rates, the expansion will yield 65 million tons of phosphate over its lifetime. The BLM FMO portion is expected to yield 3.6 million tons, or five percent of the total. This tracks with historic production rates, in which federal mineral leases have comprised from one to five percent of total mining operations. Cumulative socioeconomic impacts associated with the projected

phosphate development on BLM FMO—jobs, income, fiscal receipts, aesthetic impacts of open pit mining, traffic associated with the mining operation, etc.—would be a small portion of total impacts. Also, these impacts are already occurring in the region and would be perpetuated in the future with or without development of the BLM minerals.

It is important to note that the pace and timing of mineral-development activities depends on a variety of factors beyond the management decisions of BLM. This includes national and international energy demand and prices, production factors within the *planning area* and business strategies of operators. Because the pace of development in the *planning area* is only an estimate, actual cumulative impacts may vary if the oil and gas activity across the *planning area* changes over the planning period.

4.20 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

NEPA §102(2)C requires a discussion of any irreversible or irretrievable commitments of resources that would be involved in the proposal should it be implemented. An irreversible commitment of a resource is one that cannot be reversed (e.g., the extinction of a species or disturbance to protected cultural resources). An irretrievable commitment of a resource is one in which the resource or its use is lost for a period of time (e.g., extraction of any solid mineral ore or fluid mineral).

Implementation of the Southeastern States RMP would result in surface disturbing activities, including mineral development, dispersed recreation, and infrastructure development that would result in irreversible or irretrievable commitments of resources. These surface disturbing activities would result in long-term alterations to soil, removal of vegetation cover, fragmentation of wildlife habitat, and possible damage to cultural resources. Wildlife dependent on the affected habitats may be displaced and populations may be reduced. Increases in sediment and nonpoint source pollution that result from these activities could result in degradation of water quality and habitat for aquatic-dependent species. However, management prescriptions and stipulations prescribed under the alternatives are designed to reduce the magnitude of these impacts by preventing habitat degradation.

Lands and realty policies may lead to irretrievable commitments of resources. This includes disposals of land and subsequent development and acquisition of land that results in removal of that land from the private property tax base.

Development of oil and gas wells and production of coal would represent an irretrievable commitment of nonrenewable fossil fuels. The extraction of phosphate mineral resources also constitutes an irretrievable commitment of resources.

4.21 UNAVOIDABLE ADVERSE IMPACTS

NEPA §102(2)C requires disclosure of any adverse environmental effects that cannot be avoided should the proposed plan be implemented. Unavoidable adverse impacts are those that remain following the implementation of mitigation measures or impacts for which there are no mitigation measures. Some unavoidable adverse impacts would occur as a result of implementing the Southeastern States RMP. Others are a result of public use of BLM-managed lands within the *planning area*.

Continuing to allow surface disturbing activities consistent with BLM mandates of multiple-use management and the prevention of unnecessary or undue degradation of public lands would result in unavoidable adverse impacts. Although these impacts are mitigated to the extent possible, unavoidable damage is inevitable. Permanent conversion of vegetation resources to other uses, such as mineral

development, would reduce the quantity and quality of vegetation resources. Energy and mineral development activities on public lands could create long-term visual intrusions, soil erosion and compaction, and habitat degradation and fragmentation.

Development of the additional oil and gas wells predicted on FMO would cause air quality related impacts. Under all alternatives, production and release into the atmosphere of CO, SO_2, NO_x, and PM would increase. However, it is not anticipated that the concentrations of these substances would increase to the point where an exceedance of the NAAQS or state air quality standards would occur, because contributions would be small relative to other sources and would be spread over a large geographic area. Impacts would persist as long as development continued, unless improved methods and/or technologies for controlling and/or treating emissions were developed.

Inadvertent damage and/or destruction of cultural and paleontological resources from increased visitation and surface disturbing activities would be unavoidable. Although mitigation measures would include identification and mitigation of resources prior to surface disturbing activities, some unanticipated discoveries of unknown cultural and paleontological resources would occur. The number of sites anticipated to be inadvertently damaged is unknown.

Numerous land use restrictions imposed throughout the *planning area* to protect sensitive resources and other important values would affect the ability of operators, individuals, and groups to use the public lands without limitations and result in forgone opportunities to use resources within the *planning area*. Although attempts would be made to minimize these impacts by limiting the level of protection necessary to accomplish management objectives and by providing alternative use areas for affected activities, unavoidable adverse impacts would occur.

4.22 Relationship Between Local Short-Term Uses and Long-Term Productivity

NEPA §102(C) requires discussion of the relationship between local, short-term uses of man's environment and the maintenance and enhancement of long-term productivity of resources.

- Use of the natural resources within the *planning area* is likely to adversely affect long-term productivity of these natural resources. The short-term uses that would result in the greatest impact on long-term productivity include mineral and energy development, dispersed recreation, and infrastructure development. These uses result in surface disturbing and other disruptive activities that remove vegetation, increase soil erosion and compaction, create visual intrusions and landscape alterations, increase noise, and degrade and fragment wildlife habitat. Although management actions, BMPs, surface use restrictions, and lease stipulations are intended to minimize the effect of short-term uses, some impact on long-term productivity of resources would occur regardless of management approach. Given this situation, BLM will strive to achieve the most effective and practicable balance between short-term uses and long-term productivity through science-based and flexible management, application of mitigation measures and BMPs, monitoring, continuous evaluation of current management policies and practices, and revision of management prescriptions where necessary and feasible.

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CHAPTER 5—CONSULTATION AND COORDINATION

5.1 OVERVIEW OF THE PROCESS

Consultation, coordination, and public involvement were undertaken by the Bureau of Land Management (BLM) throughout the development and preparation of the Draft Resource Management Plan (RMP) and Environmental Impact Statement (EIS) through public and informal meetings, individual contacts, bulletins, news releases, and *Federal Register* notices. Public involvement is mandated by several federal regulations and guidelines, including the Federal Land Policy and Management Act of 1976 (FLPMA), National Environmental Policy Act of 1969 (NEPA), and guidelines from the President's Council on Environmental Quality (CEQ). In addition, the public participation process is outlined in the *BLM Land Use Planning Handbook* (H-1601-1).

5.2 CONSULTATION AND COORDINATION

This section documents the consultation and coordination efforts undertaken by BLM throughout the development and preparation of this Draft RMP/EIS. Because of jurisdictional responsibilities, BLM is required to consult with certain federal, Native American, and state agencies and entities (40 Code of Federal Regulations [CFR] §1502.25) during the NEPA decisionmaking process. BLM is also directed to integrate NEPA requirements with other environmental review and consultation requirements to reduce paperwork and delays (40 CFR §1500.4–5). Title II, Section 202, of FLPMA directs BLM to coordinate planning efforts with Native American tribes and federal, state, and local government agencies as part of its land use planning process.

