FINDING OF NO SIGNIFICANT IMPACT/DECISION RECORD

FINDING OF NO SIGNIFICANT IMPACT

Based on the analysis of potential environmental impacts contained in the attached environmental assessment (EA), I have determined that the proposed action will not have any significant impacts on the human environment and an environmental impact statement (EIS) is not required.

Elizabeth Drury 9/26/14

Bruce Dawson — Date

Field Manager

DECISION RECORD

It is my decision to authorize the offer to lease for Oil and Gas the proposed tracts located in Fifth Principal Meridian, White and Faulkner County, Arkansas, with the following legal descriptions: T9N, R7W, Sec. 26, W2SE, West of River, White County (39.57 acres) (EOI #961) and T7N, R12W, Sec. 29, S2NW, Faulkner County, Fifth Principal Meridian, AR (80 acres) (Appendix A).

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Rationale for Decision

The decision to allow the proposed action does not result in any undue or unnecessary environmental degradation and is consistent with the laws and regulations of the Federal, State, or local government. The proposed action was subject to a 30-day public review.

Elena Fink 3/12/2015

Elena Fink, DSD, Natural Resources — Date

BUREAU OF LAND MANAGEMENT
SOUTHEASTERN STATES FIELD OFFICE
411 Briarwood Drive, Suite 404
Jackson, Mississippi 39206

ENVIRONMENTAL ASSESSMENT (EA) FORM

ES-020-2012-14
ES-020-2011-40

PROJECT NAME: EOI #961, White County, Arkansas Lease EA
EOI #1108, Faulkner County, Arkansas Lease EA

TECHNICAL REVIEW:

X	Program	Reviewer	Signature	Date
X	Air Quality	Alison McCartney Natural Resource Specialist	A McCarty	3/21/14
X	ACEC	Alison McCartney Natural Resource Specialist	A McCarty	3/21/14
X	Botanical including T&E Spp.	Faye Winters Wildlife Biologist		3/21/14
	Communications (Dispatch)			
X	Cultural/Paleontology	John Sullivan Archeologist		3/26/14
X	Energy Policy	Alison McCartney Natural Resource Specialist	ASM	3/21/14
X	Environmental Justice	Alison McCartney Natural Resource Specialist	ASM	3/21/14
	Farmlands (Prime & Unique)			
	Fire Management			
X	Floodplain	Alison McCartney Natural Resource Specialist	ASM	3/21/14
X	Hazardous Material	Brian Kennedy Physical Scientist		3/21/14
X	Invasive & Non-Native Spp.	Alison McCartney Natural Resource Specialist	ASM	3/21/14
	Lands/Realty			
	Land Law Examiner			
	Law Enforcement			
X	Minerals	Alison McCartney Natural Resource Specialist	ASM	3/21/14

X	Native American Religious Concerns	John Sullivan Archeologist		3/26/14
	Operations			
	Range Management			
X	Recreation	Alison McCartney Natural Resource Specialist	ASM	3/21/14
X	Soils	Alison McCartney Natural Resource Specialist	ASM	3/21/14
	Surface Protection			
	Visual Resources			
	Water Rights			
X	Water Quality (Surface & Ground)	Alison McCartney Natural Resource Specialist	ASM	3/21/14
X	Wetlands/Riparian Zones	Alison McCartney Natural Resource Specialist	ASM	3/21/14
X	Wild & Scenic Rivers	Alison McCartney Natural Resource Specialist	ASM	3/21/14
X	Wilderness	Alison McCartney Natural Resource Specialist	ASM	3/21/14
	Wild Horse & Burro			
X	Wildlife including T&E Spp.	Faye Winters Wildlife Biologist	FKlwtx	3/24/14

Prepared by: Alison McCartney — Date: 3/21/14
Alison McCartney
Natural Resource Specialist

Reviewed by: _____ Date: 3/24/14
Gary Taylor
NEPA Coordinator

Reviewed by: _____ Date: 3/25/14
Duane Winters
Natural Resource Supervisor

Reviewed by: Elizabeth Ivy — Date: 3/25/14
Elizabeth Ivy
Minerals Supervisor

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Southeastern States Field Office
411 Briarwood Drive, Suite 404
Jackson, Mississippi 39206

Environmental Assessment
ES-020-2012-14
ES-020-2011-40

EOI #961, White County, Arkansas Lease EA
EOI #1108, Faulkner County, Arkansas Lease EA

Prepared by: Alison McCartney
Date: September 24, 2014

CH 1 – PURPOSE OF AND NEED FOR THE PROPOSED ACTION

Introduction

On July 27, 2011(EOI #961) and January 21, 2011 (EOI #1108), the BLM Southeastern States Field Office (SSFO) received two requests from the BLM Eastern States Office for a National Environmental Policy Act (NEPA) analysis report on 119.57 acres of land with the following legal descriptions (Appendix A).:

EOI #961 - T9N, R7W, Sec. 26, W2SE, West of River, White County, Fifth Principal Meridian, AR (39.57 acres)

EOI #1108 - T7N, R12W, Sec. 29, S2NW, Faulkner County, Fifth Principal Meridian, AR (80 acres)

This environmental assessment (EA) is prepared to address two proposed federal oil and gas lease nominations in White and Faulkner County, Arkansas. A federal oil and gas lease is a legal contract that grants exclusive rights to the lessee to develop federally owned oil and gas resources.

Need for the Proposed Action

The purpose of the proposed action is to make available for lease 119.57 acres in White and Faulkner Counties, Arkansas to provide exclusive rights to the lessee to develop federally owned oil and gas resources. The development of oil and natural gas is essential to meeting the nation's future needs for energy. Private exploration and development of federal oil and gas reserves are integral to the BLM's oil and gas leasing programs under the authority of the Mineral Leasing Act of 1920, as amended, the Mineral Leasing Act for Acquired Lands of 1947, as amended, the Federal Land Policy and Management Act of 1976 and the Energy Policy Act of 2005. The oil and gas leasing program managed by the BLM encourages the development of domestic oil and gas reserves and reduction of U.S. dependence on foreign sources of energy.

Management Objectives of the Action

The objective of the proposed action is to make available for lease 119.57 acres in White and Faulkner Counties, Arkansas to provide exclusive rights to the lessee to develop federally owned oil and gas resources. Not approving these EOIs would deny the option for industry to develop federal minerals in this area which could create a loss of royalties to the federal government.

Land Use Plan Conformance

The proposed action does not conflict with any known State or local planning, ordinance or zoning. This area is not covered by a BLM Resource Management Plan. According to the regulations at 43 CFR 1610.8 (b) (1), however, this environmental assessment will be used as a basis for making a decision on the proposal.

Applicable Regulatory Requirements and Required Coordination

Applicable regulatory requirements and required coordination for lease development of federal oil and gas minerals is authorized by several statutes including: The Mineral Leasing Act, as amended and supplemented (30 U.S.C. 181), The Mineral Leasing Act of 1947, as amended (30 U.S.C. 351-359), The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, Executive Order (EO) 13007, and/or other statutes and EOs.

Scoping and Public Involvement

Internal Scoping

In September, 2013, a BLM interdisciplinary (ID) team was formed which included a Natural Resource Specialist, Geologist, GIS Specialist, and Archeologist. The ID team began analyzing all relevant date regarding EOI #961 and 1108 and writing portions of the EA. The final EA was reviewed by all members of the ID team with comments made and incorporated.

External Scoping

Informal consultation with U.S. Fish and Wildlife Service (FWS), Louisiana Ecological Services was initiated on November 22, 2013 in compliance of the Endangered Species Act (ESA), Section 7 Consultation requirements. A concurrence letter was received on January 21, 2014 and is located in Appendix C. Consultation with the State Historic Preservation Officer (SHPO) occurred on January 6, 2012 (EOI #961) and May 11, 2011 (EOI #1108). A concurrence letter was received from SHPO on May 16, 201. Letters were sent to various tribes on December 16, 2011 (EOI #981) and May 15, 2011 (EOI #1108) notifying them of the proposed action and requesting comments or concerns. Several tribes responded on different dates.

The following tribes were contacted to notify them of the proposed action and to request comments or concerns (Appendix C):

Alabama-Quassarte Tribal Town
Choctaw Nation
United Keetoowah Band of Cherokee Indians in Oklahoma
Osage Nation
Muscogee (Creek) Nation of Oklahoma
Cherokee Nation of Oklahoma
Seminole Nation of Oklahoma
Quapaw Tribe of Oklahoma
Tunica-Biloxi Tribe
Thlopthlocco Tribal Town
Chickasaw Nation

The following state and/or federal agencies were contacted by the BLM ID team:

- U.S. Fish and Wildlife Service, Arkansas Ecological Services
- Arkansas Historic Preservation Program

Public Involvement

The proposed lease was subject to public review for a 30-day period per publication of a newspaper of local distribution (Appendix E).

Decision(s) That Must Be Made

There are two decisions under consideration from the BLM for the proposed action. The first is to offer the federal oil and gas mineral estate for competitive leasing. The other decision would be to deny the action so that no development and surface disturbance would take place. BLM's policy is to promote oil and gas development as long as it meets the guidelines and regulations set forth by NEPA and other subsequent laws and policies passed by the U.S. Congress.

CH 2 – ALTERNATIVES INCLUDING THE PROPOSED ACTION

Introduction

Two tracts of land (2 EOIs) totaling 119.57 acres have been nominated for federal oil and gas lease in White and Faulkner County, Arkansas. A federal oil and gas lease is a legal contract that grants exclusive rights to the lessee to develop oil and gas resources that may exist on split estate property.

Location

The two EOIs are located in Fifth Principal Meridian, White and Faulkner County, Arkansas, and have the following legal descriptions: T9N, R7W, Sec. 26, W2SE, West of River, White County (39.57 acres) (EOI #961) and T7N, R12W, Sec. 29, S2NW, Faulkner County, Fifth Principal Meridian, AR (80 acres) (Appendix A). EOI #961 is located ~3 miles east/northeast of the small community of Albion and State Highway 16. The Little Red River is located just outside of the eastern boundary. EOI #1108 is located ~4 miles west of the town of Greenbrier and State Highway 65 (Appendix A).

Proposed Action

The BLM, SSFO received two nominations or EOIs, to lease 119.57 acres of federal mineral estate for oil and gas development in White and Faulkner County, Arkansas. The leases would give the lessee exclusive rights to explore and develop oil and gas reserves on the leases, but does not in itself authorize surface disturbing activities. The competitive leases provide exclusive rights to develop the federal oil and gas resources, but do not obligate the company to drill a well on the federal mineral estate. The leases can be used to consolidate acreage to meet well spacing requirements, and/or the mineral estate may be acquired for speculative value. The BLM will require applicants to adhere to stipulations and lease notices/best management practices for oil or gas wells (Appendix B). The attached stipulations and lease notices/best management practices have been formulated while conducting our impact analysis and are made part of the proposed action.

The proposed nominations, if approved, would be offered for competitive sale with stipulations and notices generated through this and other consultations, as well as the NEPA process. Once awarded, the successful bidder is required to submit an Application for Permit to Drill (APD) to the BLM before any ground disturbance is authorized. In the APD, the company identifies a proposed drill site and provides the BLM with specific details on how and when they propose to drill the well within the constraints of the lease document. Upon receipt of an APD, BLM conducts an onsite inspection with the company, and when possible the private land owner or surface managing agency. NEPA and the ESA requirements must also be met at the APD stage and in those cases where there is the potential to affect federal or state-listed species, a site specific biological assessment is written, including the results of any biological surveys that may be indicated. This is submitted to FWS and/or the state wildlife agency for consultation, as appropriate. The lessee is required, as per lease stipulations, to comply with the recommendations of these consultations.

The Reasonable Foreseeable Development (RFD) Scenario predicts that for EOI #961, the lease will result in multiple lateral wells drilled from 1 well pad. Surface disturbance predictions include 0.52 acres disturbed for the access road, 5.74 acres for the well pad and pit, and 0.34 acres reclaimed for a net disturbance of 5.92 acres (Appendix D). The RFD for EOI #1108 predicts that 3 wells will be drilled from 1 well pad. It is predicted that 0.34 acres will be disturbed for the access road, 4.88 acres for the well pad and pit, and 0.34 acres reclaimed for a net disturbance of 4.88 acres.

Typically, after approval of an APD, the petroleum industry follows a general plan and process for all proposed drill sites, as follows:

Spacing for the tract will be 40 acres per well. Preparation for the drilling process includes construction of a road, drilling pad, and reserve pit. Constructed access roads normally have a running surface width of approximately 30 feet; the length is dependent upon the well site location in relation to existing roads or highways. The average length of road construction will be about 0.5 miles. Therefore, about 2 acres would be affected by road construction. Typically 2.5 acres are cleared and graded level for the construction of the drilling pad for a well. If the well is gas and productive, and the flowline is in the road, we can estimate that another 0.5 acres may be affected by flowline construction. The total disturbed area for drilling a productive well will be approximately 5 acres. These disturbances are typical for private or federal ownership well locations. The excavation reserve pit is usually about five feet deep and is lined with bentonite clay to retain drilling fluids, circulated mud, and cuttings. Plastic or butyl liners (or its equivalent), that meet state standards for thickness and quality, are used on occasions when soils are determined incapable of holding pit fluids.

Because of the cost of the drilling rig, drilling usually continues around the clock. Wells in this area are usually drilled in 30 days. Once drilling is completed, excess fluids are pumped out of the pit and disposed of in a state authorized disposal site and the cuttings are buried. Wells would be drilled by rotary drilling using mud as the circulating medium. Mud pumps would be used to force mud down the drillpipe, thereby forcing the rock cuttings out the wellbore. Water would normally be from a well drilled on the site, however, water could be pumped to the site from a local pond, stream or lake through a pipe laid on the surface. Approximately 1500 barrels of drilling mud would be typically kept on the location. If a tract is adjacent to a producing field and water production will be expected during the life of the field, separation, dehydration and other production processing may be necessary. Construction of facilities off the federal lease may be needed to handle this processing. Some processing or temporary storage may be necessary on site.

During well pad construction, the topsoil is stockpiled to be used during restoration activities. If the well is successful, the drill pad would be reduced to about 100' x 100' with the remaining surface area, including the reserve pit, re-graded and restored as per the BLM and surface owner requirements. A lease notice for the proposed lease encourages the use of non-invasive cover plants during all restoration and stabilization activities. Final seed mixtures and plantings are determined with recommendations from BLM with approval of the land owner. The remaining 100' x 100' pad is maintained for the life of the well. The life of a productive well may be 25 years. Following abandonment, the pad is subject to the same restoration parameters.

The following information on the federal mineral tracts is based on information collected during a site visits conducted in 2013, aerial photographs, and topographic maps. Mitigation methods for potential negative impacts are listed in Appendix B as lease stipulations and lease notices. These recommended lease stipulations and notices have been developed to provide general habitat protection and setbacks to exclude sensitive habitats from oil and gas development. Recommended mitigation for the proposed action is suggested as stipulations for freshwater aquatic habitat, cultural resources and tribal consultations, endangered species and special plant species (Appendix B). Additional surveys may be required for special status species after site-specific proposals have been received by BLM during the development phase.

CH. 3 – DESCRIPTION OF THE AFFECTED ENVIRONMENT

Introduction

This section describes the environment that would be affected by implementation of the Proposed Action described in Chapter 2. Aspects of the affected environment described in this section focus on the relevant resources and issues. Only those elements of the affected environment that have the potential to be significantly impacted are described in detail. Based on review of the elements listed on the SSFO NEPA Form and consideration of the Purpose and Need statement prepared for this EA, the following elements will be addressed in this EA: Environmental Justice, Cultural Resources, Native American Religious Concerns, Minerals and Mineral Development, Energy Policy, Wastes, Hazardous or Solid, Soils, Air Resources, Water Resources, Surface/Ground, Wetland/Riparian Areas/Floodplains, Invasive/Exotic Species, Special Status Species, Wildlife and Vegetation, and Migratory Birds of Concern.

