

United States Department of the Interior  
Bureau of Land Management  
Northeastern States Field Station  
LLES003000

# Environmental Assessment

NEPA #: DOI-BLM-ES-030-2013-0007-EA

## Expressions of Interest #1073 and #1075 and OH1120

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**Date:** March 2013

**Type of Action:** Oil and Gas

**Serial Number:** N/A

**Location:** Blue Rock State Forest, Blue Rock and Salt Creek Townships

**Project Acreage:** 4,525 acres

**Proponent Address:** Confidential

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## MISSION STATEMENT

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

# Contents

.....	2
CHAPTER 1 – PURPOSE OF AND NEED FOR ACTION .....	1
Purpose of the Proposed Action .....	1
Need for the Proposed Action .....	1
Management Objectives of the Action .....	1
Conformance with BLM Land Use Plan(s).....	1
Relationship to Statutes, Regulations and Other Plans .....	2
Decision to Be Made .....	2
Scoping and Issues .....	3
Rationale for conducting external scoping .....	3
Process for conducting external scoping .....	3
Issues identified through internal and external scoping .....	3
CHAPTER 2 – ALTERNATIVES, INCLUDING THE PROPOSED ACTION .....	3
Introduction .....	3
Location.....	3
Proposed Action.....	4
Well Drilling.....	4
Hydrocarbon Drilling Methods .....	4
Vertical Drilling.....	5
Horizontal Drilling .....	5
No-Action Alternative .....	6
CHAPTER 3 – DESCRIPTION OF THE AFFECTED ENVIRONMENT .....	6
Introduction .....	6
Air Quality .....	7
Bureau-Sensitive Species and Migratory Birds .....	7
Climate Change .....	8
Cultural Resources/Paleontology.....	8
Paleontology .....	12
Environmental Justice .....	13
Farmlands (Prime and Unique) .....	13
Fish and Wildlife.....	13

Floodplains, Wetlands, and Riparian Zones.....	13
Geology/Mineral Resources/Energy Production .....	13
Hazardous Wastes.....	14
Invasive Species/Noxious Weeds.....	14
Native American Religious Concerns .....	14
Recreation.....	14
Socioeconomics .....	15
Soils .....	16
Vegetation.....	16
Visual Resources .....	16
Water Resources and Water Quality .....	17
Wild and Scenic Rivers and Wilderness .....	17
CHAPTER 4 – ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION AND ALTERNATIVES .....	17
Introduction .....	17
Air Quality .....	17
Climate Change .....	18
Fish and Wildlife.....	19
Cumulative Effects to Fish and Wildlife .....	19
Floodplains, Wetlands, and Riparian Zones.....	19
Geology/Mineral Resources/Energy Production .....	20
Hazardous Wastes.....	20
Invasive Species/Noxious Weeds.....	20
Cumulative Effects to Invasive Species/Noxious Weeds .....	21
Recreation.....	21
Cumulative Effects to Recreation .....	22
Socioeconomics .....	22
Soils .....	22
Bureau-Sensitive Species and Migratory Birds .....	22
Vegetation and Visual Resources.....	23
Cumulative Impacts to Vegetation and Visual Resources .....	23
Water Resources and Water Quality .....	23
CHAPTER 5 – PERSONS, GROUPS, AGENCIES, and FEDERALLY RECOGNIZED TRIBES CONSULTED .....	25

Consultation and Coordination.....	25
Federally Recognized Indian Tribes .....	25
List of Preparers .....	26
CHAPTER 6 - REFERENCES.....	27
APPENDIX A – FIGURES .....	29
APPENDIX B – STIPULATIONS AND NOTICES.....	35

## CHAPTER 1 – PURPOSE OF AND NEED FOR ACTION

### Purpose of the Proposed Action

The purpose is to provide opportunities for private individuals or companies to explore and develop Federal oil and gas resources through a competitive leasing process. 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 tracts considered for lease in this analysis were nominated by Expressions of Interest (EOIs) from private industry. The oil and gas leasing program managed by the Bureau of Land Management (BLM) encourages private exploration and development of domestic oil and gas reserves and the reduction of U.S. dependence on foreign sources of energy and is essential to meeting the nation's future needs for energy. The BLM's oil and gas leasing programs are codified 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 (FLPMA) of 1976, and the Energy Policy Act of 2005.