The State Natural Heritage programs, in particular, assisted in the development of this RMP. Through a series of data use agreements, habitat and species occurrence records from the State Heritage programs provided the basis for much of the natural resource information, particularly on the extensive Federal Mineral Ownership (FMO).

5.2.1 Other Federal Agency Consultation

Section 7 of the Endangered Species Act of 1973 (ESA) requires federal agencies (such as BLM) to address impacts on species listed under ESA through consultations with the U.S. Fish and Wildlife Service (USFWS) and, when applicable, National Marine Fisheries Service (NMFS). Consultations begin informally when a federal agency requests a list of species for the project area under ESA.

The consultation regulations (50 CFR 402.12) require preparation of a biological assessment (BA) when an action agency proposes a "major construction activity," which is defined as an action requiring preparation of an EIS pursuant to NEPA. As part of that BA, an initial determination of effect is made by the lead agency, in this case BLM. If the BA determines that the proposed action may adversely affect a listed species or its designated critical habitat, BLM must enter formal consultation with USFWS, which then prepares a biological opinion (BO) that determines whether the RMP would adversely affect listed species or critical habitat. If BLM determines a proposed action is not likely to adversely affect a listed species or designated critical habitat, the agency must request that the USFWS and/or NMFS concur in that determination.

The USFWS was involved in the planning process. This was initiated through informal consultation, which included obtaining species lists, data exchanges, reviews and discussions related to the oil and gas leasing stipulations, and development of best management practices (BMP).

Informal consultation with the USFWS was initiated by BLM in October 2009 and has continued through the development of the plan. Onsite meetings with USFWS staff were held in Louisiana and Arkansas on October 6 and 7, 2009, respectively. Teleconferences were held with USFWS staff in Kentucky, Tennessee, and Virginia on October 8, 2009. Consultation with the USFWS staff in Florida has been conducted primarily through email. Communications with the USFWS offices continued through 2012 and 2013, as additional work was completed to address the new listing of additional species and refinement of lease stipulations.

Letters were sent to the following federal agencies to inform them of the RMP planning process, and invite them to be involved in the planning process as cooperating agencies:

- Barksdale Air Force Base
- Fort Chaffee
- Fort Campbell
- Avon Park Air Force Range
- Eglin Air Force Base
- Coast Guard, Miami District
- USFS Regional Office, Atlanta
- USFWS, Southeast Region
- U.S. Army Corps of Engineers (USACE), Southwestern Division
- USACE, Little Rock District
- USACE, Mississippi Valley Division
- USACE, Memphis District
- USACE, Vicksburg District
- USACE, New Orleans District
- USACE, South Atlantic Division
- USACE, Jacksonville District
- USACE, Mobile District
- USACE, Great Lakes and Ohio River Division
- USACE, Nashville District
- USACE, Louisville District
- USACE, Huntington District

5.2.2 State and Local Agency Consultation

Letters were sent to state agencies, county supervisors and commissioners, and the governors of states to inform them of the RMP planning process. 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. Only the U.S. Forest Service (USFS) agreed to be a cooperating agency. Multiple state agencies were consulted during the RMP/EIS process, including the Department of Environmental Quality, State Natural Heritage programs, and the State Historic Preservation Office (SHPO).

The following agencies were invited to be part of the planning process:

- State of Arkansas
- State of Florida
- State of Georgia
- Commonwealth of Kentucky
- State of Louisiana

- State of North Carolina
- State of South Carolina
- State of Tennessee
- Commonwealth of Virginia

The National Historic Preservation Act of 1966 (NHPA), as amended (16 United States Code [U.S.C.] 470), expands protection of historic and archeological properties to include those of national, state, and local significance. NHPA (in Section 106) requires federal agencies to consult with the SHPO, and sometimes with the Advisory Council on Historic Preservation, concerning the potential effects of agency actions on properties listed on or eligible for the National Register of Historic Places (NRHP). The SHPO is also sometimes consulted concerning applicable methods for determining whether an agency undertaking would have potential effects on NRHP-eligible properties, whether properties are eligible, and whether there are appropriate mitigation measures. The SHPOs for all of the states were informally contacted concerning potential effects on properties that are listed on or eligible for the NRHP.

5.2.3 Native American Consultation

BLM provides government officials of federally recognized tribes with opportunities to comment on and participate in the development of the RMP. BLM considers comments, notifies consulted tribes of final decisions, and informs them of how their comments were addressed in those decisions. Land use plans and coordination activities must address consistency with tribal plans (Section 202[c][9] of the FLPMA) and protection of treaty rights, and must comply with the following statutes and executive orders (EO):

Section 101(d)(6) of the NHPA requires BLM to consult with Native American tribes when historic properties of traditional religious or cultural importance to a tribe would be affected by BLM decisionmaking.

The American Indian Religious Freedom Act (AIRFA) requires BLM to protect and preserve the freedom of American Indians and Alaska Natives to exercise their traditional religions, including access to sites and freedom to worship through ceremonial and traditional rites.

EO 13007 (Indian Sacred Sites) requires BLM to accommodate access to and use of sacred sites and to avoid adversely affecting the physical integrity of sacred sites to the extent practicable, as permitted by law and consistent with essential agency functions.

EO 12898 (Environmental Justice) requires BLM to take into account relevant CEQ guidelines and Department of the Interior (DOI) policies and goals.

Specific guidance on Native American consultation is outlined in *BLM Manual 8120* and *BLM Handbook H-8120-1*. Land use plans and accompanying EISs must identify potential effects on Indian trust resources, trust assets, or tribal health and safety. Any effect must be explicitly identified and documented in the land use plan.

BLM contacted appropriate Native American tribes, inviting them to participate in the Southeastern States RMP/EIS development process, and offered to meet with tribal leaders or representatives in person to discuss issues, concerns, and questions they might have. A meeting to coordinate with Native American tribes was held in Fort Smith, Arkansas, on October 21, 2008. BLM mailed notification requests to the following tribes/groups:

- Absentee-Shawnee Tribe
- Alabama-Coushatta Tribes of Texas

- Alabama-Quassarte Tribal Town
- Caddo Nation of Oklahoma
- Catawba Indian Tribe
- Cherokee Nation of Oklahoma
- Chickasaw Nation
- Chitimacha Tribe of Louisiana
- Choctaw Nation of Oklahoma
- Coushatta Indian Tribe
- Delaware Nation of Oklahoma
- Delaware Tribe
- Eastern Band of Cherokee Indians
- Eastern Shawnee Tribe of Oklahoma
- Jena Band of Choctaw Indians
- Miccosukee Indian Tribe
- Mississippi Band of Choctaw Indians
- Muscogee (Creek) Nation of Oklahoma
- Osage Tribal Council
- Poarch Band of Creek Indians
- Quapaw Tribe of Oklahoma
- Seminole Indian Tribe
- Seminole Nation of Oklahoma
- Shawnee Tribe
- Thlopthlocco Tribal Town
- Tunica-Biloxi Tribe
- United Keetoowah Band of Cherokee Indians
- Wichita and Affiliated Tribes

Since most of the Tribes and Nations have been removed from their original home lands in the Southeast the main concerns for them are disturbance of ancestral burials and associated funerary grave items. Also a growing concern among the tribes and nations are cultural landscapes issues and TCP's (Traditional Cultural Properties). Another concern is the continued notifications and consultations on any BLM actions. These concerns will be addressed on a project-by-project basis, according to pertinent laws, regulations, and policies, in consultation with potentially affected tribes.