Description of Project Area

EOI #961 consists of 39.57 acres and is located in White County. EOI #1108 is an 80 acre parcel located in Faulkner County. Both EOIs are in north/central Arkansas entirely within the Arkansas Valley Ecoregion. The Arkansas Valley is up to forty miles wide and includes geological features typical of both the Ozarks and the Ouachitas, including dissected plateaus like those of the Ozarks and folded ridges like those of the Ouachitas. The Arkansas Valley was originally formed by downwarping of a broad area as the Ouachitas were pushed northward and warped upward by continental collision toward the south. However, the Arkansas River and its tributaries have given it a truly distinct character by eroding away thousands of feet of sediment and creating the isolated mountains surrounded by broad rolling uplands that are typical today. The Arkansas River also formed wide bottomlands and flat terraces that contribute further to the distinctive character of the valley.

The two EOIs are located in Fifth Principal Meridian, White and Faulkner County, Arkansas, and have the following legal descriptions: T9N, R7W, Sec. 26, W2SE, West of River, White County (39.57 acres) (EOI #961) and T7N, R12W, Sec. 29, S2NW, Faulkner County, Fifth Principal Meridian, AR (80 acres) (Appendix A).

Environmental Justice

Title IV of the Civil Rights Act of 1964 and related statutes ensure that individuals are not excluded from participation in, denied the benefit of, or subjected to discrimination under any program or activity receiving federal assistance on the basis of race, color, national origin, age, sex, or disability. EO 12898 on Environmental Justice directs that programs, policies, and activities not have a disproportionately high and adverse human health and environmental effect on minority and low-income populations. Leasing of the nominated parcels will not create an unsafe or unhealthy environment for any population, including minority and low-income populations and therefore will not be out of conformance with this EO.

Cultural Resources

A literature search was conducted at the Arkansas Historic Preservation Program Site Files on April 25, 2011. While the area has not been surveyed and there are no recorded sites within one mile of the leasing area, the proposed lease area may have sites that would qualify as historic properties (36 CFR 61). A professionally conducted survey for historic properties would add information on human utilization of this area.

Native American Religious Concerns

Federally recognized Native American tribes and groups have been contacted about this proposed undertaking. Known sites of Native American religious activities have not been located. The area has not been surveyed for cultural resources. Religious sites or sites of cultural importance to Native Americans may be present.

Minerals and Mineral Development

Minerals

The objective horizon for both EOIs is Fayetteville Shale and the commodity is natural gas.

Mineral Development

Wells will be drilled vertically to a certain depth referred to as the kick-off point. From there the wells are steered from the vertical to the horizontal using a short, medium, or long radius curve. A horizontal lateral is then drilled in the objective horizon for a distance of between 4,000 and 9,000 feet. These wells may require high volume hydraulic stimulation/fracturing in order to establish commercial production. Hydraulic stimulation occurs after a well has been drilled to a particular depth vertically and possibly drilled a certain distance horizontally through the targeted geologic zone (Figure 1). Steel pipe (casing) will be inserted in the well bore and will be perforated within the target zone(s) that contain oil or gas, enabling production out of the targeted zone(s) when the fracturing fluid is injected at high pressure into the well flowing through the perforations. Eventually, the targeted formation will not be able to absorb the fluid as quickly as it is being injected and at this point, the pressure created causes the formation to crack or fracture. Once the fractures have been created, injection ceases and some quantity of the fracturing fluids will begin to flow back to the surface. Materials called proppants (e.g., usually sand or ceramic beads), which were injected as part of the fracturing fluid mixture, remain in the target formation to hold open the fractures.

Some studies have shown that anywhere from 20-85% of fracturing fluids may remain underground. Used fracturing fluids that return to the surface are often referred to as flowback, and these wastes are typically stored in open pits or tanks at the well site prior to proper disposal or can be reused in developing other wells.

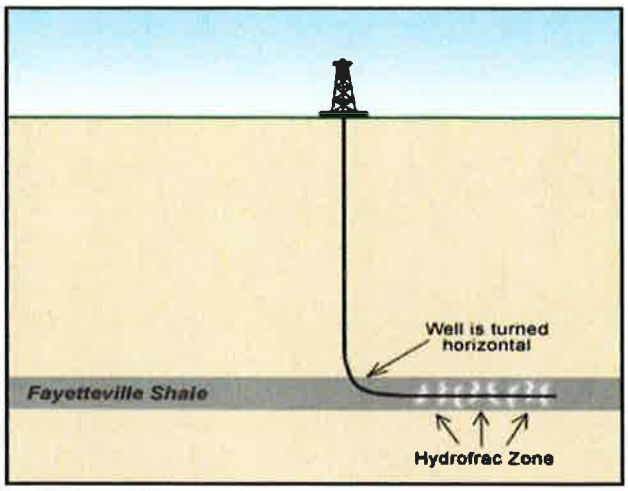

Figure 1. Diagram of hydraulically fracturing a well.

Energy Policy

Energy Policy Act of 2005 – Sets forth an energy research and development program covering: (1) energy efficiency; (2) renewable energy; (3) oil and gas; (4) coal; (5) Indian energy; (6) nuclear matters and security; (7) vehicles and motor fuels, including ethanol; (8) hydrogen; (9) electricity; (10) energy tax incentives; (11) hydropower and geothermal energy; and (12) climate change technology. Below is a list of the Sections of the Act that are relevant to the proposed action:

Title III: Oil and Gas

Subtitle B: Natural Gas
(Sec. 313) Designates FERC as the lead agency for coordinating federal permits and other authorizations and compliance with the National Environmental Policy Act of 1969 (NEPA). Directs FERC to establish a schedule for all federal authorizations.

Subtitle C: Production
(Sec. 322) Amends the Safe Drinking Water Act to exclude from the definition of underground injection the underground injection of fluids or propping agents (other than diesel fuels) pursuant to hydraulic fracturing operations related to oil or gas, or geothermal production activities.

Subtitle F: Access to Federal Lands
(Sec. 361) Requires the Secretary of the Interior to perform an internal review of current federal onshore oil and gas leasing and permitting practices.
(Sec. 364) Amends the Energy Act of 2000 to revise the requirement that the Secretary of the Interior, when inventorying all onshore federal lands, identify impediments or restrictions upon oil and gas development.
(Sec. 366) Amends the Mineral Leasing Act to set deadlines for an expedited permit application process.
(Sec. 368) Prescribes guidelines governing energy right-of-way corridors on federal land. Directs the Secretaries of Agriculture, of Commerce, of Defense, of Energy, and of the Interior (the Secretaries), in consultation with FERC, states, tribal or local government entities, affected

utility industries, and other interested persons, are directed to consult with each other and to: (1) designate corridors for oil, gas, and hydrogen pipelines and electricity transmission and distribution facilities on federal land in the 11 contiguous Western States; (2) incorporate the designated corridors into the relevant energy land use and resource management or equivalent plans; and (3) ensure that additional corridors are promptly identified and designated.
(Sec. 371) Amends the Mineral Leasing Act to cite conditions for the reinstatement of oil and gas leases terminated for certain failure to pay rentals.

Subtitle G: Miscellaneous
(Sec. 390) States that action by the Secretary of the Interior in managing the public lands, or the Secretary of Agriculture in managing National Forest System Lands, with respect to certain oil or gas drilling related activities shall be subject to rebuttable presumption that the use of a categorical exclusion under NEPA would apply if the activity is conducted pursuant to the Mineral Leasing Act for the purpose of exploration or development of oil or gas.

The two tracts contain no features related to energy development, production, supply or distribution.

Wastes, Hazardous or Solid

The Resource Conservation and Recovery Act (RCRA) of 1976 established a comprehensive program for managing hazardous wastes from the time they are produced until their disposal. The Environmental Protection Agency (EPA) regulations define solid wastes as any "discarded materials" subject to a number of exclusions. On January 6, 1988, EPA determined that oil and gas exploration, development and production wastes would not be regulated as hazardous wastes under the RCRA. The Comprehensive Environmental Response Compensation and Liability Act (CERCLA) of 1980, deals with the release (spillage, leaking dumping, accumulation, etc.), or threat of release of hazardous substances into the environment. Despite many oil and gas constituent wastes being exempt from hazardous waste regulations, certain RCRA exempt contaminants could be subject to regulations as a hazardous substance under CERCLA.

During the on-site inspections, no hazardous or solid waste disposal sites were found on the lease tracts. Should the parcels be leased and developed, generation and temporary storage of waste materials (solid and liquid) would likely occur. Waste materials would be managed in accordance with Onshore Orders 1 & 7, RCRA, applicable Arkansas Department of Environmental Quality (ARDEQ) regulations, and the Arkansas Department of Natural Resources Office and Conservation (ARDNROC) rules. Fluid handling would be evaluated at the development stage and fluids associated with any subsequent drilling, completions and/or production would either be treated, evaporated, or transferred to an approved ARDEQ treatment facility. Solids would be treated on site or transferred to a ARDEQ approved facility.

Soils

The soil characteristics, potential for erosion, and likelihood for success in revegetation efforts are important to consider when planning for stabilization of disturbed areas. Management actions may affect soil chemical and physical properties causing increases in compaction,

displacement, erosion, sedimentation, stream channel alteration, and water nutrients. Erosion and sedimentation can be quantified by measuring or by estimating tons per acre of soil loss. The comparison of soil loss tolerance (maximum rate of soil loss that can occur while sustaining productivity) to current soil loss (the rate of soil loss occurring under existing conditions) is important in describing current conditions. When current soil loss is greater than the tolerance threshold, erosion can be considered excessive. Other factors to be considered when determining whether soil erosion is too high, include the quality of the downstream water bodies and their reasons for impairment.

EOI #961

There are 4 soil types found on the proposed tract; Enders-Steprock complex, 12 – 30% slopes, Linker fine sandy loam, 3 – 8% slopes, Linder gravelly fine sandy loam, 3-8%, and Steprock-Mountainburg complex, 8-12% slopes (See Attached Soil Map). The Enders-Steprock complex, 12 – 30% slopes comprises 51.4% of the proposed site. It can be found on hills and has a parent material of clayey residuum weathered from acid shale. It is well drained with a low available water capacity (about 5.2 inches). The Linker fine sandy loam, 3 – 8% slopes comprises 0.7% of the tract and the Linder gravelly fine sandy loam, 3-8% comprises 40.7%. They can both be found on hills and have a parent material of loamy residuum weathered form sandstone. It is well drained with a low available water capacity (about 4.1 inches). The Steprock-Mountainburg complex, 8-12% slopes comprises 7.3% of the tract. It can be found on hills as well and has a parent material of skeletal loamy residuum weathered form sandstone. It is well drained with a very low available water capacity (about 2.5 inches).

EOI #1108

There are 3 soil types found on the proposed tract; Enders gravelly fine sandy loam, 8-12%, Linker fine sandy loam, 3 – 8% slopes, Linker-Mountainburg association 12-40% slopes (See Attached Soil Map). The Enders gravelly fine sandy loam, 8-12% comprises 21.2% of the proposed site. It can be found on hills and has a parent material of clayey residuum weathered from acid shale. It is well drained with a moderate available water capacity (about 6.9 inches). The Linker fine sandy loam, 3 – 8% slopes comprises 20.7% of the tract and the Linker-Mountainburg association 12-40% slopes comprises 58.1%. They can both be found on hillsides and mountains and have a parent material of loamy residuum weathered form sandstone. It is well drained with a low available water capacity (about 4.0 inches).

Air Resources

Air quality and climate are components of air resources which may be affected by BLM applications, activities, and resource management. Therefore, the BLM must consider and analyze the potential effects of BLM-authorized activities on air resources as part of the planning and decision making process.

Air Quality

The primary sources of air pollution are dust from blowing wind on disturbed or exposed soil, exhaust emissions from motorized equipment, oil and gas development, agriculture, and industrial sources. The EPA was given the authority for air quality protection with the provision

to delegate this authority to the state as appropriate under U.S. law. The ARDEQ has been delegated most of the authority for air quality protection in Arkansas. The Clean Air Act (CAA) of 1970, as amended, requires the establishment of National Ambient Air Quality Standards (NAAQS). NAAQS pollutants include carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM_{10} & $PM2_{2.5}$), sulfur dioxide (SO_2), and lead (Pb). The NAAQS pollutants are monitored in Arkansas by the ARDEQ. The CAA identifies two types of national ambient air quality standards. Primary standards define levels of air quality that the Administrator of the EPA judges to be necessary, with an adequate margin of safety, to protect the public health. Secondary standards define levels of air quality that the Administrator of the EPA judges to be necessary to protect the public from any known or anticipated adverse effects of a pollutant. Both primary and secondary standards are currently in effect (Table 1). Ambient air quality measurements taken by the ARDEQ indicate that ambient air quality for the state is within the standards, except in Crittendon County, near West Memphis, which is a nonattainment area for 8-hour ozone.

Table 1. National Ambient Air Quality Standards.

	Primary Standards		**Secondary Standards**	
Pollutant	**Level**	**Averaging Time**	**Level**	**Averaging Time**
Carbon Monoxide	9 ppm (10 mg/m^3)	8-hour (1)	None	
	35 ppm (40 mg/m^3)	1-hour (1)		
Lead	0.15 µg/m^3 (2)	Rolling 3-Month Average	Same as Primary	
	1.5 µg/m^3	Quarterly Average	Same as Primary	
Nitrogen Dioxide	53 ppb (3)	Annual (Arithmetic Average)	Same as Primary	
	100 ppb	1-hour (4)	None	
Particulate Matter (PM_{10})	150 µg/m^3	24-hour (5)	Same as Primary	
Particulate Matter ($PM_{2.5}$)	15.0 µg/m^3	Annual (6) (Arithmetic Average)	Same as Primary	
	35 µg/m^3	24-hour (7)	Same as Primary	
Ozone	0.075 ppm (2008 std)	8-hour (8)	Same as Primary	
	0.08 ppm (1997 std)	8-hour (9)	Same as Primary	
	0.12 ppm	1-hour (10)	Same as Primary	
Sulfur Dioxide	0.03 ppm	Annual (Arithmetic Average)	0.5 ppm	3-hour (1)
	0.14 ppm	24-hour (1)		

Note:

(1) Not to be exceeded more than once per year.
(2) Final rule signed October 15, 2008.
(3) The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.
(4) To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm (effective January 22, 2010).
(5) Not to be exceeded more than once per year on average over 3 years.
(6) To attain this standard, the 3-year average of the weighted annual mean PM2.5 concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m3.
(7) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m3 (effective December 17, 2006).
(8) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008).
(9) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
(b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as EPA undertakes
rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.
(c) EPA is in the process of reconsidering these standards (set in March 2008).
(10) EPA revoked the 1-hour ozone standard in all areas, although some areas have continuing obligations under that standard ("anti-backsliding").
(b) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is ≤ 1.

According to EPA's Air Trends report for 2011 (EPA 2011), since 1990, nationwide air quality has improved significantly for the six NAAQS. Nationally, air pollution was lower in 2010 than in 1990 for:, SO_2, and

- 8-hour ozone, by 17%
- 24-hour PM_{10} , by 38%
- 3-month average lead, by 83%
- annual NO_2 , by 45%
- 8-hour CO, by 73%
- annual SO_2 , by 75%

Nationally, annual $PM_{2.5}$ concentrations were 24% lower in 2010 compared to 2001 and 24-hour $PM_{2.5}$ concentrations were 28% lower in 2010 compared to 2001. Ozone levels did not improve in much of the East until 2002, after which there was a significant decline. Eight-hour ozone concentrations were 13% lower in 2010 than in 2001. This decline is largely due to reductions in oxides of nitrogen (NOx) emissions required by EPA rules including the NOx State Implementation Plan (SIP) Call, preliminary implementation of the Clean Air Interstate Rule (CAIR), and Tier 2 Light Duty Vehicle Emissions Standards.