On October 22, 2001, the BLM Northeastern States Field Office (NSFO) received one request from the BLM Eastern States Office (ESO) for National Environmental Policy Act (NEPA) analysis of oil and gas leasing of the entire Blue Rock State Forest, Muskingum County, Ohio. On August 25, 2010, the NSFO received two more requests for analysis of proposed leasing of portions of the state forest. This nomination is located on State-owned land. There is a current Federal mineral lease on approximately 113 acres of the state forest. The legal descriptions of the lease parcels are as follows:

- Existing lease parcels: Muskingum County, T12N, R12W, Sec. 15,
  - SW $\frac{1}{4}$ NW $\frac{1}{4}$ ; and,
  - A parcel described as follows: Beginning at the NW corner of the SW $\frac{1}{4}$ ; thence E. on the  $\frac{1}{4}$  section line to the center of the section; thence S. on  $\frac{1}{4}$  section line 1,980 feet; thence N. 85 degrees W. 1,036.6 feet; thence N. 15 degrees E. 1,377.3 feet; thence N. 10 degrees E. 132 feet; thence N. 85 degrees W. 889 feet; thence S. 1 degree 20' E. 505 feet; thence S. 83 $\frac{1}{4}$  degrees W. 799.4 feet to west section line; thence N. on section line 1,170 feet to the place of beginning, containing 72.55 acres, more or less.

After these deductions, a total of 4,525 acres remains to be leased for oil and gas development.

### Management Objectives of the Action

Since the BLM does not manage the surface, the BLM's sole management objective is to make Federal minerals available for economically feasible development without causing undue negative impacts to natural resources.

### Conformance with BLM Land Use Plan(s)

The BLM does not manage any surface acreage in Ohio, and the BLM has not developed a comprehensive land use plan for the State of Ohio. Two Instruction Memoranda permit the BLM to

consider leasing actions in areas for which the BLM has not conducted land use planning, provided the public has the opportunity for input into the process. BLM Instruction Memorandum No. ES-2006-13 states that, “When oil and gas leasing and non-energy solid mineral leasing are proposed in an area not covered by a Resource Management Plan (RMP) or other applicable LUP (Land Use Plan), an Environmental Assessment (EA) may be used as a basis for a decision on the proposal (43 CFR 1610.8(b)(1)), provided that there is an opportunity for the public to provide input during the process. At a minimum, there shall be some form of public notification that an EA is being initiated. This could take the form of a posting on the BLM-ES web site, a news release, or the posting of a legal notice in local media outlets”. In addition, “there will be a mandatory 30-day public review and comment period on the EA and Finding of No Significant Impact before the Decision Record is signed.”

BLM Instruction Memorandum No. WO-2010-117 states that, “State and field offices will provide for public participation as part of the review of parcels identified for potential leasing through the NEPA compliance documentation process. State and field offices will identify groups and individuals with an interest in local BLM oil and gas leasing, including surface owners of split estate lands where Federal minerals are being considered for leasing. Interested groups, individuals, and potentially affected split estate surface owners will be kept informed of field office leasing and NEPA activities through updated websites and email lists, and will be invited to comment during the NEPA compliance process.”

The ESO leasing process incorporates a mandatory 30-day public comment period on all completed EAs and unsigned Findings of No Significant Impact (FONSIs) for potential lease parcels on the ESO public website.

### **Relationship to Statutes, Regulations and Other Plans**

This EA was prepared in accordance with the NEPA of 1969 and in compliance with all applicable regulations and laws passed subsequently, including Council on Environmental Quality (CEQ) regulations (40 C.F.R., Parts 1500-1508), U.S. Department of the Interior (DOI) requirements (Department Manual 516, Environmental Quality), the National Historic Preservation Act, the American Indian Religious Freedom Act, the Native American Graves Protection and Repatriation Act, Executive Order 13007 (Indian Sacred Sites), guidelines listed in BLM’s NEPA Handbook, H-1790-1 , and/or other Federal statutes and executive orders.

Additionally, any purchaser of a Federal oil and gas lease is required to comply with all applicable Federal, State, and local laws and regulations including obtaining all necessary permits required prior to the commencement of project activities.