5.3 PUBLIC PARTICIPATION

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

5.3.1 BLM Website

Material was added to BLM's website to provide the public with information on planning issues and the overall planning process. The project website, http://www.blm.gov/es/st/en/fo/Jackson_Home_Page/planning/southeastern_rmp.html, features information on resource and planning issues associated with the Southeastern States RMP. Information includes background documents, project schedule, news releases, and bulletins.

5.3.2 Public Scoping

Scoping is an early and open process for determining the scope of issues to be addressed in the planning process, as defined by 40 CFR Parts 1500 *et seq*. Scoping serves to solicit agency and public input on planning issues and criteria, areas of concern, and ideas and proposals for long-term management. Scoping provides a formal mechanism for engaging the public in identifying key planning and land management issues.

The scoping process formally began with the publication of the Notice of Intent (NOI) in the *Federal Register* on October 8, 2008. The NOI documents BLM's intent to prepare an RMP for the southeastern states and invites interested individuals and organizations; affected federal, state, and local agencies; as well as affected Native American tribes to submit comments to BLM. Upon publication of the NOI, BLM Southeastern States Field Office (SSFO) initiated the first phase of the public scoping process, including a call for resource information and the identification of issues for this planning effort. The official 60-day scoping period began on October 8, 2008, with the printing of the NOI and closed December 8, 2008. Letters were sent to federal and state agencies, county supervisors and commissioners, and the governors of all states within the *planning area* to inform them of the planning process and the scoping meetings.

The NOI announced that BLM would be holding public scoping meetings and that information on locations and times of these meetings would be announced through the media, newsletters, and BLM public website. Public notice of the scoping meetings was published in a number of newspapers across the southeastern United States. Table 5-1 provides the names of the newspapers and the associated public meetings. Public scoping meetings provide an opportunity for interested parties to submit scoping comments and may be a part of the early and open scoping process NEPA requires (40 CFR 1501.7). These meetings are especially important when there is "substantial environmental controversy concerning the proposed action or substantial interest in holding the [meeting]" (40 CFR 1506.6c1).

Table 5-1. Newspaper Announcements and Meeting Locations

Local Media	Date of Press Release	Scoping Meeting Location & Date
Arkansas		
(1) Arkansas Democrat Gazette	Sunday, October 5, 2008	Little Rock, October 20, 2008
(2) Times Record	Saturday, October 4, 2008	Fort Smith, October 21, 2008
(3) Baxter Bulletin	Saturday, October 4, 2008	Mountain Home, October 23, 2008
Tennessee		
(4) The Tennessean	Monday, October 6, 2008	Nashville, October 21, 2008
Kentucky		
(5) The State Journal	Tuesday, October 7, 2008	Frankfurt, October 22, 2008
Louisiana		
(6) Shreveport Times	Sunday, October 12, 2008	Shreveport, October 27, 2008
(7) The Advocate	Saturday, October 11, 2008	Baton Rouge, October 28, 2008
Florida		
(8) Tallahassee Democrat	Monday, October 13, 2008	Tallahassee, October 29, 2008
Virginia		
(9) Richmond Times-Dispatch	Monday, October 27, 2008	Richmond, November 12, 2008
(10) Lorton Valley Star	Saturday, November 1, 2008	Lorton, November 13, 2008

Local Media	Date of Press Release	Scoping Meeting Location & Date
(11) Fairfax Extra in the Washington Post	Thursday, October 23, 2008	Lorton, November 13, 2008

A press release was sent to all the above newspapers, and flyers were distributed to several of the meeting locations and posted onsite. In addition, 878 newsletters announcing the meetings were mailed to individuals on the project mailing list. The 10 public meetings were held over a 4-week period in October and November 2008. The total registered attendance for all 10 meetings was 78 people. Attendance was recorded using a sign-in sheet at the registration station at each public scoping meeting. A copy of the project newsletter and a socio-economic handout were made available to the public. Comments were solicited in a manner that provided an opportunity for everyone attending the public meetings to provide input. Hardcopy forms were provided to attendees so that their individual comments could be written and handed to a BLM representative or mailed to the SSFO.

Attendance at scoping meetings was very low, with only a few individuals at each meeting (Table 5-2). The one exception was Lorton, Virginia, where 63 individuals attended, many of whom submitted written comments. The reason for the large turnout in Lorton, Virginia, appears to be tied to the heavy public use of the BLM surface tract at nearby Meadowood. Recreational users, such as bird-watchers and equestrians and other organized groups, enjoy the use of the area and were interested in providing scoping input.

Table 5-2. Scoping Meeting Attendance

Scoping Meeting Location	Date	Number of Attendees
Little Rock, Arkansas	October 20, 2008	0
Fort Smith, Arkansas	October 21, 2008	3
Mountain Home, Arkansas	October 23, 2008	1
Nashville, Tennessee	October 21, 2008	3
Frankfort, Kentucky	October 22, 2008	2
Shreveport, Louisiana	October 27, 2008	3
Baton Rouge, Louisiana	October 28,2008	2
Tallahassee, Florida	October 29, 2008	1
Richmond, Virginia	November 12, 2008	0
Lorton, Virginia	November 13, 2008	63

Source: Sign-in sheets from public meetings.

5.3.3 Summary of Public Scoping Comments

During the scoping process, a number of written comments were received, all of them pertaining to recreation uses at Meadowood in Virginia. In all, there were approximately 170 comments from 130 individuals. A majority of commenters listed recreational uses they supported and uses they did not support. Comments ranged from limiting existing recreational uses, such as horse-boarding, equestrian trails, and hiking, to expansion and development of new uses, such as additional days and structures for control-line model airplane flying.

Although not submitted in written form, verbal comments were made at the scoping meetings by owners of land adjacent to BLM tracts who were interested in the preservation or development of BLM tracts. Some adjacent landowners were also interested in purchasing BLM tracts. It is anticipated that as the RMP process continues, more adjacent landowners will become interested in the decisions being made through the RMP and will become involved. Verbal comments were also received from attendees at the Ft. Smith, Arkansas, scoping meeting who were representing interests from the oil and gas industry. These individuals made comments in support of oil and gas development and were interested in the mineral and energy reasonably foreseeable development (RFD) scenario, as well as the ownership maps displayed at the meeting.