EPA concludes that total emissions of toxic air pollutants have decreased by approximately 42% between 1990 and 2005. Control programs for mobile sources and facilities such as chemical plants, dry cleaners, coke ovens, and incinerators are primarily responsible for these reductions. They also found that monitored concentrations of toxic pollutants such as benzene, 1,3-butadiene, ethylbenzene, and toluene decreased by 5% or more per year between 2003 and 2010 at more than half of ambient monitoring sites. Other toxic air pollutants of concern to

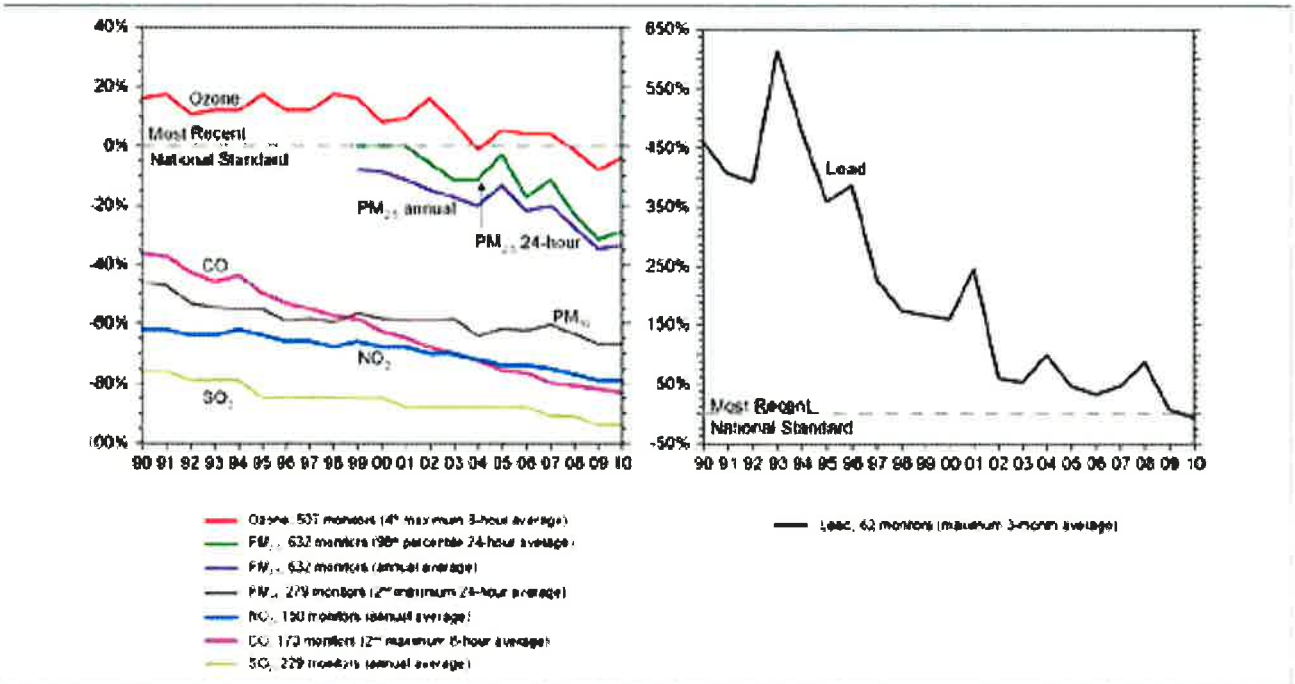

Figure 2. Comparison of national levels of the six common pollutants to the most recent NAAQS, 1990-2010. National levels are averages across all monitors with complete data for the time period. Note: Air quality data for PM2.5 starts in 1999 (EPA, 2011).

public health such as carbon tetrachloride, formaldehyde, and several metals, declined at most sites.

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Visibility

Visibility, also referred to as visual range, is a subjective measure of the distance that light or an object can clearly be seen by an observer. Light extinction is used as a measure of visibility and is calculated from the monitored components of fine particle mass (aerosols) and relative humidity. It is expressed in terms of deciviews, a measure for describing perceived changes in visibility. One deciview is defined as a change in visibility that is just perceptible to an average person, which is approximately a 10% change in light extinction. Visibility can also be defined by standard visual range (SVR) measured in miles, which is the farthest distance at which an observer can see a black object viewed against the sky above the horizon. The larger the SVR, the cleaner the air. To estimate potential visibility impairment, monitored aerosol concentrations are used to reconstruct visibility conditions for each day monitored. The aerosol species include

ammonium sulfate, ammonium nitrate, organic mass, elemental carbon, soil elements, and coarse mass. The daily values are then ranked from clearest to haziest and divided into three categories; the mean visibility for all days (average), the 20% of days with the clearest visibility (20% clearest), and the 20% of days with the worst visibility (20% haziest).

A wide variety of pollutants can impact visibility, including particulate matter, nitrogen dioxide, nitrates (compounds containing NO_3), and sulfates (compounds containing SO_4). Fine particles suspended in the atmosphere decrease visibility by blocking, reflecting, or absorbing light. Two types of visible impairment can be caused by emission sources: plume impairment and regional haze. Plume impairment occurs when a section of the atmosphere becomes visible due to the contrast or color difference between a discrete pollutant plume and a viewed background, such as a landscape feature. Regional haze occurs when pollutants from widespread emission sources become mixed in the atmosphere and travel long distances.

There are three classifications of areas that attain NAAQS: Class I, Class II, and Class III. Congress established certain national parks and wilderness areas as mandatory Class I areas where only a small amount of air quality degradation is allowed. Since 1980, the Interagency Monitoring of Protected Visual Environments (IMPROVE) network has measured visibility in Class I areas. These are managed as high visual quality under the federal visual resource management (VRM) program. The CAA 1997 amendment declared "as a national goal the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory Class I federal areas…from manmade air pollution." 42 U.S.C. § 7491(a)(1).25. All other areas of the U.S. are designated as Class II, which allow a moderate amount of air quality degradation. No areas of the U.S. have been designated Class III, which would allow more air quality degradation. The CAA gives federal managers the affirmative responsibility, but no regulatory authority, to protect air quality-related values, including visibility, from degradation. There are 2 Class I areas listed for Arkansas; Caney Creek Wilderness Area (WA) and Upper Buffalo WA. Caney Creek WA consists of 4,344 acres of Forest Service land and is located over 175 miles southwest of EOI #961 and over 146 miles southwest of EOI #1108. Upper Buffalo WA consists of 9,912 acres of Forest Service Land and is located over 100 miles northwest of the proposed sites.

This WA is the only site in Arkansas in which visibility data is available for. In 1997 (last year data is available for), sulfates were the primary pollutant contributing to reduced visibility (representing 61%) (Figure 3). Sulfates were predominantly produced from utility and industrial boilers. Nitrates were the second highest pollutant contributing to reduced visibility (20%). Nitrates were predominantly produced from automobiles and utility and industrial boilers. Other contributing pollutants included organic carbon particles, elemental carbon, and crustal material. Visual range was monitored at this WA from 1992 – 1997 (Figure 4). Visual range or distance ranged from 11 – 63 miles during this time period. The differences in visual range was caused by the amount of air pollution in the form of haze.

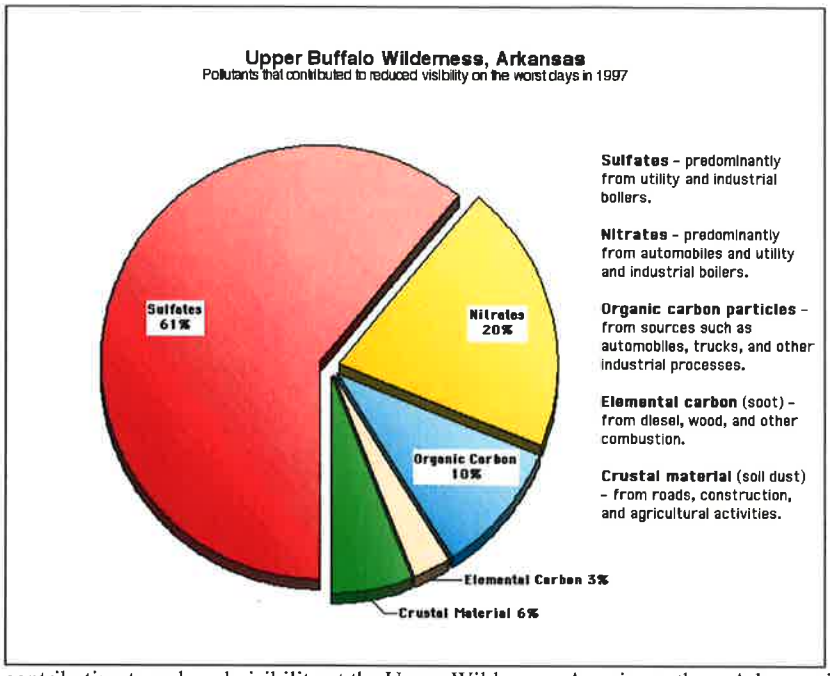

Figure 3. Pollutants contributing to reduced visibility at the Upper Wilderness Area in northern Arkansas in 1997.

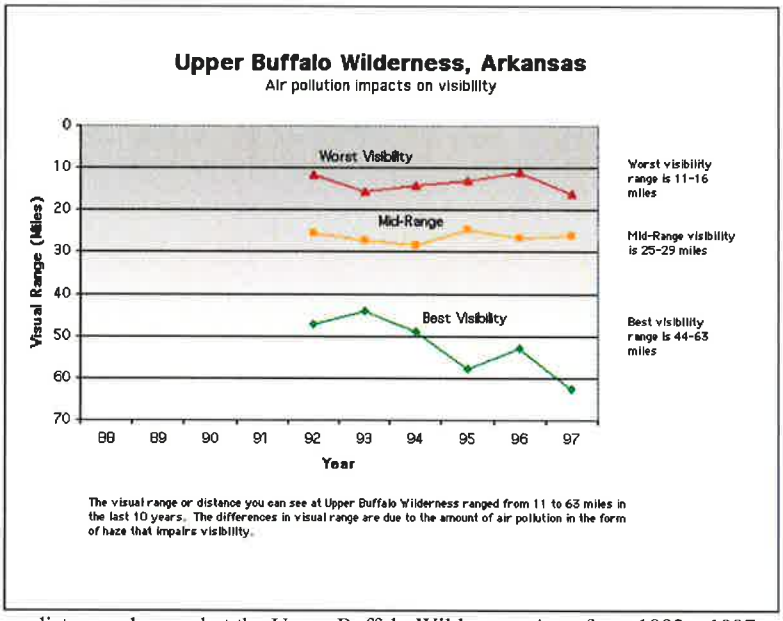

Figure 4. Visual range or distance observed at the Upper Buffalo Wilderness Area from 1992 – 1997.

Prevention of Significant Deterioration (PSD) increments limit air quality degradation and ensure that areas with clean air continue to meet NAAQS, even during economic development. The PSD program goal is to maintain pristine air quality required to protect public health and welfare from air pollution effects and "to preserve, protect and enhance the air quality in national parks, national wilderness areas, national monuments, national seashores, and other areas of special national or regional natural, recreation, scenic or historic value."

PSD increments have been established for NO_2, SO_2, and PM_{10}. Comparisons of potential PM_{10}, NO_2, and SO_2 concentrations with PSD increments are intended only to evaluate a threshold of

concern. The allowable PSD increment depends on an area's classification. Class I areas have lower increments, due to their protected status as pristine areas.

Atmospheric Deposition

Atmospheric deposition refers to processes in which air pollutants are removed from the atmosphere and deposited into terrestrial and aquatic ecosystems. Air pollutants can be deposited by precipitation (rain and snow) or the gravitational settling of gaseous pollutants on soil, water, and vegetation. Much of the concern about deposition is due to secondary formation of acids and other compounds from emitted nitrogen and sulfur species, such as oxides of nitrogen (NOx) and SO_2, which can contribute to acidification of lakes, streams, and soils and affect other ecosystem characteristics, including nutrient cycling and biological diversity.

Substances deposited include:

- Acids, such as sulfuric (H_2SO_4) and nitric (HNO_3), sometimes referred to as acid rain
- Air toxics, such as pesticides, herbicides, and volatile organic compounds (VOC)
- Heavy metals, such as mercury
- Nutrients, such as nitrates (NO_3-) and ammonium (NH4+)

The accurate measurement of atmospheric deposition is complicated by contributions to deposition by several components including but not limited to rain, snow, cloud water, particle settling, and gaseous pollutants. Deposition varies with precipitation and other meteorological variables (e.g., temperature, humidity, winds, and atmospheric stability), which in turn, vary with elevation and time.

The USFS has established guidelines or Levels of Concern (LOC) for total deposition of nitrogen and sulfur compounds in Class I Wilderness Areas. Total nitrogen deposition of 1.5 kilograms (kg) per hectare (ha) per year or less is considered to be unlikely to harm terrestrial or aquatic ecosystems. For total sulfur deposition, the LOC is 5 kg per ha per year. The USFS is considering a sulfur LOC of 1.5 kg per ha per year. Note that these are the same LOCs the National Park Service uses.

Air Quality Index

Air quality in a given region can be measured by its Air Quality Index (AQI) value. The AQI is reported according to a 500-point scale for each of the major criteria air pollutants, with the worst denominator determining the ranking. For example, if an area has a CO value of 132 on a given day and all other pollutants are below 50, the AQI for that day would be 132. The AQI scale breaks down into six categories: good (AQI<50), moderate (50-100), unhealthy for sensitive groups (100-150), unhealthy (>150), very unhealthy and hazardous. The AQI is a national index. The air quality rating is an important indicator for populations sensitive to air quality changes. There are 3 air quality monitoring sites in northern Louisiana. The AQI for all

sites for ozone was good (<50) with the highest AQI being 47. Only 1 site monitored PM_{10} and was listed as good.

Climate and Climate Change

Climate

On average, there are 217 sunny days per year in Arkansas. The July high is around 92 degrees. The January low is 29. Arkansas gets 49 inches or rain per year and 4 inches of snowfall. The number of days with any measurable precipitation is 91.

Climate Change

Climate change refers to any significant change in measures of climate (e.g., temperature or precipitation) lasting for an extended period (decades or longer). Climate change may result from natural processes, such as changes in the sun's intensity and natural processes within the climate system (such as changes in ocean circulation), and human activities that change the atmosphere's composition (such as burning fossil fuels) and the land surface (such as urbanization) (Intergovernmental Panel on Climate Change [IPCC] 2007).

Greenhouse gases (GHGs) are gases in the atmosphere composed of molecules that absorb and reradiate infrared electromagnetic radiation. When present in the atmosphere the gas contributes to the greenhouse effect. The greenhouse effect is a process by which thermal radiation from a planetary surface is absorbed by atmospheric GHGs and is re-radiated in all directions. Since part of this re-radiation is back towards the surface and the lower atmosphere, it results in an elevation of the average surface temperature above what it would be in the absence of the gases. Some GHGs such as CO_2 occur naturally and are emitted to the atmosphere through natural processes and human activities. Other GHGs (e.g., fluorinated gases) are created and emitted solely through human activities. The primary GHGs that enter the atmosphere as a result of anthropogenic activities include CO_2, methane (CH_4), nitrous oxide (N_20), and fluorinated gases such as hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Fluorinated gases are powerful GHGs that are emitted from a variety of industrial processes including production of refrigeration/cooling systems, foams and aerosols. Fluorinated gases are not primary to the activities authorized by the BLM and will not be discussed further in this document.

Ongoing scientific research has identified the potential impacts of anthropogenic GHG emissions and changes in biological sequestration due to land management activities on global climate. Through complex interactions on a regional and global scale, these GHG emissions and net losses of biological carbon sinks cause a net warming effect of the atmosphere, primarily by decreasing the amount of heat energy radiated by the earth back into space. Although GHG levels have varied for millennia, recent industrialization and burning of fossil carbon sources have caused carbon dioxide equivalent (CO_2e) concentrations to increase dramatically, and are likely to contribute to overall global climatic changes. The IPCC recently concluded that "warming of the climate system is unequivocal" and "most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic GHG concentrations" (IPCC 2007).

It is important to note that GHGs will have a sustained climatic impact over different temporal scales. For example, recent emissions of CO_2 can influence climate for 100 years. In contrast, black carbon is a relatively short-lived pollutant, as it remains in the atmosphere for only about a week. It is estimated that black carbon is the second greatest contributor to global climate change behind CO_2 (Ramanathan and Carmichael 2008). Without additional meteorological monitoring systems, it is difficult to determine the spatial and temporal variability and change of climatic conditions, but increasing concentrations of GHGs are likely to accelerate the rate of climate change.