### **Decision to Be Made**

The BLM must decide whether to offer the Federal oil and gas mineral estate for competitive leasing. The BLM’s policy is to promote oil and gas development if such action meets the guidelines and regulations set forth by the NEPA of 1969 and other subsequent laws and policies passed by the U.S. Congress.

## Scoping and Issues

### Rationale for conducting external scoping

The BLM elected to conduct external scoping because of the forestry and recreational uses of the state forest. The Ohio Department of Natural Resources has expertise in the resources contained within the state forest and can assist the BLM in accurately assessing and mitigating environmental impacts of the proposed action.

### Process for conducting external scoping

External scoping was conducted via e-mail correspondence, data-sharing, a conference call between the BLM and the Ohio Department of Natural Resources (ODNR) on July 12, 2012, and a site visit on July 31, 2012, in which BLM and ODNR staff participated. The names of the participants are listed in **Chapter 5 - Persons, Organizations, and Agencies Consulted**.

### Issues identified through internal and external scoping

Following are the issues that were identified through internal and external scoping:

1. Non-native, invasive plant species are present in and around the state forest, and development activities tend to spread these species to new areas.
2. The state forest land and surrounding area have many steep, erosion-prone slopes. Development needs to avoid disturbing these areas to the extent practicable.

## CHAPTER 2 – ALTERNATIVES, INCLUDING THE PROPOSED ACTION

### Introduction

The BLM Northeastern States Field Office has received three expressions of interest (EOIs) for various portions of the Blue Rock State Forest. Competitive leases would provide the lessee exclusive rights to explore and develop Federal oil and gas minerals on the lease(s) but would not authorize surface-disturbing activities or obligate the company to drill a well on the lease(s). Lease(s) could be used to consolidate acreage to meet well spacing requirements, and mineral estate may be acquired for speculative value. The BLM would require applicants to adhere to lease stipulations (Appendix B), which have been formulated while conducting this EA and are made part of the proposed action.

### Location

The site, shown in Figure 1, Appendix A, is located on state-owned land in east-central Ohio. The Blue Rock State Forest can be described generally as being bounded on the east by McDonald Road and Sugargrove Roads, on the north by State Road 146 near Chandlersville, on the south by Shaver and Buttermilk Roads, and on the west by Poverty Ridge Road.

## Proposed Action

### Well Drilling

The nominated lease parcels, if approved, would be offered for competitive sale with attached stipulations and notices. Once awarded, the successful bidder would be required to submit an Application for Permit to Drill (APD) to the BLM before any ground disturbance would be authorized. In an APD, an applicant identifies a proposed drill site and provides the BLM with specific details on how and when the applicant proposes to drill the well within the constraints of the lease document. Upon receipt of an APD, the BLM conducts an onsite inspection with the applicant and, if possible, the private landowner or, as in this case, the surface-managing agency. NEPA and Endangered Species Act requirements must also be met at the APD stage and, in cases with potential to affect Federally-listed or State-listed species, a site-specific biological assessment is written, including the results of any required biological surveys. This is submitted to the U.S. Fish and Wildlife Service (USFWS) and the MDNR for consultation. The lessee would be required, as a condition of approval, to comply with the recommendations of these consultations.

The BLM estimates that leasing the requested minerals would likely lead to the construction of 10 to 15 conventional, vertical wells on separate, widely-dispersed pads and three horizontal, shale gas wells from a single pad. *This scenario is provided strictly for the purpose of analysis and does not represent a BLM Decision as to a number of wells that may be permitted under the proposed lease.*

### Hydrocarbon Drilling Methods

Oil and gas (hydrocarbon) wells are built in two phases – drilling the borehole and completing the well. Wells may be drilled vertically if the end of the well, or *bottom hole location*, is directly below the well pad, or directionally, if the bottom hole location is not directly below the well pad. For example, federal minerals under a state park, where drilling is not permitted, can be accessed by directional drilling from a well pad located near the state park. The same method may be used to drill horizontally, with a wellbore extending for more than one mile through the hydrocarbon-producing rock formation. In this case, the purpose of non-vertical drilling is not necessarily to provide access to the hydrocarbons but to increase the well's production.