5.3.4 Development of Planning Criteria

The NOI also announced preliminary planning criteria—the framework of laws, regulations, policies, and guidance within which a RMP must be developed. Comments on the planning criteria were solicited during the scoping period.

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CHAPTER 6—LIST OF PREPARERS

As required by National Environmental Policy Act of 1969 (NEPA) regulations (40 Code of Federal Regulations [CFR] 1502.17), this section lists the people who were primarily responsible for preparing this Draft Resource Management Plan and Environmental Impact Statement (RMP/EIS). A team of specialists from the Bureau of Land Management (BLM) Southeastern States Field Office (SSFO); a contractor, Booz Allen Hamilton; and subcontractors T. Baker Smith, Brockington, and Quantitative Ecological Services prepared the Southeastern States RMP/EIS. Table 6-1 lists contributors who were primarily responsible for preparing this Draft RMP/EIS and presents their qualifications, experience, and role.

Table 6-1. List of Preparers

Contributor	Qualifications and Experience	Project Role
Bureau of Land Management		
Bill Bagnall	B.S., Geology, Campbell University Years of Experience: 38	Geologist, Minerals
Victoria Craft	Lands and Realty Academy Years of Experience: 3	Lands and Realty Specialist
John Dykes	B.S., Mechanical Engineering, Mississippi State University Years of Experience: 16	Supervisory Engineer
Lars Johnson	M.S. and B.S., Geology, Texas A&M University Years of Experience: 36	Geologist, Minerals
Stuart Grange	M.B.A., University of Nevada, Reno B.S., Mining Engineering, University of Utah Years of Experience: 24	Mining Engineer
Brian Kennedy	B.S., Geography, University of Southern Mississippi Years of Experience: 11	Physical Scientist
Alison McCartney	M.S., Environmental Science, Jackson State University B.S., Biology, Jackson State University Years of Experience: 11	Wildlife Biologist
Jeff McCusker	M.S., Forest Resources, University of Idaho B.S., Outdoor Recreation, University of Utah Years of Experience: 23	Outdoor Recreation Planner
John Reiss	B.S., Oceanography, Marine Geology, Lamar University Years of Experience: 38	Registered Professional Geologist
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John Sullivan	M.A. Archeology, University of Mississippi B.A. Anthropology and History, University of Mississippi Years of Experience: 18	Archeologist

Contributor	Qualifications and Experience	Project Role
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Booz Allen Hamilton		
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Terry Garnett	B.S., Environmental Science, Mary Washington College Years of Experience: 21	Assistant Project Manager
Jared Gunnerson	M.P.A., Environmental Management, University of Utah B.A., Environmental Policy, Utah State University Years of Experience: 13	Wildland Fire, Lands and Realty, Travel and Recreation Specialist
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Pamela Middleton	M.A.S., Environmental Policy and Management, University of Denver B.A., Biology, Botany, Sonoma State University Years of Experience: 9	Fish and Wildlife, Special Status Species, Soil Resources Specialist
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Contributor	Qualifications and Experience	Project Role
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Contributor	Qualifications and Experience	Project Role
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Dwayne Hightower	M.S., Wildlife Science, Louisiana State University B.S., Wildlife Management, NcNeese State University Years of Experience: 13	Biologist
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Premiere Data Services		
Shavon Caldwell	B.A., Geography, University of Colorado Certificate of Advanced Study in Geographic Information Systems, University of Denver Years of Experience: 6	Senior GIS Technician

GLOSSARY

Activity Plan. A site-specific plan for the management of one or more resources (e.g., special recreation area management plan, habitat management plan). Activity plans provide the additional detail necessary to implement decisions made in the Resource Management Plan (RMP).

Administrative Use. Official use related to management and resources of the public lands by federal, state, or local governments or non-official use sanctioned by an appropriate authorization instrument, such as right-of-way (ROW), permit, lease, or maintenance agreement.

Air Pollution. The contamination of the atmosphere by any toxic or radioactive gases and particulate matter as a result of human activity.

Aquifer. A geologic formation, group of formations, or part of a formation that contains sufficient saturated, permeable material to be able to yield significant quantities of water to wells and springs.

Archaeological Site. Geographic locale containing structures, artifacts, material remains, and/or other evidence(s) of past human activity.

Areas of Critical Environmental Concern (ACEC). Areas within public lands in which 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 (from H-6310-1, Wilderness Inventory and Study Procedures).

Atmospheric Deposition. Air pollution produced when acid chemicals are incorporated into rain, snow, fog, or mist and fall to Earth. Sometimes referred to as "acid rain," it comes from sulfur oxides and nitrogen oxides, from products of burning coal and other fuels, and from certain industrial processes. If the acid chemicals in the air are blown into areas where the weather is wet, the acids can fall to Earth in the rain, snow, fog, or mist. In areas where the weather is dry, acid chemicals may become incorporated into dusts or smokes.

Attainment Area. Any area meeting Ambient Air Quality Standards and designated as such by 17275.410 of the Florida Administrative Code (F.A.C.).

Best Management Practice (BMP). A suite of techniques that guide, or may be applied to, management actions to aid in achieving desired outcomes. BMPs are often developed in conjunction with land use plans, but they are not considered a land use plan decision unless the land use plan specifies that they are mandatory. They may be updated or modified without a plan amendment if they are not mandatory.

Big Game. Indigenous ungulate wildlife species that are hunted (e.g., elk, deer).

Candidate Species. Taxa for which the U.S. Fish and Wildlife Service (USFWS) has sufficient information about their status and threats to support proposing the species for listing as endangered or threatened under the Endangered Species Act (ESA) but for which issuance of a proposed rule is currently precluded by higher priority listing actions. Separate lists for plants, vertebrate animals, and invertebrate animals are published periodically in the *Federal Register* (from M6840, *Special Status Species Manual*).

Clean Air Act (CAA) of 1963 and Amendments. Federal legislation governing air pollution control.

Closed. Denotes an area is not available for a particular use or uses; refers to specific definitions found in law, regulations, or policy guidance for application to individual programs. For example, 43 Code of Federal Regulations (CFR) 8340.0-5 sets forth the specific meaning of "closed" as it relates to off-highway vehicle (OHV) use, and 43 CFR 8364 defines "closed" as it relates to closure and restriction orders (from H-1601-1, *BLM Land Use Planning Handbook*).

Controlled Surface Use (CSU). A fluid minerals leasing constraint under which use and occupancy are allowed (unless restricted by another stipulation), but identified resource values require special operational limitations that may modify lease rights.

Council on Environmental Quality (CEQ). An advisory council to the President of the United States established by the National Environmental Policy Act of 1969 (NEPA). It reviews federal programs to analyze and interpret environmental trends and information.