Global mean surface temperatures have increased nearly 1.0°C (1.8°F) from 1890 to 2006 (Goddard Institute for Space Studies, 2007). In 2001, the IPCC indicated that by the year 2100, global average surface temperatures would increase 1.4 to 5.8°C (2.5 to 10.4°F) above 1990 levels. The National Academy of Sciences (2006) has confirmed these findings, but also indicated that there are uncertainties regarding how climate change may affect different regions. Observations and predictive models indicate that average temperature changes are likely to be greater in the Northern Hemisphere. Data indicates that northern latitudes (above 24° N) have exhibited temperature increases of nearly 1.2°C (2.1°F) since 1900, with nearly a 1.0°C (1.8°F) increase since 1970 alone. It also shows temperature and precipitation trends for the conterminous United States. For both parameters we see varying rates of change, but overall increases in both temperature and precipitation.

The lack of scientific tools designed to predict climate change at regional or local scales limits the ability to quantify potential future impacts. However, potential impacts to air quality due to climate change are likely to be varied. Oil and gas development activities can generate CO_2 and CH_4. CO_2 emissions result from the use of combustion engines, while CH_4 can be released during processing.

Because GHGs circulate freely throughout Earth's atmosphere, the planning area for this resource is the entire globe. The largest component of global anthropogenic GHG emissions is CO_2. Global anthropogenic carbon emissions reached about 7,000,000,000 metric tons per year in 2000 and about 9,000,000,000 metric tons per year in 2008 (Boden, et al, 2010). Oil and gas production is a major contributor of GHGs. In 2006, natural gas production accounted for 8% of global methane emissions, and oil production accounted for 0.5% of global methane emissions (URS Corporation, 2010). A description of the potential GHG emissions associated with the proposed leasing activities is included in Chapter 4.

Water Resources, Surface/Ground

The ARDNROC regulates oil and gas operations in state. The ARDNROC has the responsibility to gather oil and gas production data, permit new wells, establish pool rules and oil and gas allowables, issue discharge permits, enforce rules and regulations of the division, monitor underground injection wells, and ensure that abandoned wells are properly plugged and the land is responsibly restored. The Arkansas Environment Department (ARED) administers the major environmental protection laws. The Water Quality Control Commission (WQCC), which is administratively attached to the state, assigns responsibility for administering its regulations to

constituent agencies, including the ARDNROC. The ARDNROC administers, through delegation by the WQCC, all Water Quality Act regulations pertaining to surface and groundwater (except sewage not present in a combined waste stream). According to the ARDNROC, produced water if predictable in salt concentration, can be used for drilling and completion and possibly cementing.

Surface Water Resources

Surface water hydrology within the area is typically influenced by geology, soil characteristics, precipitation and vegetation. There are no water bodies on either EOI #961 or #1108.

Water resources may be affected by many activities including fire/prescribed burns, military use, mineral extraction, recreation, transportation, and vegetation management activities. The most likely effects to hydrology will be to stream channel morphology, and water quality. Channel alterations can be measured in specific morphological parameters. Water nutrients can be measured in concentration per unit volume.

The Arkansas River Valley Region exhibits distinct seasonal characteristics of its surface waters with zero flows common during summer critical conditions. Peak runoff events from within this region tend to introduce contaminants from the predominantly agricultural land use, which are primarily pasture lands with increasing poultry production. The development of natural gas has resulted in some site-specific water quality degradation. Soil types in much of this area are highly erosive and tend to easily go into colloidal suspension, thus causing long-lasting, high-turbidity values (ADEQ 2008).

Ground Water Resources

Groundwater hydrology within the areas is influence by geology and recharge rates. Groundwater quality and quantity can be influenced by precipitation, water supply wells, and various disposal activities. Most onshore produced water is injected deep underground for either enhanced recovery or disposal. With the passage of the Safe Drinking Water Act in 1974, the subsurface injection of fluids came under federal regulation. In 1980, the EPA promulgated the Underground Injection Control regulations. The program is designed to protect underground sources of drinking water.

Almost all of the surficial aquifers supply water of good to very good quality, ranging from calcium-bicarbonate to sodium-bicarbonate water types. Areas of poor water quality can result from both natural and anthropogenic sources. Natural sources of contamination are typically regional in extent and are related to water-rock interactions. Anthropogenic impacts include both point and nonpoint sources of contamination. Nonpoint sources can result in large areas of impact, although contaminant concentrations typically are significantly lower than point sources, and the contaminants typically represent soluble, non-reactive species. Point sources of contamination often result in elevated levels of contaminants that exceed federal maximum contaminant levels; however, the extent of contamination normally is confined to a small area, with little to no offsite migration or impact on receptors (ADEQ 2008).

The initial Arkansas Nonpoint Source Pollution Assessment (1988) assessed approximately 4,068 miles of stream and found that 58 percent of the assessed streams were not meeting all designated uses. Limited data for the 79 significant publicly owned lakes indicated no use impairment by nonpoint sources. The 1988 assessment identified agriculture and mining as the primary categories of nonpoint source pollution causing impairments to water bodies of the state (ADEQ 2008). The 1988 assessment was updated in June 1997, using updated assessment criteria. The 1997 report assessed 8,700 stream miles and indicated that nonpoint source pollution was impacting (but not necessarily impairing) more than 4,100 stream miles. Agricultural impacts were identified as the major cause of impacts on 3,197 stream miles. Other major impacts were related to silviculture activities, road construction/maintenance activities, and unknown sources. The unknown source was mercury contamination of fish tissue (ADEQ 2008).

Hydraulic Fracturing

Some studies have shown that anywhere from 20-85% of fracturing fluids may remain underground. Used fracturing fluids that return to the surface are often referred to as flowback. The resulting flowback and produced water will be contained until it is promptly removed and disposed of to an injection well, recycling facility, or disposal facility. Conditions of Approval (COAs) at the APD stage will require the operator and contractors to ensure that all use, production, storage, transportation and disposal of produced water associated with the drilling, completion and production of a well be in accordance with all applicable existing or hereafter promulgated federal, state and local government rules, regulations and guidelines.

Wetlands/Riparian Areas/Floodplains

Wetlands

Wetland habitats provide important wintering and migration habitat for several species of migratory birds. Wetlands also provide a link between land and water and are some of the most productive ecosystems in the world. EO 11990 on the Protection of Wetlands provides an opportunity for early review of federal agency plans regarding new construction in wetland areas. Under EO 11990, each agency shall provide leadership and shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating and licensing activities.

There are no water bodies on the proposed tracts, however the Little Red River is located < 200 miles east of the eastern boundary of EOI #961.

Invasive Exotic Species

Noxious weeds can have a disastrous impact on biodiversity and natural ecosystems. Noxious weeds affect native plant species by out-competing native vegetation for light, water and soil nutrients. Noxious weeds cause $2 to $3 million in estimated losses to producers annually. These

losses are attributed to: 1) decreased quality of agricultural products due to high levels of competition from noxious weeds, 2) decreased quantity of agricultural products due to noxious weed infestations, and 3) costs to control and/or prevent the spread of noxious weeds.

There are a number of non-native species that are considered invasive in Arkansas. The Arkansas State Plant Board and the University of Arkansas Division of Agriculture have published a list of the top ten invasive species of concern in Arkansas, summarized in the table below. The potential applicability of these invasive species' habitat to the proposed tracts are also discussed below. While none of these species were observed while on the tracts, those tracts that have optimal or marginal habitat for the species are listed.

COMMON NAME	SCIENTIFIC NAME	DESCRIPTION	APPLICABILITY TO TRACT
Bacteria Leaf Streak of Rice (BLS)	*NA*	Disease affecting rice leafs. Symptoms include thin water soaked interveinal leaf streaks that enlarge, brown, and join together. Typically found in warm, wet, nitrogen rich environments. Hosts include *Leersia, Zizania, Paspalum, Leptochloa, and Zoysia.*	No rice crops identified on or near the tracts.
Channeled Apple Snail	*Pomacea canaliculata*	Snail poses threats to rice and wetland areas. Snails lay clusters of 200-300 pink colored eggs above water.	No suitable habitat on tracts.
Cogongrass	*Imperata Cylindrica*	Fast growing weed that outcompetes native plants. Found in fields and spread through rhizome fragments in soil, farming equipment, soil movement, etc.	No suitable habitat on tracts.
Hydrellia wirthi	*Hydrellia wirthi*	Small (about 5mm long) fly that attacks and stuns or kills rice seedlings.	No rice crops identified on or near tracts.
Hydrilla	*Hydrilla verticillata*	Aquatic weed first observed in Lake Ouachita. Found at or just below the water surface and may extent up to 30 feet deep.	No suitable water on the tracts.
Old World Bollworm	*Helicoverpa armigera*	Ornamental plants and flowers as well as crops can host this insect. Looks similar to corn earworm. Not yet detected in Arkansas but ongoing sampling is in effect.	No suitable habitat on tracts.
Rice Nematode	*Ditylenchus angustus*	Microscopic rice disease which distorts rice panicles causing panicle twisting and sterilization.	No rice crops identified on or near tracts.
Sirex Wood Wasp	*Sirex noctilio*	Wood wasps that threatens even-aged stands of pines or stressed pines. Has historically caused significant damage to Loblolly Pine.	No suitable habitat on tracts.
Sudden Oak Death (SOD)	*(caused by) Phytophthora ramorum*	Fungus-like microorganism causing SOD disease. SOD symptoms include bleeding cankers on lower trunk and leaf spots with dark margins. SOD eventually can lead to death of host. Hosts include numerous varieties of trees and woody ornamentals.	Suitable habitat available on both tracts.
Tropical Soda Apple	*Solanum viarum*	Perennial shrub with sharp bards and fruit resembling small watermelons. Declared a noxious weed in 2007. Found in fields, pastures, parks, and possibly open forests.	No suitable habitat on tracts.

Table 2. List of top ten invasive species documented to occur in Arkansas by the Arkansas State Plant Board.
Source: Top Ten Invasive Species. Arkansas State Plant Board & University of Arkansas Division of Agriculture. Available online at http://plantboard.arkansas.gov/PlantIndustry/Documents/InvasiveSpeciesGuide.pdf

Special Status Species

The ESA was signed in 1973 with the purpose of ensuring that federal agencies and departments use their authorities to protect and conserve endangered and threatened species. Section 7 of the ESA requires that federal agencies prevent or modify any projects authorized, funded, or carried out by the agencies that are "likely to jeopardize the continued existence of any endangered species or threatened species, or result in the destruction or adverse modification of critical habitat of such species." Table 3 presents the species listed by FWS as endangered, threatened, proposed, or candidate that are documented to occur in White County, Arkansas. The tables also present a summary of BLMs determination regarding anticipated effects on those species from the proposed activities. Specific information regarding habitat requirements and rationale for those determinations are provided below under each species section. Details regarding species habitat, habits, threats and other information has been obtained from the Nature Serve website (www.natureserve.org).

Table 3. Federally listed species in White County, Arkansas with BLM determinantion and justification for potential effects form proposed project.

Species	Federal Status	Determination	Rationale
Pink Mucket (*Lampsilis abrupta*)	Endangered	May affect, not likely to adversely affect	Suitable habitat present in close proximity
Scaleshell (*Leptodea leptodon*)	Endangered	May affect, not likely to adversely affect	Suitable habitat present in close proximity
Fat Pocketbook (*Potamilus capax*)	Endangered	May affect, not likely to adversely affect	Suitable habitat present in close proximity
Piping Plover (*Charadrius melodus*)	Threatened	No effect	No suitable habitat
Bald Eagle (*Haliaeetus leucocephalus*)	Delisted	May affect, not likely to adversely affect	Suitable habitat present
Gray Bat (*Myotis grisescens*)	Endangered	May affect, not likely to adversely affect	Suitable foraging habitat present
Rabbitsfoot (*Quadrula cylindrica cylindrica*)	Threatened	May affect, not likely to adversely affect	Suitable habitat present in close proximity
Northern Long-eared Bat (*Myotis septentrionalis*)	Proposed Endangered	May affect, not likely to adversely affect	Suitable foraging habitat present
Speckled Pocketbook (*Lampsilis streckeri)*	Threatened	May affect, not likely to adversely affect	Suitable habitat present in close proximity

Pink Mucket (*Lampsilis abrupta*) (Endangered)
The pink mucket is characterized as a large river species associated with fast-flowing waters, although in recent years it has been able to survive and reproduce in impoundments with river-lake conditions but never in standing pools of water. It is found in waters with strong currents, rocky or boulder substrates, with depths up to about 1 meter, but is also found in deeper waters with slower currents and sand and gravel substrates.

Although there are no water bodies on the proposed project site, the Little Red River is just outside of the eastern boundary. To protect the water quality of watersheds and natural stream substrate and morphology and to avoid potential impacts to aquatic species and their habitat, a stipulation will apply to this EOI stating that there will be no ground disturbance permitted within 250 of water bodies (Appendix B). Exceptions and modifications can be made however, to the lease that would allow for construction closer to the River. If proper erosion control techniques are not implemented during construction activities, sedimentation issues could occur in the Little Red River which could affect water quality and quantity, which in turn, could have an effect on the pink mucket. As a result, BLM has determined that the proposed project may affect, but is not likely to adversely affect the pink mucket.

Scaleshell (*Leptodea leptodon*) (Endangered)
The scaleshell mussel is a small freshwater mussel with thin shell and faint green streaks. It can grow up to 4 inches in length. Scaleshell mussels live in slow to medium flowing rivers with stable channels and good water quality. They burrow in sand and gravel on the river bottom and siphon nutrition from particle in the water such as plant debris. Channelization and impoundment of rivers have eliminated large areas of suitable habitat. There are no water bodies on the tract to support the scaleshell mussel, however due to the close proximity of this tract to the Little Red River, which does contain suitable habitat for this species BLM has determined that the proposed project may affect, but is not likely to affect the scaleshell due to potential sedimentation issues discussed above.

Fat Pocketbook (*Potamilus capax*) (Endangered)
The fat pocketbook is a freshwater mussel that prefers sand, silt, and clay habitats in flowing water. The species typically grows up to 4.5 inches in length and has a rounded, greatly inflated shell. Large rivers in slow flowing water in mud or sand provides the optimal habitat for the fat pocketbook. The fat pocketbook lives in the St. Francis River drainage in areas ranging from small ditches to the main channel at the river's lower end. White it is listed as endangered, the fat pocketbook has a "stable" status ranking from the Arkansas Game and Fish Commission. There are no water bodies on the tract to support the fat pocketbook, however due to the proximity of this tract to the Little Red River, which does contain suitable habitat, BLM has determined that the proposed project may affect, but is not likely to adversely affect the fat pocketbook (see additional rationale above for the scaleshell).

Piping Plover (*Charadrius melodus*) (Threatened)
The piping plover is a small, stocky, shorebird with a sand-colored upper body, white underside, and orange legs. They grow up to 7 inches long and weigh just 2.25 ounces. Their food consists of worms, fly larvae, beetles, crustaceans, mollusks, and other invertebrates. The piping plover is a migratory bird which often returns to the same nesting area in consecutive years. This species

lives near ocean beaches or on sand or algal flats in protected bays. It is most abundant on expansive sandflats, sandy mudflats, and sandy beach in close proximity; usually in areas with high habitat heterogeneity. Arkansas suitable breeding habitats are wide beaches (> 20 meters) with highly clumped vegetation, having less than 5 percent overall vegetation cover and/or with extensive gravel. There are no water bodies on the tract to support the piping plover. BLM has determined that the proposed project will have no effect on the piping plover due to a lack of suitable habitat.

Bald Eagle (*Haliaeetus leucocephalus*) (Delisted)
The bald eagle was delisted in 2007 due to recovery. A five year monitoring program has been established to ensure that bald eagle populations are stable, and that delisting continues to be appropriate for this species. Bald eagles will remain protected under the Bald and Golden Eagle Protection Act, as well as the Migratory Bird Treaty Act. Bald eagles are associated with large inland lakes, large rivers and coastal waters and use large old growth pine, bald cypress and some oak species, usually within ¼ mile of inland lakes and large rivers for nesting and loafing. There is potential for the bald eagle to utilize the proposed tract for nesting. As a result, BLM has determined that the proposed project may affect, but is not likely to adversely affect the bald eagle.