Horizontal drilling using hydraulic fracturing methods is commonly used for mineral extraction in shale formations. Hydraulic fracturing (hydrofracture or *fracking*) has been widely used in the oil and gas industry since the late 1940s. The process has enhanced hydrocarbon production from tight sandstones, shales and carbonates. Fracturing is not used in all well completions. The use of hydrofracture is dependent on the type of reservoir rock encountered in the subsurface. Virtually all wells in most productive strata are completed using hydrofracture.

In the hydraulic fracturing process, water, sand and small amounts of chemical additives are pumped down the wellbore. Holes in the production tubing direct the mixture into the reservoir rock under high pressure, breaking the rock. The water-induced fractures allow the oil and gas to flow into the wellbore. Additives may be added depending upon the rock and fluids encountered at depth.

The subsurface pressure forces the hydrocarbons, reservoir fluids, and used fracture fluids to the surface. The hydrocarbons naturally separate from the other fluids. The used fracture and reservoir fluids are stored in large tanks for disposal in deep injection wells. In areas where large quantities of water are needed to fracture the rocks, the fluids may be recycled and used in other well completion operations.

### Vertical Drilling

**The total disturbed area for drilling a productive well would be 1 acre. Half of this disturbance would be restored upon well completion, leaving 0.5 acre to be maintained in a cleared state for the life of the well.**

Drilling operations continue around the clock. Wells in this area are generally drilled within 30 days. An excavation reserve pit is usually constructed about 5-10 feet deep and is lined with bentonite clay to retain drilling fluids, circulated mud, and cuttings. Plastic or butyl (or equivalent) liners that meet applicable thickness and quality standards are required for holding pit fluids.

Once drilling is completed, excess fluids are pumped out of the pit and disposed of in a state-authorized disposal site, and the remaining cuttings are buried. Wells may be drilled by rotary drilling using mud as the circulating medium. Mud pumps would be used to force mud down the drill pipe and up through the annulus, circulating the rock cuttings out of the wellbore. Most conventional wells require less than 500,000 gallons of water for completion. Water users must apply for state approval for use of any water sources. Water may also be trucked in or pumped to the site from the Muskingum River or another water body through a pipe laid on the surface. If water production is expected during the life of the field, then separation, dehydration, and other production processing may necessitate on- and off-site construction of storage and processing facilities.

During well pad construction, topsoil is stockpiled for use during restoration activities. If the well is successful, the drill pad would be reduced to about one-half acre with the remaining surface area, including the reserve pit, re-graded and restored as per the BLM's and the surface owner's requirements. The remaining pad is maintained for the life of the well. The life of a productive well is typically on the order of 10-20 years. Following abandonment, the pad is reclaimed.

### Horizontal Drilling

Wells drilled horizontally with multiple-stage hydrofracture operations require somewhat larger well pads and reserve pits than conventional vertical or directional wells and typically accommodate several wells. The larger pads are required to store the larger amounts of equipment and supplies used in drilling horizontal wells. Horizontal wells also require more water for completion than conventional wells. In Ohio, lateral lengths exceeding one mile are common, and the number of fracture stages used to complete a horizontal well are greater than the number used for a conventional well. Marcellus and Utica shale wells typically consume between two and six million gallons of water for completion. **For the purpose of this analysis, the total disturbance associated with horizontal drilling is 5 acres per well pad, including 2 acres to be maintained for the life of the wells.**

## No-Action Alternative

Under the No-Action Alternative, the request to offer the proposed tract for oil and gas lease would be denied.

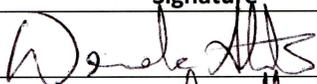
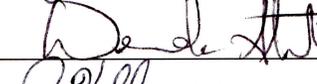
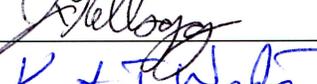
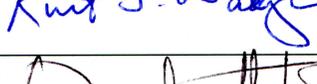
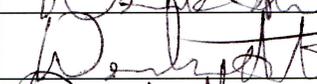
## CHAPTER 3 – DESCRIPTION OF THE AFFECTED ENVIRONMENT