Criteria Continuous Concentration (CCC). The Environmental Protection Agency (EPA) national water quality criteria recommendation for the highest instream concentration of a toxicant or an effluent to which organisms can be exposed indefinitely without causing unacceptable effect.

Critical Habitat. Any habitat that, if lost, would appreciably decrease the likelihood of the survival and recovery of a threatened or endangered species or of a distinct segment of its population. Critical habitat: may represent any portion of the present habitat of a listed species and may include additional areas for reasonable population expansion. Critical habitat : must be officially designated by the USFWS or the National Marine Fisheries Services.

Cultural Resource. The fragile and nonrenewable remains of human activity, occupation, or endeavor reflected in districts, sites, structures, buildings, objects, artifacts, ruins, works of art, architecture, and natural features that were of importance in human events. These resources consist of (1) physical remains, (2) areas in which significant human events occurred, even though evidence of the event no longer remains, and (3) the environment immediately surrounding the resource.

Decision Area. The surface land and subsurface mineral estate within the *planning area* for which BLM has authority to make, and does make, land use and management decisions.

Designated Road. Specific roads that the Bureau of Land Management (BLM) (or other agencies) identified in which some type of motorized vehicle use is appropriate and allowed either seasonally or yearlong (from H-1601-1, *BLM Land Use Planning Handbook*).

Disposal. Transfer of public land out of federal ownership to another party through sale, exchange, Recreation and Public Purposes Act, or other land law statutes.

Endangered Species. A species listed by the USFWS or National Marine Fisheries Service as being in danger of extinction throughout all or a significant portion of its range (from M6840, *Special Status Species Manual*). May also be used as a designation by states.

Environmental Impact Statement (EIS). A detailed statement prepared by the responsible official in which a major federal action that significantly affects the quality of the human environment is described, alternatives to the proposed action provided, and effects analyzed (from *BLM National Management Strategy for OHV [Off-Highway Vehicle] Use on Public Lands*).

Extensive Recreation Management Area (ERMA). Areas in which significant recreation opportunities and problems are limited and explicit recreation management is not required. Minimal management actions related to the Bureau's stewardship responsibilities are adequate in these areas.

Federal Land Policy and Management Act of 1976 (FLPMA). Public Law 94-579, October 21, 1976, often referred to as BLM's "Organic Act," which provides the majority of BLM legislated authority, direction policy, and basic management guidance (from *BLM National Management Strategy for OHV Use on Public Lands).*

Federal Mineral Ownership (FMO). Lands on which either all minerals, a certain percentage of minerals, or a certain type of minerals are owned by the Federal Government. As used in this document, it is the FMO within the decision area of the Southeastern States RMP.

Fire Suppression. All work activities connected with fire extinguishing operations, beginning with discovery of a fire and continuing until the fire has been extinguished.

Florida Parishes. Eight parishes in Louisiana that were formerly part of "West Florida," and not part of the Louisiana Purchase. These parishes are East Baton Rouge, East Feliciana, Livingston, St. Helena, St. Tammany, Tangipahoa, Washington, and West Feliciana.

Fluid Minerals. Oil, gas, coalbed natural gas, and geothermal resources.

Ground Water. Water located beneath the Earth's surface in soil pore spaces and in the fractures of rock formations.

Habitat. An environment that meets a specific set of physical, biological, temporal, or spatial characteristics that satisfy the requirements of a plant or animal species or group of species for part or all of their life cycle.

Herbaceous. A plant with little or no woody tissue that dies back at the end of the growing season.

Historic. The period wherein non-native cultural activities, based primarily on European roots, take place and have no origin in traditional Native American culture(s).

Hydrocarbons. Organic chemical compounds of hydrogen and carbon atoms that form the basis of all petroleum products (e.g., oil and gas).

Hydraulic Fracturing. A process that involves the injection of fluid under high pressure to create or enlarge fractures in the reservoir rocks. The fluid that is used in hydraulic fracturing is usually accompanied by proppants, such as particles of sand, which are carried into the newly fractured rock and help keep the fractures open once the pressure from the fracturing operation is released.

Hydrologic Unit Code (HUC). Numerical designations for hydrological units. The United States is divided and sub-divided into successively smaller hydrologic units that are classified into four levels: regions, sub-regions, accounting units, and cataloging units. The hydrologic units are arranged or nested within each other, from the smallest (cataloging units) to the largest (regions). Each hydrologic unit is identified by a unique hydrologic unit code consisting of two to eight digits based on the four levels of classification in the hydrologic unit system.

Interdisciplinary. Characterized by interactive participation or cooperation of two or more disciplines or fields of study.

Intermittent Stream. A stream that is a flowing system under normal weather conditions. During the dry season and throughout minor drought periods, intermittent streams do not exhibit flow. Geomorphological characteristics are not well defined and are often inconspicuous.

Land Tenure Adjustments. Ownership or jurisdictional changes. To improve the manageability of BLM lands and their usefulness to the public, BLM has numerous authorities for "repositioning" lands into a more consolidated pattern, disposing of lands, and entering into cooperative management agreements. These land pattern improvements are completed primarily through the use of land exchanges, but also through land sales, jurisdictional transfers to other agencies, and the use of cooperative management agreements and leases.

Land Use Plan (LUP). A set of decisions that establishes management direction for land within an administrative area, as prescribed under the planning provisions of FLPMA; an assimilation of LUP-level decisions developed through the planning process outlined in 43 CFR 1600, regardless of the scale at which the decisions were developed. The term includes RMPs and Management Framework Plans (MFP) (from H-1601-1, *BLM Land Use Planning Handbook*).

Lease. Section 302 of FLPMA provides BLM's authority to issue leases for the use, occupancy, and development of the public lands. Leases are issued for purposes such as a commercial filming, advertising displays, commercial or noncommercial croplands, apiaries, livestock holding or feeding areas not related to grazing permits and leases, harvesting of native or introduced species, temporary or permanent facilities for commercial purposes (does not include mining claims), residential occupancy,

ski resorts, construction equipment storage sites, assembly yards, oil rig stacking sites, mining claim occupancy if the residential structures are not incidental to the mining operation, and water pipelines and well pumps related to irrigation and non-irrigation facilities. The regulations establishing procedures for the processing of these leases and permits are found in 43 CFR 2920.

Leasable Minerals. Those minerals or materials that can be leased.

Lease Stipulation. A modification of the terms and conditions on a standard lease form at the time of the lease sale. (See also No Surface Occupancy, Controlled Surface Use, and Seasonal Limitation.)

Limited. Designated areas and trails where the use of OHVs is subject to restrictions, such as limits on the number or types or vehicles allowed, dates and times of use (seasonal restrictions), limits on use to existing roads, or limits on use to designated roads. Under the designated roads designation, use is allowed only on roads that are signed for use. Combinations of restrictions are possible, such as limiting use to certain types of vehicles during certain times of the year (from *BLM National Management Strategy for OHV Use on Public Lands*).