Gray Bat (*Myotis grisescens*) (Endangered)
The gray bat occurs mainly in the karst region of the eastern and central U.S. and is highly vulnerable to disturbance. Only a few caves contain most of the individuals. As a result of ongoing cave protection efforts, the total population is increasing. Each summer a colony occupies a traditional home range that often contains several roosting caves scattered along as much as 70 kilometers of river or reservoir borders. Individuals forage along rivers or shoreline up to 20 km from their roosts. Forested areas along the banks of streams and lakes provide important protection for adults and young. Young often feed and take shelter in forest areas near the entrance to cave roosts. This species does not feed in areas along rivers or reservoirs where the forest has been cleared. No caves are located on the proposed site and no known caves are located in the immediate surrounding area. The gray bat is unlikely to roost on the tract as there is no suitable habitat located on or near the tract. However, the proposed site does provide suitable foraging habitat for the gray bat. As a result, BLM has determined that the proposed project may affect, but is not likely to adversely affect the gray bat.

Rabbitsfoot (*Quadrula cylindrical cylindrical*) (Threatened)
The typical habitat for the rabbitsfoot is small to medium rivers with moderate to swift currents. In smaller streams it in habits bars or gravel and cobble close to the fast current. It is found in medium to large rivers in sand and gravel. It has been found in depths up to 3 m. Despite their stgremlined appearance, specimens are more often found fully exposed lying on their sides on top of the substrate. Due to the proximity of this site to the Little Red River and potential problems that could arise due to erosion as discussed above, BLM has determined that the proposed project may affect, but is not likely to adversely affect the rabbitsfoot.

Northern Long-eared Bat (*Myotis septentrionalis)* (Proposed Endangered)
The northern long-eared bat requires caves or mines to hibernate in during the winter. During the summer months, this species can be found roosting in caves, mines, or buildings, and under

loose bark, bridges, or in hollow tree cavities. Research has shown that during the summer months, presence and activity of the northern long-eared bat is highest in forests with late successional characteristics. Late-successional forest characteristics that seem to be important to this species includes a high percentage of old trees (>100 years), uneven forest structure, single and multiple tree fall gaps, standing snags, and woody debris. These characteristics provide a high number of dead or decaying trees that can be used for breeding, summer day roosting, and foraging. There is suitable foraging habitat on the proposed tract for the northern long-eared bat. As a result, BLM has determined that the proposed project may affect, but is not likely to adversely affect the northern long-eared bat.

Speckled Pocketbook (*Lampsilis streckeri*) (Endangered)
The speckled pocketbook is a medium-sized (reaching approximately 80 mm in length) fresh water mussel with a thin, dark-yellow or brown shell with chevron-like spots, and chain-like rays. Like other freshwater mussels, the speckled pocketbook feeds by filtering food particles from the water column. The specific food habits of the species are unknown, but other juvenile and adult freshwater mussels have been documented to feed on detritus, diatoms, phytoplankton, and zooplankton. The diet of speckled pocketbook glochidia, like other freshwater mussels, comprises water (until encysted on a fish host) and fish body fluids (once encysted). This species is typically found in coarse to muddy sand with a constant flow of water. The speckled pocketbook is not associated with slow current, pools, or stretches of rivers with intermittent flow.

Historically, populations occurred in Archey, Middle, and South Forks of the Little Red River in Van Buren County, Arkansas. This species has been found in recent years from the following streams in the Little Red River drainage: Archey, Beech, Middle, South, and Turkey Forks of the Little Red River, and Big Creek. Due to the tract proximity to the Little Red River and potential sedimentation issues discussed above that could arise from construction activities, BLM has determined that the proposed project may affect, but is not likely to adversely affect the speckled pocketbook.

Table 4 provides the USFWS list of federally listed species that occur in Faulkner County (EOI #1108). Also included in the table is BLMs determination for potential effects that the proposed leases could have on each species.

Table 4. FWS list of threatened and endangered species documented to occur in Faulkner County, Arkansas including determination and rationale.

Species	Federal Status	Determination	Rationale
Interior Least Tern (*Sterna antillarum athalassos*)	Endangered	No effect	No suitable habitat
Piping Plover (*Charadrius melodus*)	Threatened	No effect	No suitable habitat
Bald Eagle (*Haliaeetus leucocephalus*)	Delisted	No effect	No suitable habitat
Fat Pocketbook (*Potamilus capax*)	Endangered	No effect	No suitable habitat
Pink Mucket (Lamsilis abrupta)	Endangered	No effect	No suitable habitat
Rabbitsfoot (*Quadrula cylindrica cylindrica*)	Threatened	No effect	No suitable habitat

Scaleshell (*Leptodea leptodon*)	Endangered	No effect	No suitable habitat
Northern Long-eared Bat (Myotis septentrionalis)	Proposed Endangered	May affect, not likely to adversely affect	Suitable foraging habitat present

Interior Least Tern (*Sterna antillarum athalassos*) (Endangered)
The interior least tern is a migratory shorebird species which breeds, nests, and rears young on non-vegetated portions of sand bars and beaches along major rivers and reservoirs. Current USFWS guidance recommends that no activity be conducted within 650′ of a nesting colony; and that construction activities within 650-ft. of a nesting colony be conducted outside of the nesting season (May 15 through August 31) to avoid adverse effects to the species. There are no large reservoirs or rivers near the proposed site therefore suitable habitat for this species is not present. As a result, BLM has determined that there will be no effect on the interior least tern from the proposed project.

Piping Plover (*Charadrius melodus*) (Threatened)
See above paragraph for EOI #961 for species description and habitat needs. There are no water bodies on the tract or nearby that would support the piping plover. BLM has determined that the proposed project will have no effect on the piping plover due to a lack of suitable habitat.

Bald Eagle (*Haliaeetus leucocephalus*) (Delisted)
See the above description for EOI #961 for a description of species habitat needs. The closest lake to this tract is Bennett Lake which is located ~5 miles north. As a result, BLM has determined that the proposed project will have no effect on the bald eagle due to a lack of suitable habitat.

Fat Pocketbook (*Potamilus capax*) (Endangered)
See the above description for EOI #961 for a description of species habitat needs. There are no water bodies on the tract or within a mile of the tract. Mill Creek is located ~1.5 miles west of the proposed site however, this creek probably does not provide suitable habitat for this species. Also, given the distance of the proposed project site to the creek it is not anticipated that the project would have any effects on the creek. Therefore, BLM has determined that the proposed project will have no effect on the fat pocketbook.

Pink Mucket (*Lampsilis abrupta*) (Endangered)
See the above description for EOI #961 for a description of species habitat needs. There are no water bodies on the proposed project site and no large rivers within 10 miles of the tract. As a result, BLM has determined that the proposed project will have no effect on the pink mucket, due to a lack of suitable habitat.

Rabbitsfoot (*Quadrula cylindrical cylindrical*) (Threatened)
See the above description for EOI #961 for a description of species habitat needs. There are no water bodies on the proposed project site and no large rivers within 10 miles of the tract. As a result, BLM has determined that the proposed project will have no effect on the rabbitsfoot.

Scaleshell (*Leptodea leptodon*) (Endangered)

See the above description for EOI #961 for a description of species habitat needs. There are no water bodies on the proposed project site and no large rivers within 10 miles of the tract. As a result, BLM has determined that the proposed project will have no effect on the scaleshell.

Northern Long-eared Bat (*Myotis septentrionalis)* (Proposed Endangered)
See the above description for EOI #961 for a description of species habitat needs. There is suitable foraging habitat on the proposed tract for the northern long-eared bat. As a result, BLM has determined that the proposed project may affect, but is not likely to adversely affect the northern long-eared bat.

Wildlife and Vegetation

EOI #961
The eastern boundary of this 30.57 acre tract is located < 200 feet west of the Little Red River. Several old ATV trails run through the tract. A large pond (~8 – 10 acres) is located outside of the southwest boundary. A gravel road and well pad are located < ¼ mile south of the southern boundary. The surrounding area is primarily forested although there are some cleared areas of agriculture and well pads.The parcel consists of an oak-pine forest. Dominant canopy cover species include; northern red oak (*Quercus rubra*), white oak (*Q. alba*), sweetgum (*Liquidambar styraciflua*), shortleaf pine (*Pinus echinata*), and Eastern red cedar (*Juniperus virginiana*). Shrubs include: winged sumac (*Rhus copallinum*), smooth sumac (*R. glabra*), blackberry (*Rubus* spp.), sassafras (*Sassafras albidum*), and common persimmon (*Diospyros virginiana*). The sparse ground cover is composed mostly of a high leaf litter, sedges (*Carex* spp.), panic grasses (*Panicum* spp.), poison ivy (*Toxicodendron radicans*), and greenbriar (*Smilax* spp.).

EOI #1108
EOI #1108 consists of 80 acres. A county road runs north/south just inside of the eastern boundary. The topography is hilly with 5 – 15% slopes. A well pad is located just outside the northwest boundary. There are forested areas surrounding the tract as well as cleared areas for well pads and agricultural land. The parcel consists of an oak-pine forest. Dominant tree species include; northern red oak (*Quercus rubra*), white oak (*Q. alba*), shagbark hickory (*Carya ovata*), sweetgum (*Liquidambar styraciflua*), and shortleaf pine (*Pinus echinata*). Canopy cover trees reach 60 – 75 feet in height with some having a DBH of 24 inches.

Migratory Bird Species of Concern

EO 13188, 66 Fed. Reg. 3853, (January 17, 2001) identifies the responsibility of federal agencies to protect migratory birds and their habitats, and directs executive departments and agencies to undertake actions that will further implement the Migratory Bird Treaty Act (MBTA). Under the MBTA, incidental, unintentional, and accidental take, killing, or possession of a migratory bird or its parts, nests, eggs or products, manufactured or not, without a permit is unlawful. EO 13186 includes a directive for federal agencies to develop a memorandum of understanding with the FWS to promote the conservation of migratory bird populations, including their habitats, when their actions have, or are likely to have, a measureable negative effect on migratory bird populations.

For the purpose of this analysis, the term "migratory birds" applies generally to native bird species protected by MBTA. This includes native passerines (flycatchers and songbirds) as well as birds of prey, migratory waterbirds (waterfowl, wading birds, and shorebirds), and other species such as doves, hummingbirds, swifts, and woodpeckers. The term "migratory" is a misnomer and should be interpreted broadly to include native species that remain in the same area throughout the year as well as species that exhibit patterns of latitudinal or elevational migration to avoid winter conditions of cold or shortage of food. For most migrant and native resident species, nesting habitat is of special importance because it is critical for supporting reproduction in terms of both nesting sites and food. Also, because birds are generally territorial during the nesting season, their ability to access and utilize sufficient food is limited by the quality of the territory occupied. During non-breeding seasons, birds are generally non-territorial and able to feed across a larger area and wider range of habitats.

Among the wide variety of species protected by the MBTA, special concern is usually given to the following groups:

- Species that migrate across long distances, particularly Neotropical migrant passerines that winter in tropical or Southern Hemisphere temperate zones
- Birds of prey, which require large areas of suitable habitat for finding sufficient prey
- Species that have narrow habitat tolerances and hence are vulnerable to extirpation from an area as a result of a relatively minor habitat loss
- Species that nest colonially and hence are vulnerable to extirpation from an area as a result of minor habitat loss

Migratory birds of concern are discussed in the table below developed by the US Fish and Wildlife Service listing birds of conservation concern for the Central Hardwoods Ozark Mountains region where the proposed projects are located. While none of these birds were observed on the tracts on the survey dates, those tracts containing optimal or marginal habitat have the potential to be affected by the proposed leases.

Table 5. FWS list of migratory birds of concern found in the Central Hardwoods Ozark Mountains region.

Species	**Suitability of Habitat**	**Species**	**Suitability of Habitat**
Bald Eagle (b) *Haliaeetus leucocephalus*	Optimal (#961) Marginal (#1108) *(Prefers large lakes of rivers)*	Wood Thrush *Hylocichla mustelina*	Marginal *(Inhabits areas with running water)*
Peregrine Falcon *Falco mexicanus*	Marginal *(Prefers cliffs for nest sites)*	Blue-winged Warbler *Vermivora pinus*	Marginal *(Prefers fields or regenerating forests)*
Black Rail *Laterallus jamaicensis*	Marginal *(Typically found on coastal areas)*	Prairie Warbler *Dendroica discolor*	Marginal*(Prefers fields or regenerating forests)*
Solitary Sandpiper (nb) *Tringa solitaria*	Marginal *(Prefers ditches/ponds)*	Cerulean Warbler* *Dendroica cerulea*	Optimal *(Typically found in mature deciduous forests)*

Buff-breasted Sandpiper (nb) *Tryngites subruficollis*	Marginal *(Prefers short-grass habitats)*	Worm-eating Warbler* *Helmitheros vermivorus*	Optimal *(Prefers large deciduous forests)*
Short-eared Owl (nb) *Asio flammeus*	Marginal *(Prefers prairies)*	Swainson's Warbler *Limnothypis swainsonii*	Suitable *(Prefers forests with thick undergrowth)*
Whip-poor-will* *Caprimulgus vociferus*	Optimal *(Prefers deciduous or mixed forests)*	Kentucky Warbler* *Oporornis formosus*	Optimal *(Prefers deciduous southeastern forests)*
Red-headed Woodpecker *Melanerpes erythrocephalus*	Optimal *(prefers deciduous woodlands)*	Bachman's Sparrow* *Aimophila aestivalis*	Marginal *(Inhabits clear cuts and open pine forests)*
Loggerhead Shrike *Lanius ludovicianus*	Marginal *(Prefers open land)*	Henslow's Sparrow *Ammodramus henslowii*	Marginal *(Found in large flat fields with no woody plants)*
Bell's Vireo (c) *Vireo bellii*	Marginal *(Prefers shrubby or riparian areas)*	LeConte's Sparrow (nb) *Ammodramus leconteii*	Marginal *(Winters in Arkansas in hayfields/other grassy areas)*
Brown-headed Nuthatch *Sitta pusilla*	Marginal *(Prefers mature pine forests)*	Smith's Longspur (nb) *Calcarius pictus*	Marginal *(prefers short grassy fields and prairies)*
Bewick's Wren* *Thryomanes bewickii*	Marginal *(Prefers dry brushy areas and open country)*	Painted Bunting *Passerina ciris*	Optimal *(Found in thickets and woodlands by streams)*
Sedge Wren *Cistothorus platensis*	Marginal *(Prefers densely vegetated meadows)*	Rusty Blackbird (nb) *Euphagus carolinus*	Optimal *(Winters in Arkansas in wet dense forests)*
Legend: (a) ESA Candidate, (b) ESA delisted, (c) non-listed subspecies or population of Threatened or Endangered species, (d) MBTA protection uncertain or lacking, (nb) non-breeding in this region. The * symbol indicates the species is listed as priority bird population with the Partners of Flight program.			

None of the above species were observed on the proposed parcel on the survey date, however, it is likely that many of these species could be found on the nominated parcels during portions of the year.

Ch. 4 - ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION AND ALTERNATIVES

Introduction

This chapter assesses potential environmental consequences associated with direct, indirect, and cumulative effects of the Proposed Action. The act of leasing parcels would, by itself, have no impact on any resources in the nominated area. All impacts would be linked to as yet undetermined future levels of lease development. If these parcels were developed, short-term impacts are considered those that would be stabilized or mitigated within five years and long-term impacts are those that would substantially remain for more than five years. Potential impacts and mitigation measures are described below. Cumulative impacts include the combined effect of past projects, specific planned projects and other reasonably foreseeable future actions such as other infield wells being located within these leases. The cumulative impacts fluctuate with the gradual reclamation of well abandonments and the creation of new additional surface disturbances in the construction of new access roads and well pads. The on-going process of restoration of abandonments and creating new disturbances for drilling new wells gradually accumulates as the minerals are extracted from the land. Preserving as much land as possible and applying appropriate mitigation measures will alleviate the cumulative impacts. Potential cumulative effects may occur should an oil and gas field be discovered if these parcels are drilled and other infield wells are drilled within this lease or if this lease becomes part of a new unit. Cumulative impacts are addressed for each resource within each resource section.

Based on review of the elements listed on the SSFO NEPA Form and consideration of the Purpose and Need statement prepared for this EA, the following elements/resource will be addressed: Environmental Justice, Cultural Resources, Native American Religious Concerns, Visual/Noise Resources, Minerals and Mineral Development, Energy Policy, Wastes, Hazardous or Solid, Soils, Air Resources, Water Resources, Surface/Ground, Wetland/Riparian Areas/Floodplains, Invasive/Exotic Species, Special Status Species, Wildlife and Vegetation and Migratory Birds of Concern.

Environmental Justice

No minority or low income populations would be directly affected in the vicinity of the proposed lease parcels. Indirect impacts could include an increase in overall employment opportunities related to the oil and gas and service support industry in the region, as well as the economic benefits to state and county governments related to royalty payments and severance taxes. Other potential impacts include a short-term increase in traffic volume, dust and noise which could negatively impact nearby residents or businesses. These nuisance impacts are usually limited to the construction, drilling, completion and/or hydraulic fracturing phases of the well and would be significantly reduced during production, when the site would be visited periodically for inspection and/or to haul produced fluids. These impacts would apply to all land users in the area. There are no cumulative impacts anticipated for environmental justice from the proposed project.

Cultural Resources and Native American Religious Concerns

Cultural resource surveys have not been conducted, therefore direct and indirect impacts may occur to cultural resources or to a potentially sacred Native American religious site if there is ground disturbance. Direct impacts are those such as completely destroying a site by bulldozing the area and workers picking up artifacts. Indirect impacts are those such as erosion or compaction of the soil on the site. However, if sites are located and recorded before ground disturbance begins, these impacts can be avoided or mitigated.

Cumulative effects from repetitious illegal activity, primarily archeological vandalism, may occur on certain sites or site types unless perpetrators are apprehended and prosecuted. The degree of cumulative effects to known properties from BLM activities should be slight as inventory, assessment, protection, and mitigation measures would be implemented at the APD stage.

A stipulation regarding cultural resources and Native American religious concerns applies to this lease (Appendix B) and is applicable for all the proposed parcels. The stipulation states that the BLM will not approve any ground disturbing activities that may affect historic properties and/or resources until it completes its obligations under applicable requirements of the National Historic Preservation Act and other authorities. If currently unknown burial sites are discovered during development activities associated with this lease, these activities must cease immediately, applicable law on unknown burials will be followed and, if necessary, consultation with the appropriate tribe/group of federally recognized Native Americans will take place.

Visual/Noise Resources

Visual

While the act of leasing federal minerals would produce no impacts to visual resources, subsequent exploration/development of the proposed leases could impact visual quality through: increased visibility of constructed features such as roads, well pads, pipelines, and tank batteries; road degeneration from heavy trucks and vehicles following rain; dust and exhaust from construction, drilling, and production vehicles and equipment; vegetation removal and construction of steep slopes; unreclaimed sites; and discarded equipment. Well pads, power lines, access roads, and associated production facilities and storage tanks have the greatest potential to alter visual conditions for the life of the well. Vegetation removal would present an obvious contrast in color with the surrounding vegetation and affect foreground and middleground distance zones for more than a decade. These impacts would be most obvious immediately after construction. Impacts would decrease as the disturbed surface began to blend in color, form, and texture, when interim or final reclamation occurs. Long-term visual impacts could persist as long as the well is producing, which could be a couple of years to more than 50 years. Long-term impacts may include vegetation removal, alteration of the landscape, and installation of equipment and facilities. The extent of cumulative effects on visual resources will depend on the future amount of oil and gas development in northwest Arkansas. Oil and gas productivity has been high in this area and it is likely that continued development will also be

high. Additional roads, wells pads and other constructed features due to oil and gas development will have a negative cumulative effect on visual resources. As well pads get reclaimed however, this impact should diminish.

Noise

Noise generation from well operations would be associated with vehicle movements and the operation of production equipment. Increased traffic to well sites will have a short-term impact on noise levels. After drilling operations are completed, minimal traffic for maintenance will be associated with the proposed wells. Impacts from noise on people and wildlife species inhabiting the areas are expected to be minimal and of occasional and short duration for the proposed parcels. The extent of cumulative impacts to noise in the area surrounding the proposed parcels will depend on the future amount of oil and gas development in the area. Productivity has been high in this area and development is likely to increase which would increase noise levels. An increase in noise levels should be periodic and only occur during drilling operations.

Minerals and Mineral Development

While the act of leasing federal minerals would produce no impacts to mineral resources, subsequent exploration/development of the proposed lease could impact the production horizons and reservoir pressures. If production wells are established, the resources allotted to the wells would eventually be depleted. The amount and location of direct and indirect effects cannot be predicted until site-specific development information is available, typically during the APD stage.

Other mineral resources could be impacted as a result of exploration/development through the loss of available surface or subsurface area needed to develop or access the other mineral resource overlapping the proposed lease parcel. The extent of the impacts, if any, cannot be predicted until site-specific development information is available at the APD stage. Cumulative effects on minerals would increase as development in the area increases. The cumulative effect on resources is that they will eventually be depleted.

Energy Policy

The area contains no features related to energy development, production, supply or distribution. Therefore, there will be no impact (direct, indirect, or cumulative) on energy development from the proposed project.

Wastes, Hazardous or Solid

While the act of leasing federal minerals would produce no impacts on the environment from hazardous or solid wastes, subsequent exploration/development of the proposed lease could result in the introduction of hazardous and non-hazardous substances to the site. Hazardous substances may be produced, used, stored, transported or disposed of as a result of development on the proposed lease. Projects would typically generate the following wastes; (1) discharge of drilling fluids and cuttings into the reserve pits; (2) wastes generated from used lubrication oils,

hydraulic fluids, and other fluids used during production of oil and gas, some of which may be characteristic or listed hazardous waste; and (3) service company wastes from exploration and production activities as well as containment of some general trash. Certain wastes unique to the exploration, development, and production of crude oil and natural gas have been exempted from Federal Regulations as hazardous waste under Subtitle C of the RCRA of 1976. The exempt waste must be intrinsic to exploration, development or production activities and cannot be generated as part of a transportation or manufacturing operation. The drilling fluids, drill cuttings, and produced waters are classified as a RCRA exempt waste, and potential drilling that could occur would not introduce hazardous substances into the environment if they are managed and disposed of properly under federal, state, and local waste management regulations and guidelines. Properly used, stored, and disposed of hazardous and non-hazardous substances greatly decreases the potential for any impact on any environmental resources. One way operators and the BLM ensure hazardous and non-hazardous substances are properly managed is through the preparation of a Spill Prevention, Control, and Countermeasure (SPCC) plan.

In hydraulic fracturing, chemical substances other than water make up a small percentage of the fluid composition; however, the very large volumes used require correspondingly large volumes of a variety of compounds. These substances range from the relatively benign to the highly toxic at certain concentrations. In addition to these added chemicals, naturally occurring toxicants such as heavy metals, volatile organics, and radioactive compounds are mobilized during extraction and return to the surface with the produced water. Of the millions of gallons of water used to hydraulically fracture a well one time, less than 30% to more than 70% may remain underground (Bamberger and Oswald 2012). Although the risk is low, the potential exists for unplanned releases that could have serious effects on human health and environment. A number of chemical additives are used that could be hazardous, but are safe when properly handled according to requirements and long-standing industry practices. In addition, many of these additives are common chemicals which people regularly encounter in everyday life (GWPC 2009).

Surface spills of drilling mud and additives, hydraulic fracturing fluids and additives, flowback water, and other produced water can happen at a variety of points in the development and production phases. Spills that occur can span a range of different spill sizes and causes of failure at any point in the process. For example, small spills often happen as the result of poor pipe connections or leaks; large spills sometimes occur as the result of a major well blowout, but such blowouts rarely occur. Additionally, spills from some parts of the phases may be the result of human error (i.e. vehicle collisions, improper handling, improper equipment operation or installation, etc.), while others stem from equipment failure (i.e. broken pipes, torn pit liners, leading tanks, etc.) or acts of nature (Fletcher 2012). The most common cause of spills comes from equipment failure and corrosion (Wenzel 2012).

The cause of the spill, the spill size, the hazard rating of the spilled material, response time to clean up the spill and the effectiveness of the cleanup, all play a critical role in determining the overall impact on the environment. The volume of a spill can significantly vary with spill types. Pipe spills are not expected to release more than 1,000 gallons into the environment, retaining pit spills and truck spills are not expected to release more than 10,000 gallons of fluid, and blowouts are expected to cause the largest spills, with the potential to release tens of thousands of gallons into the environment. Small spills occur with greater frequency than large spills. Secondary

containment or recovery for small spills would likely minimize, if not eliminate, any potential release into the environment. However, for spills on the order of several thousands of gallons of fluid, it is expected that less than half the fluid may be captured by secondary containment or recovery. The vast majority of operations do not incur reportable spills (5 gallons or more), indicating that the fluid management process can be, and usually is, managed safely and effectively (Fletcher 2012). Cumulative effects from wastes are not anticipated. If the BLM COAs outlined below are followed during the APD process, cumulative impacts to wastes should not occur.

Mitigation

Specific mitigation is deferred to the APD process. However, the following measures are common to most projects: all trash would be placed in a portable trash cage and hauled to an approved landfill, with no burial or burning of trash permitted, chemical toilets would be provided for human waste, fresh water zones encountered during drilling operations would be isolated by using casing and cementing procedures, a berm or dike would enclose all production facilities if a well is productive, and all waste from all waste streams on site would be removed to an approved disposal site. Future development activities on the lease parcel would be regulated under the RCRA, Subtitle C regulations. Additionally, waste management requirements are included in the 12 point surface use plan and the 9 point drilling plan required for all APDs. Leaseholders proposing development would be required to have approved SPCCPs, if the applicable requirements of 40 CFR 112 are met, and comply with all requirements for reporting of undesirable events. Lease bonds would not be released until all facilities have been removed, wells are plugged, and satisfactory reclamation has occurred.

There are 5 BLM COAs that would apply at the APD stage regarding handling and disposing of wastes. These COAs include: storing wastes properly to minimize the potential for spills, providing secondary containment for all stored containers, draining the reserve pit before closure and trucked to a disposal site, use of preventative measures to avoid drainage of fluids, sediments, and other contaminants from the pad into water bodies, and keeping the project area clear of trash.

Soils

While the act of leasing federal minerals would produce no impacts to soils, subsequent exploration/development of the proposed lease may produce impacts by physically disturbing the topsoil and exposing the substratum soil on subsequent project areas. Direct impacts resulting from oil and gas construction of well pads, access roads, and reserve pits include: removal of vegetation, exposure of the soil, mixing of horizons, compaction, loss of topsoil productivity and susceptibility to wind and water erosion. Wind erosion would be expected to be a minor contributor to soil erosion with the possible exception of dust from vehicle traffic during all phases of development. Vehicle traffic related wind erosion would be limited to approved travel routes in which the surface has not been paved or dressed in a material to prevent soil movement. The extent of wind erosion related to vehicle traffic will be dependent on a number of factors including: length of well bore, whether hydraulic fracturing is used during completion, whether telemetry is used during production, and whether the well is gas, oil, condensate, or a

combination thereof. These impacts could result in increased indirect impacts such as runoff, erosion and off-site sedimentation. Activities that could cause these types of indirect impacts include construction and operation on well sites, access roads, gas pipelines and facilities.

Additional soil impacts associated with lease development would occur when heavy precipitation causes water erosion damage. When water saturated segment(s) on the access road become impassable, vehicles may still be driven over the road. Consequently, deep tire ruts would develop. Where impassable segments are created from deep rutting, unauthorized driving may occur outside the designated route of access roads.

Contamination of soil from drilling, hydraulic fracturing, and production wastes mixed into soil or spilled on the soil surface could cause a long-term reduction in site productivity. Contaminants spilled on soil would have the potential to pollute and/or change the soil chemistry. See the Wastes, Hazardous or Solid Section for a more in-depth analysis of spill contamination. These direct impacts can be reduced or avoided through proper design, construction, maintenance and implementation of Best Management Practices (BMPs). Cumulative effects to soils are not anticipated. If the BLM COAs and BMPs as outlined below are followed during the APD process, cumulative impacts to soils should not occur.

Mitigation

The operator would stockpile the topsoil from the surface of well pads which would be used for surface reclamation of the well pads. The impact to the soil would be remedied upon reclamation of well pads when the stockpiled soil that was specifically conserved to establish a seed bed is spread over well pads and vegetation re-establishes.

During the life of the development, all disturbed areas not needed for active support of production operations should undergo "interim" reclamation in order to minimize the environmental impacts of development on other resources and used. Upon abandonment of wells and/or when access roads are no longer in service, final reclamation would be implemented. Earthwork for interim and final reclamation much be completed within 6 months of well completion or well plugging (weather permitting). Road construction requirements and regular maintenance would alleviate potential impacts to access roads from water erosion damage.

Fluid impermeable containment systems (i.e. liners, dikes, berms) would be placed in, under and/or around any tank, pit, drilling cellar, ditches associated with the drilling process, or other equipment that use or has the potential to leak/spill hazardous and non-hazardous fluids, to completely prevent solid contamination (e.g. liners) at the site or prevent the spill from going beyond the immediate site (e.g. dikes, berms).

In addition to the above mentioned BMPs, a BLM COA would apply at the APD stage which would require the operator to take necessary measures to ensure that the final graded slopes are stabilized to prevent the movement of soil from the pad area for the life of the project. Stabilization techniques could include: natural, organic matting, silt fences, and or additional mulching.

Air Resources

Air Quality

The administrative act of offering any of the proposed parcels and the subsequent issuing of lease would have no direct impacts to air quality. Any potential effects to air quality would occur if and when the lease was developed. Any proposed development project would be subject to additional analysis of possible air effects before approval. The analysis may include air quality modeling for the activity.

An MOU between the Departments of the Interior and Agriculture and EPA directs that air quality modeling be conducted for actions that meet certain emissions or geographic criteria:

- Creation of a substantial increase in emissions
- Material contribution to potential adverse cumulative air quality impacts
- Class I or sensitive Class II Areas
- Non-attainment or maintenance area
- Area expected to exceed NAAQS or PSD increment

The proposed project area includes no Class I, sensitive Class II or non-attainment areas. Due to the small number of wells projected to follow a lease on the proposed tract in relation to the current volume of hydrocarbon, development of the lease is not likely to exceed the emissions criteria, NAAQS or PSD increment or contribute to adverse cumulative air quality impacts. As a result, air quality modeling is not required for the proposed project and likely won't be required at the APD stage, if development occurs as a result of the proposed lease.

The following sources of emissions are anticipated during any oil and gas exploration or development: combustion engines (i.e. fossil fuel fired internal combustion engines used to supply electrical or hydraulic power for hydraulic fracturing to drive the pumps and rigs used to drill the well, drill out the hydraulic stage plugs and run the production tubing in the well; generators to power drill rigs, pumps, and other equipment; compressors used to increase the pressure of the oil or gas for transport and use; and tailpipe emissions from vehicles transporting equipment to the site), venting (i.e. fuel storage tanks vents and pressure control equipment), mobile emissions (i.e. vehicles bringing equipment, personnel, or supplies to the location) and fugitive sources (i.e. pneumatic valves, tank leaks, and dust). A number of pollutants associated with combustion of fossil fuels are anticipated to be released during drilling including: CO, NOx, SO_2, Pb, PM, CO_2, CH_4, and N_2O. Venting may release VOC/HAP, H_2S, and CH_4. Mobile source emissions are likely to include fugitive particulate matter from dust or inordinate idling.

The actual emissions of each pollutant will be entirely dependent on the factors described in the previous paragraph. During the completion phase, the most significant emissions of criteria pollutants emitted by oil and gas operations in general are VOCs, particulate matter and NO_2.

VOCs and NOx contribute to the formation of ozone. The EPA's Natural Gas STAR Program is a voluntary program that identifies sources of fugitive methane sources and seeks to minimize fugitive CH_4 through careful tuning of existing equipment and technology upgrades. Data provided by STAR show that some of the largest air emissions in the natural gas industry occur as natural gas wells that have been fractured and are being prepared for production. During well completion, flowback, fracturing fluids, water, and reservoir gas come to the surface at high velocity and volume. This mixture includes a high volume of VOCs and CH_4, along with air toxins such as benzene, ethylbenzene, and n-hexane. The typical flowback process lasts from three to 10 days. Pollution also is emitted from other processes and equipment during production and transportation of the oil and gas from the well to a processing facility.