Locatable Minerals. Minerals subject to exploration, development, and disposal by staking mining claims as authorized by the Mining Law of 1872, as amended. Locatable minerals include deposits of gold, silver, and other uncommon minerals not subject to lease or sale.

Mesic. Related to conditions of moderate moisture or water supply. Used for describing organisms occupying moist habitats.

Mineral. Any naturally formed inorganic material, solid or fluid inorganic substance that can be extracted from the Earth, and any of various naturally occurring homogeneous substances (such as stone, coal, salt, sulfur, sand, petroleum, water, or natural gas) obtained for man's use, usually from the ground. Under federal laws, considered as locatable (subject to the general mining laws), leasable (subject to the Mineral Leasing Act of 1920), and salable (subject to the Materials Act of 1947).

Mineral Entry. The filing of a claim on public land to obtain the right to any locatable minerals it may contain.

Mineral Estate. The ownership of minerals, including rights necessary for access, exploration, development, mining, ore dressing, and transportation operations.

Mineral Materials. Materials such as sand and gravel and common varieties of stone, pumice, pumicite, and clay that are not obtainable under the mining or leasing laws but that can be acquired under the Materials Act of 1947, as amended.

Multiple Use. The management of the public lands and their various resource values so that they are used in the combination that will best meet the present and future needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to changing needs and conditions; the use of some land for less than all of the resources; a combination of balanced and diverse resource uses that takes into account the long-term needs of future generations for renewable and nonrenewable resources, including, but not limited to, recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, scientific and historical values; and harmonious and coordinated management of the various resources without permanent impairment of the productivity of the land and the quality of the environment with consideration given to the relative values of the resources and not necessarily to the combination of uses that will give the greatest economic return or the greatest unit output.

National Register of Historic Places (NRHP). A register of districts, sites, buildings, structures, and objects, significant in American history, architecture, archaeology, and culture, established by the National Historic Preservation Act of 1966 (NHPA) and maintained by the Secretary of the Interior.

No Surface Occupancy (NSO). A fluid minerals leasing constraint that prohibits occupancy or disturbance on all or part of the lease surface to protect special values or uses. Lessees may exploit the fluid mineral resources under the leases restricted by this constraint through use of directional drilling from sites outside the NSO area.

Nonattainment Area. Any area not meeting Ambient Air Quality Standards and designated as such.

Off-Highway Vehicle (OHV). Any motorized vehicle capable of, or designed for, travel on or immediately over land, water, or other natural terrain, excluding (1) any non-amphibious registered motorboat; (2) any military, fire, emergency, or law enforcement vehicle while being used for emergency purposes; (3) any vehicle whose use is expressly authorized by the authorized officer, or otherwise officially approved; (4) vehicles in official use; and (5) any combat or combat support vehicle when used for national defense (from H-1601-1, *BLM Land Use Planning Handbook*).

Open. Designated areas and trails where OHVs may be operated, subject to operating regulations and vehicle standards set forth in BLM Manuals 8341 and 8343; or an area where all types of vehicle use are permitted at all times, subject to the standards in BLM Manuals 8341 and 8343 (from BLM *National Management Strategy for OHV Use on Public Lands*).

Ozone. A faint blue gas produced in the atmosphere from chemical reactions from such sources as burning coal, gasoline, and other fuels and chemicals found in such products as solvents, paints, and hairsprays.

Perennial Stream. A stream carries flowing water continuously throughout the year, regardless of weather conditions. It exhibits well-defined geomorphological characteristics; in the absence of pollution, thermal modifications, or other manmade disturbances, it has the ability to support aquatic life. During hydrological drought conditions, the flow may be impaired.

Planning Area. The geographic area within which BLM makes decisions during a planning effort. The *planning area* boundary includes all lands regardless of jurisdiction.

Prehistoric. Refers to a period wherein Native American cultural activities took place that were not yet influenced by contact with historic non-native cultures.

Prevention of Significant Deterioration (PSD). An air pollution permitting program intended to ensure that air quality does not diminish in attainment areas.

Prime Farmland. Land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. The land could be cropland, pastureland, rangeland, forest land, or other land but not urban built-up land or water.

Priority Species. Rare, at-risk fish and wildlife 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.

Proppant. A material such as sand, used in the hydraulic fracturing process to help keep the fractures open once the pressure from the fracturing operation is released.

Public Domain. Public lands that the Federal Government owned originally (that is, upon admittance of a state to the United States) and have since then remained in continuous federal ownership.

Public Land. Land or interest in land owned by the United States and administered by the Secretary of the Interior through BLM without regard to how the United States acquired ownership, except lands located on the outer continental shelf and land held for the benefit of Indians, Aleuts, and Eskimos (from H-1601-1, *BLM Land Use Planning Handbook*).

Reasonable Foreseeable Development (RFD) Scenario. The prediction of the type and amount of oil and gas activity that would occur in a given area. The prediction is based on geologic factors, past history of drilling, projected demand for oil and gas, and industry interest.

Recreation and Public Purposes (R&PP) Act (of 1926). An act that provides for the lease and sale of public lands determined valuable for public purposes. The objective of the R&PP Act is to meet the needs of state and local government agencies and non-profit organizations by leasing or conveying public land required for recreation and public purpose uses. Examples of uses made of R&PP lands are parks and greenbelts, sanitary landfills, schools, religious facilities, and camps for youth groups. The act provides substantial costs and benefits for land acquisition and provides for recreation facilities or historical monuments at no cost.

Recreation Opportunity Spectrum (ROS). A widely use planning and management framework for classifying and defining recreation opportunity environments ranging from the primitive to the urban. This continuum recognizes variation among the components of any landscape's physical, social, and operational attributes. Typically, ROS is divided into six major classes: Primitive, Semi-primitive non-motorized, Semi-primitive motorized, Roaded natural, Rural, and Urban.

Resource Management Plan (RMP). A land use plan as prescribed by FLPMA that establishes, for a given area of land, land-use allocations, coordination guidelines for multiple use, objectives, and actions to be achieved.

Right-of-Way (ROW). The public lands authorized to be used or occupied for specific purposes pursuant to a ROW grant, which are in the public interest and require ROWs over, upon, under, or through such lands.

Riparian Area. A form of wetland transition between permanently saturated wetlands and upland areas. Riparian areas exhibit vegetation or physical characteristics that reflect the influence of permanent surface or subsurface water. Typical riparian areas are lands along, adjacent to, or contiguous with perennially and intermittently flowing rivers and streams, glacial potholes, and shores of lakes and reservoirs with stable water levels. Excluded are ephemeral streams or washes that lack vegetation and depend on free water in the soil.