To reasonably quantify emissions associated with well exploration and production activities, certain types of information are needed. Such information includes a combination of activity data such as:

- The number, type, and duration of equipment needed to construct/reclaim, drill and complete (e.g. belly scrapers, rig, completions, supply trucks, compressor, and production facilities)

- The technologies which may be employed by a given company for drilling any new wells to reduce emissions (e.g. urea towers on diesel powered drill rigs, green completions, and multi-stage flares)

- Area of disturbance for each type of activity (e.g. roads, pads, pipelines, electrical lines, and compressor station)

- Compression per well (sales and field booster), or average horsepower for each type of compressor

- The number and type of facilities utilized for production.

The degree of impact will also vary according to the characteristics of the geological formations from which production occurs. Currently, it is not feasible to directly quantify emissions for the proposed lease. What can be said is that emissions associated with oil and gas exploration and production would incrementally contribute to increases in air quality emissions into the atmosphere.

Air pollution can affect public health in many ways. Numerous scientific studies have linked air pollution to a variety of health problems including: (1) aggravation of respiratory and cardiovascular disease, (2) decreased lung function, (3) increased frequency and severity of respiratory symptoms such as difficulty breathing and coughing, (4) increased susceptibility to respiratory infections, (5) effects on the nervous system, including the brain, such as IQ loss and impacts on learning, memory, and behavior, (6) cancer, and (7) premature death. Some sensitive individuals appear to be at greater risk for air pollution-related health effects, for example, those

with pre-existing heart and lung diseases (e.g., heart failure/ischemic heart disease, asthma, emphysema, and chronic bronchitis), diabetics, older adults, and children.
Significant degradation of air quality may also damage ecosystem resources. For example, ozone can damage vegetation, adversely impacting the growth of plants and trees. These impacts can reduce the ability of plants to uptake CO_2 from the atmosphere and can then indirectly affect the larger ecosystems.

The primary activities that contribute to levels of air pollutants surrounding the proposed lease site are predominately combustible engines of road and non-road diesel and gasoline vehicles and equipment. The Air Resources Technical Report includes a description of the varied sources of national and regional emissions that are incorporated to represent the past, present, and reasonably foreseeable impacts to air resources (USDI 2013). It includes a summary of emissions on the national and regional scale by an industry source. Sources that are considered to have notable contributions to air quality impacts and GHG emissions include electrical generating units, fossil fuel production (nationally and regionally) and transportation.

The very small increase in emissions that could result from approval of the proposed action would not result in the area violating the NAAQS for any criteria pollutant. In October 2012, EPA regulations that require control of VOC emissions from oil and gas development became effective. These regulations will reduce VOC emissions from oil and gas exploration and production emissions that contribute to the formation of ozone. Emissions from any lease development are not expected to impact the 8-hour average ozone concentrations, or any other criteria pollutants in the area of the proposed lease.

Cumulative effects to air resources may increase as oil and gas development increases in the area. The extent of the effect will be dependent on the amount of increase in development and additional development factors that aren't currently known (the number of anticipated wells, etc.). Additional air quality analysis and perhaps air modeling might become necessary in the future as development continues to determine cumulative impacts on air resources from oil and gas development.

Mitigation

The BLM encourages industry to incorporate and implement BMPs, which are designed to reduce impacts to air quality by reducing emissions, surface disturbances, and dust from field production and operations. Typical measures include:

- Flared hydrocarbon gases at high temperatures in order to reduce emissions of incomplete combustion

- Watering dirt roads during periods of high use to reduce fugitive dust emissions

- Co-location wells and production facilities to reduce new surface disturbance

- Implementation of directional drilling and horizontal completion technologies whereby one well provides access to petroleum resources that would normally require the drilling of several vertical wellbores

- Requiring that vapor recovery systems be maintained and functional in areas where petroleum liquids are stored

- Performing interim reclamation to reclaim areas of the pad not required for production facilities and to reduce the amount of dust from the pads

Additionally, the BLM encourages oil and natural gas companies to adopt proven, cost-effective technologies and practices that improve operational efficiency and reduce natural gas emissions. At the APD stage, the BLM would encourage operators to participate in the voluntary STAR program.

In October 2012, EPA promulgated air quality regulations for completion of hydraulically fractured gas wells. These rules require air pollution mitigation measures that reduce the emissions of volatile organic compounds during gas well completions. Mitigation includes a process known as "Green Completion" in which natural gas brought up during flowback must be recaptured and rerouted into the gathering line.

Climate and Climate Change

The administrative act of leasing all or part of the proposed parcel covering 50.44 acres would not result in any direct GHG emissions. However, in regard to future development, the assessment of GHG emissions and climate change is in its formative phase. While it is not possible to accurately quantify potential GHG emissions in the affected area as a result of making the proposed tracts available for lease, some general assumptions can be made: offering the proposed parcels may contribute to the installation and production of new wells, which may consequently lead to an increase in GHG emissions.

Emissions from fossil fuel production grew 101% from 1990 to 2005 and are projected to increase by a further 10% between 2005 and 2020. The natural gas industry is the major contributor to both GHG emissions and emissions growth, with CH_4 emissions from coal mining second. That said, it is worth noting that a significant portion of the emissions attributed to the natural gas industry are due to vented gas from processing plants, many of which are used for injection in enhanced oil recovery operations. Additionally, many technological advances in emission control technology have been implemented by the oil and gas industry to reduce emission levels.

Many aspects of oil and gas production emit greenhouse gases (GHG). The primary aspects include the following:

- Fossil fuel combustion for construction and operation of oil and gas facilities – vehicles driving to and from production sites, engines that drive drill rigs, etc. These produce CO_2 in quantities that vary depending on the age, types, and conditions of the equipment as

well as the targeted formation, locations of wells with respect to processing facilities and pipelines, and other site-specific factors.

- Fugitive CH_4 – CH_4 that escapes from wells (both gas and oil), oil storage, and various types of processing equipment. This is a major source of global CH_4 emissions. These emissions have been estimated for various aspects of the energy sector, and starting in 2011, producers are required under 40 CFR 98, to estimate and report their CH_4 emissions to the EPA.

- Combustion of produced oil and gas – it is expected that drilling will produce marketable quantities of oil and/or gas. Most of these products will be used for energy, and the combustion of the oil and/or gas would release CO_2 into the atmosphere. Fossil fuel combustion is the largest source of global CO_2.

The assessment of GHG emissions, their relationship to global climatic patterns, and the resulting impacts is an ongoing scientific process. It is currently not feasible to know with certainty the net impacts from the proposed action on climate – that is, while BLM actions may contribute to the climate change phenomenon, the specific effects of those actions on global climate are speculative given the current state of the science. The BLM does not have the ability to associate a BLM action's contribution to climate change with impacts in any particular area. The science to be able to do so is not yet available. The inconsistency in results of scientific models designed to predict climate change on regional or local scales, limits the ability to quantify potential future impacts of decisions made at this level and determining the significance of any discrete amount of GHG emissions is beyond the limits of existing science. When further information on the impact to climate change is known, such information would be incorporated in the BLM's planning and NEPA documents as appropriate.

In recent years, many states and other organizations have initiated GHG inventories, tallying GHG emissions by economic sector. The EPA provides links to statewide GHG emissions inventories (EPA 2014). Guidelines for estimating project-specific GHG emissions are available (URS Corporation 2010), but some necessary data, including the volume of oil produced and the number of wells, are not available for the proposed action. The uncertainties regarding numbers of wells and other factors make it very impractical to attempt to project amounts of GHG that the proposed action would emit. At the APD stage, more site-specific information on GHG impacts and mitigation measures would be described in detail.

The cumulative impacts of GHG emissions and their relationship to climate change are evaluated at the national and global levels in the Air Resources Technical Report (USDI 2013). The very small increase in GHG emissions that could result from approval of the proposed action would not produce climate change impacts that differ from the No Action Alternative. This is because climate change is a global process that is impacted by the sum total of GHGs in the Earth's atmosphere. The incremental contribution to global GHGs from the proposed action cannot be translated into effects on climate change globally or in the area of this site-specific action. It is currently not feasible to predict with certainty the net impacts from particular emissions associated with a federal action; however, EPA's recently finalized oil and gas air quality

regulations have a co-benefit of methane reduction that will reduce GHG emissions from any oil and gas development that would occur on this lease.

Water Resources, Surface/Ground

While the act of leasing federal minerals would produce no impacts to water resources, subsequent exploration and development of the proposed lease may produce impacts. Surface disturbance from the construction of well pads, access roads, pipelines, and utility corridors can result in degradation of surface water and groundwater quality from non-point source pollution, increased soil losses, and increased erosion.

Surface Water

Potential impacts to surface water that may occur due to construction of well pads, access roads, fracturing ponds, pipelines, utility lines and production include:

- Increased surface runoff and off-site sedimentation brought about by soil disturbance
- Increased salt loading and water quality impairment of surface waters
- Channel morphology changes due to road and pipeline crossings and possible contamination of surface waters by spills

The magnitude of these impacts to water resources would depend on the proximity of the disturbance to the drainage channel, slope aspect and gradient, degree and area of soil disturbance, amount of local precipitation, soil character, and duration and time before implementation mitigation or clean up measures can be put into place.

Direct impacts would likely be greatest shortly after the start of construction activities and would decrease in time due to decreased activity during production, natural stabilization and reclamation efforts. Construction activities would occur over a relatively short period, therefore, the majority of the disturbance would be temporary and localized. Flows of perennial, ephemeral, or intermittent rivers and streams could be directly affected in the short term by an increase in impervious surfaces resulting from the construction of the well pad and road. An increase in impervious surfaces provides for reduced infiltration which can then cause overland to move more quickly causing peak flow to potentially occur earlier, have a higher flow velocity and/or a larger volume then the channels are equipped for. Increased velocity and volume of peak flow can cause bank erosion, channel widening, downward incision, and disconnection to the floodplain. The potential hydrologic effect to low flow is reduced surface storage and groundwater recharge, which can then result in reduced base flow to perennial rivers and/or streams and potentially causing intermittent channels to become ephemeral. Hydrologic processes may be altered where the perennial, ephemeral, and intermittent river and stream system responds by changing physical parameters, such as channel configuration. These changes may in turn impact water quality and ultimately the aquatic ecosystem through eutrophication, changes in water temperature, and/ or a change in the food structure.

Minor long-term direct and indirect impacts to the watershed and hydrology could continue for the life of surface disturbance from water discharge from roads, road ditches, and well pads, but would decrease once all well pads and road surfacing material has been removed and reclamation of well pads, access roads, pipelines, and powerlines have taken place. Interim reclamation of the portion of the well pad not needed for production operation, re-vegetating the portion of the pad that is needed for production operations, and re-vegetating road ditches would reduce this long-term impact. Short-term direct and indirect impacts to the watershed and hydrology from access roads that are not surfaced with impervious materials would occur and would likely decrease in time due to reclamation efforts. Cumulative effects to surface water are not anticipated. If the BLM COAs as outlined below are followed during the APD process, cumulative impacts to surface water should not occur.

Ground Water

Groundwater could be affected by multiple factors, including industrial, domestic, or agricultural activities through withdrawal, injection (including chemical injection), or mixing of materials from different geologic layers or the surface. Withdrawal of groundwater could affect local groundwater flow patterns and create changes in the quality or quantity of the remaining groundwater. Loss of a permitted source of groundwater supply due to drawdown would be considered a significant impact if it were to occur. This potential would be assessed at the development stage should development be proposed. The drilling of horizontal wells, versus directional and vertical wells may initially appear to require a greater volume of water for drilling/completion purposes. However, a horizontal well develops a much larger area of the reservoir than a directional and/or vertical well and actually results in a lesser volume of fluids being required. Vertical and directional wells can easily require one well per 10 acres resulting in 64 wells per section. This is in contrast to one horizontal well per 640 acres or one per 320 acres which results in a net decrease in total fluid volumes needed and in surface disturbance acreages. Impacts to the quality of groundwater, should they occur, would likely be limited to near a well bore location due to inferred groundwater flow conditions in the area of the parcels.

Oil and gas contained in geologic formations is often not under sufficient hydraulic pressure to flow freely to a production well. The formation may have low permeability or the area immediately surrounding the well may become packed with cuttings. A number of techniques are used to increase or enhance the flow. They include hydraulic fracturing and acid introduction to dissolve the formation matrix and create larger void space(s). The use of these flow enhancement techniques and secondary recovery methods result in physical changes to the geologic formation that will affect the hydraulic properties of the formation. Typically, the effects of these techniques and methods are localized to the area immediately surrounding the individual well, are limited to the specific oil and gas reservoir, and do not impact adjacent aquifers.

In recent years there has been an elevated public concern about the possibility of subsurface hydraulic fracturing operations creating fractures that extend well beyond the target formation to water aquifers, allowing CH_4, contaminants naturally occurring in formation water, and fracturing fluids to migrate from the target formation into drinking water supplies (Zoback et al 2010). Typically, thousands of feet of rock, including some impermeable, separate most major formations in the U.S. from the base of aquifers that contain drinkable water (U.S. Department of

Energy, 2009). The direct contamination of underground sources of drinking water from fractures created by hydraulic fracturing would require hydrofractures to propagate several thousand feet beyond the upward boundary of the target formations through many layers of rock. It is extremely unlikely that the fractures would ever reach fresh water zones and contaminate freshwater aquifers (Zoback et al 2010). During the APD review, the exact difference between the base of treatable water and the top of the target formation for the specific site would be reviewed to determine the potential for direct contamination of underground sources.

Contamination of groundwater could occur without adequate cementing and casing of the proposed well bore. For fracturing fluid to escape the wellbore and affect the usable quality water or contaminate or cross contaminate aquifers, the fluid would have to breech several layers of steel casing and cement. Failure of the cement or casing surrounding the wellbore is a possible risk to water supplies. If the annulus is improperly sealed, natural gas, fracturing fluids, and formation water containing high concentrations of dissolved solids may be transferred directly along the outside of the wellbore among the target formation, drinking water aquifers, and layers of rock in between. Complying with BLM and state regulations regarding casing and cementing, implementing BMPs, testing casings and cement prior to continuing to drill or introducing additional fluids and continual monitoring during drilling and hydraulic fracturing, allow producers and regulators to check the integrity of casing and cement jobs and greatly reduce the chance of aquifer contamination.

Casing specifications are designed and submitted to the BLM. The BLM independently verifies the casing program, and the installation of the casing and cementing operations are witnessed by a Petroleum Engineer. Petroleum products and other chemicals used in the drilling and/or completion process could result in groundwater contamination through a variety of operational sources including but not limited to pipeline and well casing failure, well (gas and water) construction, and spills. Similarly, improper construction and management of reserve and evaporation pits could degrade ground water quality through leakage and leaching.

The potential for negative impacts to groundwater caused from completion activities such as hydraulic fracturing have not been confirmed but based on its history of use are not likely. A recent study completed on the Pinedale Anticline did not find a direct link to known detections of petroleum hydrocarbons to the hydraulic fracturing process. Authorization of the proposed project would require full compliance with local, state, and federal directives and stipulations that relate to surface and groundwater protection and the BLM would deny any APD who proposed drilling and/or completion process was deemed to not be protective of usable water zones as required by 43 CFR 3162.5-2(d).

A high risk of fluid migration exists along the vertical pathways created by inadequately constructed wells and unplugged inactive wells. Brine or hydrocarbons can migrate to overlying or underlying aquifers in such wells. This problem is well known in the oil fields around Midland, TX. Since the 1930s, most States have required that multiple barriers be included in well construction and abandonment to prevent migration of injected water, formation fluids, and produced fluids. These barriers include (1) setting surface casing below all known aquifers and cementing the casing to the surface, and (2) extending the casing from the surface to the production or injection interval and cementing the interval. Barriers that can be used to prevent

fluid migration in abandoned wells include cement or mechanical plugs. They should be installed (1) at points where the casing has been cut, (2) at the base of the lowermost aquifer, (3) across the surface casing shoe, and (4) at the surface. Individual states, and the BLM have casing programs for oil and gas wells to limit cross contamination of aquifers.