Salable Minerals. Minerals that may be sold under the Material Sale Act of 1947, as amended. Included are common varieties of sand, stone, gravel, and clay.

Scoping Process. An early and public process for determining the nature, significance, and range of issues to be addressed related to a proposed action.

Seasonal Limitation. A fluid minerals leasing constraint that prohibits surface use during specified time periods to protect identified resource values. The constraint does not apply to the operation and maintenance of production facilities unless analysis demonstrates that such constraints are needed and that less stringent, project-specific constraints would be insufficient.

Section 106. Refers to Section 106 of the NHPA, which requires federal agencies to take into account the effects of their undertakings on historic properties, and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment. The historic preservation review process, mandated by Section 106, is outlined in regulations (36 CFR Part 800) and includes consultation with the State Historic Preservation Officer (SHPO).

Section 7. Refers to Section 7 of the ESA, which requires a federal agency to consult with the USFWS when any action the agency carries out, funds, or authorizes (such as through a permit) actions that may affect a listed endangered or threatened species.

Significance. A high degree of importance as indicated by either quantitative measurements or qualitative judgments. Significance may be determined by evaluating characteristics pertaining to location extent, consequences, and duration.

Special Recreation Management Area (SRMA). A public lands unit identified in LUPs to direct recreation funding and personnel to fulfill commitments made to provide specific, structured recreation opportunities (i.e., activity, experience, and benefit opportunities). BLM recognizes three distinct types of SRMAs: community-based; intensive; and undeveloped big open (from H-1601-1, *BLM Land Use Planning Handbook*).

Special Status Species. Species listed or proposed for listing under the ESA of 1973 (16 United States Code [U.S.C.] 1531-1544, 87 Stat. 884), as amended, and 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, including all federal candidate species, and delisted species in the 5 years following delisting.

Species of Concern. Species that are not yet listed as endangered or threatened, but that are undergoing a status review. This may include species whose populations are consistently and widely dispersed or whose ranges are restricted to a few localities, so that any major habitat change could lead to extinction. A species that is particularly sensitive to some external disturbance factors.

Split-Estate. A given land area where the surface and mineral estates are in different ownerships. Most often split-estate areas occur where the surface is owned by private individuals, corporations, or groups or by state or local government, and the minerals are federally owned.

Surface Managing Agency (SMA). Any federal or state agency having jurisdiction over the surface overlying federal mineral ownership.

Surface Tract. Public land administered by BLM.

Surficial. Pertaining to or lying in or on a surface; the surface of the Earth; e.g. “surficial weathering” of a rock, or a “surficial structure” formed by creep.

Surficial Aquifer. These aquifers consist of sand and shell deposits with uppermost layers contiguous with the land surface.

Threatened Species. A species listed by the USFWS or National Marine Fisheries Service that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (from M6840, *Special Status Species Manual*). This designation may also be used by states.

Total Maximum Daily Load (TMDL). An estimate of the total quantity of pollutants (from all sources: point, nonpoint, and natural) that may be allowed into waters without exceeding applicable water quality criteria.

Unique Farmland. Land other than prime farmland that is used for the production of specific high-value food and other fiber crops. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high-quality and/or high yields of a specific crop when treated and managed according to acceptable farming methods. Examples of such crops are citrus, tree nuts, olives, cranberries, fruit, and vegetables.

Valid Existing Rights. Legal “rights” or interest that are associated to a land or mineral estate and that cannot be divested from the estate until that interest expires or is relinquished. Lands within the *decision area* are subject to various authorizations, some giving “rights” to the holders and some of which could be construed as providing valid, but lesser, interests. Valid existing rights are established by various laws, leases, and filings under federal law.

Mineral: Authorizations for activities on existing mineral leases and mining claims are governed by valid existing rights. Valid existing rights vary from case to case with respect to oil and gas leases, mineral leases, and mining claims, but generally involve rights to explore, develop, and produce within the constraints of laws, regulations, and policies at the time the lease/claim was established or authorized.

Non-Mineral: There are other situations, unrelated to minerals, in which BLM has authorized some use of public land or has conveyed some limited interest in public land. The authorization may be valid and existing and may convey some "right" or interest. Many rights-of-way, easements, and leases granted on public land are this type of valid existing right. These types vary from case to case, but the details of each one are specified in the authorizing document. Valid and existing authorizations of this type would continue to be allowed subject to the terms and conditions of the authorizing document.

Access: The presence of non-federal land within the *decision area* has implications for valid existing rights because owners of non-federal land surrounded by public land are entitled to reasonable access to their land. Reasonable access is defined as access that the Secretary of the Interior deems adequate to secure the owner reasonable use and enjoyment of the non-federal land. Such access is subject to rules and regulations governing the administration of public land. In determining reasonable access, BLM has discretion to evaluate and would consider such things as proposed construction methods and location, reasonable alternatives, and reasonable terms and conditions as are necessary to protect the public interest and resources of the *decision area*.

Other: A variety of other land use authorizations do not involve the granting of legal "rights" or interests. Outfitter and guide permits are an example. These permits authorize certain uses of public land for a specified time, under certain conditions, without conveying a right, title, or interest in the land or resources used. If at any time it is determined that an outfitter and guide permit, other such permit, or any activities under those permits, are not consistent with the approved RMP, then the authorization would be adjusted, mitigated, or revoked where legally possible. Grazing permits are also in this category. Grazing permits or leases convey no right, title, or interest in the land or resources used. Other applicable laws and regulations govern changes to existing grazing permits and levels of livestock grazing.

Visibility (Air Quality). A measurement of the ability to see and identify objects at different distances.

Visitor Use. Public use of land and facilities, typically expressed in numbers of persons per day.

Visual Resource Management (VRM) Classes. VRM classes define the degree of acceptable visual change within a characteristic landscape. A class is based on the physical and sociological characteristics of any given homogeneous area and serves as a management objective. Categories are assigned to public lands based on scenic quality, sensitivity level, and distance zones. Each class has an objective that prescribes the amount of change allowed in the characteristic landscape (from H-1601-1, *BLM Land Use Planning Handbook*). The four classes are described below:

Class I provides for natural ecological changes only. This class includes primitive areas, some natural areas, some wild and scenic rivers, and other similar areas where landscape modification activities should be restricted.

Class II areas are those areas where changes in any of the basic elements (form, line, color, or texture) caused by management activity should not be evident in the characteristic landscape.

Class III includes areas where changes in the basic elements (form, line, color, or texture) caused by a management activity may be evident in the characteristic landscape. However, the changes should remain subordinate to the visual strength of the existing character.

Class IV applies to areas where changes may subordinate the original composition and character; however, they should reflect what could be a natural occurrence within the characteristic landscape.

Volatile Organic Compounds (VOC). Organic chemicals that readily produce vapors at room temperature and normal atmospheric pressure. Volatile organic chemicals include gasoline, industrial chemicals such as benzene, solvents such as toluene and xylene, and tetrachloroethylene (perchloroethylene, the principal dry cleaning solvent).