Impacts of water use for oil and gas development and production depend on local water availability and competition for water from other users. Overall, impacts range from declining water levels at the regional or local scales and related decreases in base flow to streams (Nicot & Scanlon, 2012). Water supplied for hydraulic fracturing could come from surface or groundwater sources. If surface water is used, there could be a temporary decrease in the source's water levels depending upon the conditions at the time of withdrawl. The time it takes to return to baseline conditions is dependent on the amount of rainfall received and other competing uses of the resource.

Typically when groundwater is used as a source of drilling/completion water, impacts to the aquifer would be minimal due to the size of the aquifers impacted and recharge potential across the entire aquifer. However, localized aquifer effects could be expected depending upon the rate of drawdrown and the density and/or intensity of the drilling activity. A cone of depression may occur in the immediate vicinity of the existing water well used to supply the drilling/completion water. With each rain event, the aquifer is expected to recharge to some degree, but it is unknown if or when it would recharge to baseline conditions after pumping ceases which is dependent upon surface conditions (whether impervious surface or not). The time it takes depends greatly on rainfall events, surface soil materials, drought conditions, and frequency of pumping that has already occurred and will continue to occur into the future.
The amount of water actually used for drilling/completion activities is highly dependent on a number of factors including: length of well bore, closed-loop or reserve pit drilling system, type of mud, whether hydraulic fracturing would be used during stimulation, whether recycled water would be used, dust abatement needs, and type and extent of construction, to name a few. The impacts of water use on water quality and quantity would be analyzed in more detail during the APD review.

Any proposed drilling/completion activities would have to be in compliance with Onshore Order #2, 43 CFR 3160 regulations, and not result in a violation of a federal and/or state law. If these conditions were not met, the proposal would be denied. As such, no significant impacts to groundwater from the proposed action are expected. Cumulative effects to ground water are not anticipated. If the BLM COAs as outlined below are followed during the APD process, cumulative impacts to ground water should not occur.

Mitigation

The BLM recommends BMPs requiring fluid impermeable containment systems (i.e. liners, dikes, berms) be placed in, under and/or around any tank, pit, drilling cellar, ditches associated with the drilling process, or other equipment that use or has the potential to leak/spill hazardous and non-hazardous fluids, to prevent chemicals from penetrating the soil and impacting the aquifer or from moving off-site to a surface water source.

The BLM will closely analyze areas proposed for drilling in APDs during the onsite inspection, since regional wetland inventories often do not capture small wetlands. EPA requires that Storm Water Pollution Prevention Plans and SPCCP be in place to prevent any spill from reaching surface water due to rain events or accidental release of fluids related to production operations.

Wetlands/Riparian Areas/Floodplains

While the act of leasing federal minerals would produce no direct impacts to wetland/riparian areas, these areas could be adversely impacted by subsequent mineral development (drilling, hydraulic fracturing, production, et.) by changing the water quality or quantity (chemical spills, storm water runoff, etc.). Cumulative effects to wetlands are not anticipated. If the BLM COA as outlined below is followed during the APD process, cumulative impacts to wetlands should not occur.

Mitigation

To protect the water quality of watersheds and natural stream substrate and morphology and to avoid potential impacts to aquatic species and their habitat, a BLM stipulation regarding freshwater aquatic habitat applies to this lease. The stipulation states that no surface occupancy or disturbance, including discharges, are permitted within 250 feet of a river, stream, wetland spring, headwater, wet meadow, wet pine savanna, pond, tributary, lake, coastal slough, sand bar, vernal pools, calcareous seepage marsh, or small, marshy calcareous stream.

Invasive/Exotic Species

While the act of leasing federal minerals would not contribute to the spread or control of invasive or non-native species, subsequent exploration/development of the proposed lease may. Any surface disturbance could establish new populations of invasive non-native species, although the probability of this happening cannot be predicted using existing information. Noxious weed seeds can be carried to and from the project areas by construction equipment, the drilling rig and transport vehicles. At the APD stage, BLM requirements for use of weed control strategies would minimize the potential for the spread of these species. Cumulative effects to invasive species are not anticipated. If the BLM COA as outlined below is followed during the APD process, cumulative impacts to soils should not occur.

Mitigation

Mitigation is deferred to site-specific development at the APD stage. BMPs require that all federal actions involving surface disturbance or reclamation take reasonable steps to prevent the introduction or spread of noxious weeds, including requirements to use weed-free hay, mulch and straw. A BLM COA applies to all APDs which recommends that native cover plants in seeding mixtures be used during reclamation activities. Post-construction monitoring for cogon grass and other invasive plant species should be conducted to ensure early detection and control. If invasive species are found, the proper control techniques should be used to either eradicate the species from the area or minimize its spread to other areas. If cogon grass is found on site,

equipment should be washed before exiting the site to prevent the spread of this highly invasive species to other locations.

Special Status Species

Approval of the proposed lease does not in itself authorize any ground disturbance. If there is any future ground disturbance activities, the lessee will be required to submit an APD. Additional consultation with FWS will occur at that time, if necessary. Threatened and endangered species may be disturbed during construction, drilling, or hydraulic fracturing operations, as these activities involve many vehicles, mobile and non-mobile heavy equipment, and numerous noise-producing equipment (i.e. generators, compressors). The most significant impacts would be limited to the construction, drilling, and completion/stimulation phases, which can span from several weeks to several months and is entirely dependent on the size and extent of new surface disturbance, length of the well bore, formations encountered during drilling, or whether hydraulic fracturing is used, just to name a few. During production, impacts from noise and human disturbance would greatly diminish with time. In general, most wildlife species would become habituated to the disturbances. For other wildlife species with a low tolerance to activities, the operations on the well pad would continue to displace wildlife from the area due to ongoing disturbances such as vehicle traffic from inspectors and semi-trucks hauling produced fluids, noise from compressors and/or a pump-jack if needed, and equipment maintenance. These impacts would last for the life of the well. Cumulative effects to special status species are not anticipated. If the BLM COAs and BMPs as outlined below are followed during the APD process, cumulative impacts to soils should not occur.

There is no available habitat at EOI #961 for the piping plover, however there is suitable habitat present on the site or within close proximity of the site for the following species: pink mucket, scaleshell, fat pocketbook, bald eagle, gray bat, rabbitsfoot, northern long-eared bat and speckled pocketbook. As a result, BLM has determined that the proposed project will have no effect on the piping plover but may affect, is not likely to adversely affect the remaining species noted above. There is no available habitat at EOI #1108 for the piping plover, bald eagle, interior least tern, fat pocketbook, pink mucket, rabbitsfoot, and scaleshell. However there is suitable habitat foraging habitat present for the northern long-eared bat. As a result, BLM has determined that the proposed project may affect, but is not likely to adversely affect the northern long-eared bat and will have no effect on the remaining species noted above. Informal consultation with U.S. Fish and Wildlife Service (FWS), Louisiana Ecological Services was initiated on November 22, 2013 in compliance of the ESA, Section 7 Consultation requirements. A concurrence letter was received on January 21, 2014 and is located in Appendix C.

Mitigation

If the proposed lease results in oil or gas exploration and development, site specific surveys for threatened or endangered species may be required. Additional consultation with FWS will occur at that time, if necessary. Due to changes in species habits, habitats, and our knowledge thereof, BLM stipulations and lease notices regarding rare species apply to this proposal. The stipulation states that the BLM may recommend modifications to exploration and development proposals to further the conservation and management objectives for threatened, endangered, or other special

status plant or animal species or their habitat to avoid BLM-approved activity that would contribute to a need to list such a species or their habitat. To protect threatened, endangered, candidate, proposed, and BLM sensitive plant species, a second stipulation applies to this lease. The stipulation states that all suitable special status plant species habitat will be identified during environmental review of any proposed surface use activity. If field examination indicates that habitat of one or more of these species is present, the BLM will require a survey by a qualified botanist for special status plants during periods appropriate to each species. Operations will not be allowed in areas where sensitive plants would be affected.

Wildlife and Vegetation

While the act of leasing federal minerals would produce no direct impacts to wildlife, subsequent development of a lease may produce impacts. Impacts could result from increased habitat fragmentation, noise, or other disturbance during development. Although reclamation and restoration efforts for surface disturbance could provide for the integrity of other resources, these efforts may not always provide the same habitat values (e.g. structure, composition, cover, etc.) in the short or in some instance, the long-term, in complex vegetative community types (e.g., shrub oak communities). Short-term negative impacts to wildlife would occur during the construction and production phase of the operation (drilling, fracturing, production, etc.) due to noise and habitat destruction. In general, most wildlife species would become habituated to the new facilities. For other wildlife species with a low tolerance to activities, the operations on the well pad would continue to displace wildlife from the area due to ongoing disturbances such as vehicle traffic, noise and equipment maintenance. The magnitiude of above effects would be dependent on the rate and location of the oil and gas development, but populations could likely not recover to pre-disturbance levels until the activity was completed and vegetative community restored.

The Reasonable Foreseeable Development Scenario (RFD) for EOI # 1741 predicts that 12 federal wells will be drilled from 4 pads. The total disturbance predicted would be 25.13 acres, with 24.08 acres disturbed for the well pad and pit, 2.41 acres for the access road, and 1.36 acres reclaimed. (Appendix D). The RFD for EOI #1746 predicts that 3 federal wells will be drilled from 1 pad. The total disturbance predicted would be 6.85 acres, with 5.74 acres disturbed for the well pad and pit, 1.79 acres for the access road, and 0.68 acres reclaimed. (Appendix D).

Wildlife use at the proposed site is likely limited due to the fact that it is an active agricultural field. Common species that might be utilizing the proposed parcel would likely move to a neighboring agricultural field during construction. Wildlife use of the site after the well is put into production would vary depending on vegetation and succession stage. Once put into production, the well pad would be reduced in size and the reserve pit would be graded and seeded. The producing well site would be subject to regular maintenance and inspection. Wildlife use of the site is dependent on the adequacy of restoration. However, over the life of the well, some of the acreage would be excluded from utilization by most wildlife species. Cumulative effects on wildlife and vegetation could increase as oil and gas development increases in the area. The extent of the effect will be dependent on the amount of increase in development.

Mitigation Common to All Species

Measures would be taken to prevent, minimize, or mitigate impacts to fish and wildlife animal species from exploration and development activities. Prior to authorization, activities would be evaluated on a case-by-case basis, and the project would be subject to mitigation measures. Mitigation could potentially include rapid re-vegetation, noise restrictions, project relocation, or pre-disturbance wildlife species surveying.

A BLM COA would apply at the APD stage that is designed to prevent bat and bird mortality. The COA states that all open vent stack equipment, such as heater-treaters, separators, and dehydrator units, will be designed and constructed to prevent birds and bats from entering or nesting in or on such units, and to the extent practical, to discourage birds from perching on the stacks. Installing cone-shaped mesh covers on all open vents is one suggested method. Flat mesh covers are not expected to discourage perching and will not be acceptable.

Migratory Bird Species of Concern

While the act of leasing federal minerals produces no impacts to migratory birds, subsequent exploration/development of the proposed parcel may produce impacts. Surface disturbance from the development of well pads, access roads, pipelines, and utility lines can result in an impact to migratory birds and their habitat.

FWS estimates that many migratory birds are killed annually throughout the U.S. in oil field production skim pits, reserve pits, and centralized oilfield wastewater disposal facilities. Numerous grasshoppers, moths, June bugs, and the like become trapped on the surface in tanks and on pits, and become bait for many species of migratory birds. Open tanks and pits then become traps to many species of birds protected under the MBTA. Properly covered tanks and pits (and regularly inspected covered tanks and pits) is imperative to the continued protection of migratory birds in the well pad area. Cumulative effects on migratory birds could increase as oil and gas development increases in the area. The extent of the effect will be dependent on the amount of increase in development.

Mitigation

Per the MOU between BLM and FWS, entitled, "To Promote the Conservation of Migratory Birds," the following temporal and spatial conservation measures must be implemented as part of the COAs with a permit to drill:

1. Avoid any take of migratory birds and/or minimize the loss, destruction, or degradation of migratory bird habitat while completing the proposed project or action.

2. If the proposed project or action includes a reasonable likelihood that take of migratory birds will occur, then complete actions that could take migratory birds outside of their nesting season. This includes clearing or cutting of vegetation, grubbing, etc. The primary nesting season for migratory birds varies greatly between species and geographic location, but generally extends from early April to mid-July. However, the maximum

time period for the migratory bird nesting season can extend from early February through late August. Strive to complete all disruptive activities outside the peak of migratory bird nesting season to the greatest extent possible.

3. If no migratory birds are found nesting in the proposed project or action areas immediately prior to the time when construction and associated activities are to occur, then the project activity may proceed as planned.

To protect perch and roosting sites and terrestrial habitats for and to avoid potential impacts to migratory birds and federally listed wildlife, BLM COAs would apply at the APD stage. The COAs provide recommendations regarding reserve pits, maximum design speeds for roads, and powerline construction to minimize effects on migratory birds.

No Action Alternative

Under the No Action Alternative, the proposed parcel would be deferred and the lease would not be issued. There would be no subsequent impacts from oil and/or gas construction, drilling, and production activities. The No Action Alternative would result in the continuation of the current land and resource uses in the proposed lease areas.

Environmental Justice

By not leasing the proposed parcels under the No Action Alternative, there may be negative effects on the overall employment opportunities related to the oil and gas and service support industry, as well as a loss of the economic benefits to state and county governments related to royalty payments and severance taxes. However, there would be no increase in activity and noise associated with these proposed leases unless the land is used for other purposes.

Cultural Resources and Native American Concerns

If the area is not leased and cultural resource surveys are not conducted, direct and indirect impacts may occur. Direct impacts are those such as completely destroying a site by "relic hunters" or by people picking up artifacts. Other direct impacts may be the mixing of layers in a site by plowing or the destruction of a site by land leveling. Indirect impacts are those such as after timber thinning or clear-cutting resulting in erosion of a site.

Mineral Resources

Under the No Action Alternative there would be no new impacts from oil and gas production on the proposed parcels. Oil and gas development of federal, state, and private minerals would continue on the land surrounding the proposed parcels. No additional natural gas or crude oil from the proposed parcels would enter the public markets and no royalties would accrue to the federal or state treasuries. An assumption is that the No Action Alternative (no lease option) would not affect current domestic production of oil and gas. However, this may result in reduced federal and state royalty income, and the potential for federal land to be drained by wells on adjacent private or state land. Oil and gas consumption is driven by a variety of complex

interacting factors including energy costs, energy efficiency, availability of other energy sources, economics, demography, and weather or climate. If the BLM were to forego leasing and potential development of the proposed parcels, the assumption is that the public's demand for the resource would not be expected to change. Instead, the mineral resource foregone would be replaced in the short- and long-term by other sources that may include a combination of imports, using alternative energy sources (e.g. wind, solar), and other domestic production. This offset in supply would result in a no net gain for oil and gas domestic production.

All Other Resources

No other resources would be affected under the No Action Alternative, as there would be no surface disturbance that could detrimentally affect these resources. The No Action Alternative would result in the continuation of the current land and resource uses on the parcels.

CH. 5 - LIST OF AGENCIES AND PERSONS CONSULTED:

The following agencies/tribes were contacted (Appendix C):

U.S. Fish and Wildlife Service, Louisiana Ecological Services
Louisiana Natural Heritage Program
Louisiana State Historic Preservation Officer
Tunica-Biloxi Tribe of Louisiana
Alabama Coushatta Tribe of Texas
Coushatta Indian Tribe
Chitimacha Tribe of Louisiana
Quapaw Tribe of Oklahoma
Caddo Nation of Oklahoma
Muscogee (Creek) Nation of Oklahoma
Alabama-Quassarte Tribal Town
Choctaw Nation of Oklahoma
Jena Band of Choctaw
Mississippi Band of Choctaw Indians
Thlopthlocco Tribal Town

List of Preparers

Specialist Name	**Title, Organization**
Alison McCartney	Natural Resource Specialist
John Sullivan	Archaeologist

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