Wetlands. Areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

Wildland Fire. Any fire, regardless of ignition source, that is burning outside of a prescribed fire and any fire burning on public lands or threatening public land resources, where no fire prescription standards have been prepared (from H-1742-1, *BLM Emergency Fire Rehabilitation Handbook*).

Withdrawal. Removal or withholding an area of federal land from settlement, sale, location, or entry, under some or all of the general land laws, for the purpose of limiting activities under those laws to maintain other public values in the area or reserving the area for a particular public purpose or program; or transferring jurisdiction over an area of federal land, other than "property" governed by the Federal Property and Administrative Services Act, as amended (40 U.S.C. 472) from one department, bureau, or agency to another department, bureau, or agency (from FLPMA, Title 43 Chapter 35 Subchapter I 1702[j]).

Woodland. Forest land on which trees are present but form only an open canopy, the intervening areas being occupied by lower vegetation.

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ACRONYMS

ACEC	Area of Critical Environmental Concern
ACWCS	Arkansas Comprehensive Wildlife Conservation Strategy
ADEQ	Arkansas Department of Environmental Management
AED	Area of Expected Development
AGFC	Arkansas Game and Fish Commission
ANHC	Arkansas Natural Heritage Commission
APLIC	Avian Power Line Interaction Committee
ARPA	Archeological Resources Protection Act of 1979
BA	Biological Assessment
BBL	Barrels of Oil
BCC	Birds of Conservation Concern
BEA	Bureau of Economic Analysis
BLM	Bureau of Land Management
BLS	Bureau of Labor Statistics
BMP	Best Management Practice
BO	Biological Opinion
BOEMRE	Bureau of Ocean Energy Management, Regulation and Enforcement
BSFW	Bureau of Sport Fisheries and Wildlife (now USFWS)
CBNG	Coal bed Natural Gas
CCC	Criteria Continuous Concentration
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CSU	Controlled Surface Use
CWCS	Comprehensive Wildlife Conservation Strategy
DBH	Diameter at Breast Height
DoD	Department of Defense
DOE	U.S. Department of Energy
DOI	Department of the Interior
DOR	Department of Revenue
dv	Deciview
EA	Environmental Assessment
EAC	Early Action Compact
EGCP	East Gulf Coastal Plain
EIA	Energy Information Agency
EIS	Environmental Impact Statement
EJ	Environmental Justice
EO	Executive Order
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act of 1986
ERMA	Extensive Recreation Management Area
ESA	Endangered Species Act
FDEP	Florida Department of Environmental Protection
FERC	Federal Energy Regulatory Commission
FPC	Federal Power Commission (now FERC)
FFWCC	Florida Fish and Wildlife Conservation Commission
FLPMA	Federal Land Policy and Management Act (of 1976)

FLTFA	Federal Land Transaction Facilitation Act
FL-WLI	Florida Wildlife Legacy Initiative
FMO	Federal Mineral Ownership
FMR	Federal Mineral Royalties
FPPA	Farmland Protection Policy Act
FY	Fiscal Year
GAO	Government Accountability Office
GBBDC	Game Birds Below Desired Condition
GCPM	Gulf Coast Prairies and Marshes
GHG	Greenhouse Gases
GSA	General Services Administration
HAP	Hazardous Air Pollutant
HUC	Hydrologic Unit Code
IFAS	University of Florida Institute of Agricultural and Food Science
INRMP	Integrated Natural Resources Management Plan
IPCC	Intergovernmental Panel on Climate Change
KDAQ	Kentucky Division for Air Quality
KDFWR	Kentucky Department of Fish and Wildlife Resources
LBA	Lease by Application
LDEQ	Louisiana Department of Environmental Quality
LDWF	Louisiana Department of Wildlife and Fisheries
LNG	Liquefied Natural Gas
LNHP	Louisiana Natural Heritage Program
LWGCP	Lower West Gulf Coastal Plain
MCF	Thousand Cubic Feet of Natural Gas
MCFE	Thousands of Cubic Feet Equivalent
Mgal/d	Million Gallons per Day, also MGD
MMcf	Million Cubic Feet of Natural Gas
MMS	Minerals Management Service
MOU	Memorandum of Understanding
MRAP	Mississippi River Alluvial Plain
MTR	Mountain Top Removal
NAAQS	National Ambient Air Quality Standards
NADP	National Atmospheric Deposition Program
NAICS	National Association of Industry Classifications Systems
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act (of 1969)
NHPA	National Historic Preservation Act (of 1966)
NRHP	National Register of Historic Places
NMFS	National Marine Fisheries Service
NO_2	Nitrogen Dioxide
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NRI	National Resources Inventory
NSO	No Surface Occupancy (a stipulation on an oil and gas lease)
NTSA	National Traffic Safety Administration

NWR	National Wildlife Refuge
O_3	Ozone
OCS	Outer Continental Shelf
OHV	Off-Highway Vehicle
ONA	Outstanding Natural Area
PCB	Polychlorinated Biphenyls
P.L.	Public Law
PM	Particulate Matter
ppm	parts per million
PSD	Prevention of Significant Deterioration
PSR	Power Site Reserve
R&PP	Recreation and Public Purposes Act
RCRA	Resource Conservation and Recovery Act (1976)
REIS	Regional Economic Information System
RFD	Reasonably Foreseeable Development
RMP	Resource Management Plan
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
ROW	Right-of-Way
SACP	South Atlantic Coastal Plain
SDWA	Safe Drinking Water Act
SERCC	Southeastern Regional Climate Center
SHPO	State Historic Preservation Office(r)
SIC	Standard Industrial Classification
SIP	State Implementation Plan
SMA	Surface Managing Agency
SO_2	Sulfur Dioxide
SGCN	Species of Greatest Conservation Need
SRMA	Special Recreation Management Area
SRP	Special Recreation Permit
SSFO	Southeastern States Field Office
TCWCS	Tennessee Comprehensive Wildlife Conservation Strategy
TDEC	Tennessee Department of Environment and Conservation
TDS	Total Dissolved Solids.
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
TVA	Tennessee Valley Authority
UEGCP	Upper East Gulf Coast Plain
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
USCRS	United States Congressional Research Service
USGC	United States Coast Guard
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UVA	University of Virginia
UWGCP	Upper West Gulf Coastal Plain
VA	Veterans Administration
VCWCS	Virginia's Comprehensive Wildlife Conservation Strategy
VDEQ	Virginia Department of Environmental Quality

VOC	Volatile Organic Compounds
VRI	Visual Resource Inventory
VRM	Visual Resource Management
WAP	Wildlife Action Plan
WGCP	Western Gulf Coastal Plain
WUI	Wildland-Urban Interface

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