### Introduction

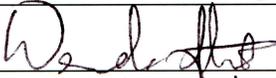
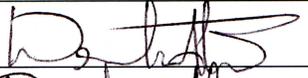
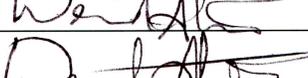
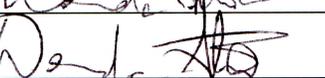
The Decision Area includes the EOI plus a 1.5-mile buffer around the EOI, a total area of 27,120 acres (Figure 1, Appendix A), since wells may be drilled from as much as 1.5 miles from the EOI boundary. The Decision Area is within the Eastern Temperate Forests level-I ecoregion, Ozark/Oauchita-Appalachian level-II ecoregion, and the Western Allegheny Plateau level-III ecoregion. The Decision Area is in the Muskingum subbasin of the Muskingum basin, which drains to the Ohio River and subsequently to the Mississippi River. Much of the information in this chapter and Chapter 4 is derived from the Blue Rock State Forest’s management plan. Most of the land surrounding the state forest is privately owned forestland and agricultural land.

This analysis will cover the resources listed in Table 1, below.

**Table 1. Technical Review.**

Program	Reviewer	Signature	Date
Air Quality	Derek Strohl Natural Resources Specialist		3/22/13
Climate Change	Derek Strohl Natural Resources Specialist		3/22/13
Cultural/Paleontology	Jarrod Kellogg Archeologist		
Environmental Justice	Kurt Wadzinski Planning & Environmental Coordinator		3/22/2013
Farmlands (Prime & Unique)	Derek Strohl Natural Resources Specialist		3/22/13
Fish and Wildlife	Derek Strohl Natural Resources Specialist		3/22/13
Floodplains, Wetlands, and Riparian Zones	Derek Strohl Natural Resources Specialist		3/22/13
Forestry	Derek Strohl Natural Resources Specialist		3/22/13
Geology/Mineral Resources/Energy Production	Jeff Nolder Geologist		3/24/13
Hazardous Wastes	Derek Strohl Natural Resources Specialist		3/22/13
Invasive Species/Noxious Weeds	Derek Strohl Natural Resources Specialist		3/22/13
Native American Religious Concerns	Derek Strohl Natural Resources Specialist		3/22/13
Recreation	Derek Strohl Natural Resources Specialist		3/22/13

**Table 1. Technical Review.**

Program	Reviewer	Signature	Date
Socioeconomics	Kurt Wadzinski Planning & Environmental Coordinator		3/22/2013
Soils	Derek Strohl Natural Resources Specialist		3/22/13
Threatened, Endangered or Candidate Animal Species/Migratory Birds	Derek Strohl Natural Resources Specialist		3/22/13
Vegetation	Derek Strohl Natural Resources Specialist		3/22/13
Visual Resources	Derek Strohl Natural Resources Specialist		3/22/13
Water Resources/Quality (Drinking, Surface & Ground)	Derek Strohl Natural Resources Specialist		3/22/13
Wild & Scenic Rivers	Derek Strohl Natural Resources Specialist		3/22/13
Wilderness	Derek Strohl Natural Resources Specialist		3/22/13

### Air Quality

Muskingum County meets the National Ambient Air Quality Standards (NAAQS) for carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>), sulfur dioxide (SO<sub>2</sub>), particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>), and lead (Pb). These are the primary pollutants that the U.S. Environmental Protection Agency (EPA) tracks nationwide.

### Bureau-Sensitive Species and Migratory Birds

There are five species on the Endangered Species Act list that have been known to occur in Muskingum County, Ohio, as listed in Table 2, below. An additional four state-listed plant species and 22 animal species that are on the State of Ohio's endangered species list have been reported in Muskingum County and may be present in the Decision Area. Most of these species are aquatic, such as fish and freshwater mussels. Since the Blue Rock State Forest and most of the surrounding area has been intensively logged within the last century, it does not contain a high concentration of habitat for rare species.

**Table 2. Federally threatened, endangered, and candidate species present in Muskingum County, Ohio.**

Scientific name	Common name	Status	Habitat	Habitat present
<i>Myotis sodalis</i>	Indiana bat	END	Hibernacula – caves and mines; maternity and foraging habitat – small stream corridors with well-developed riparian woods, upland forests	L
<i>Cyprogenia stegaria</i>	Fanshell	END	Found in areas of packed sand and gravel at locations in a good current	L

**Table 2. Federally threatened, endangered, and candidate species present in Muskingum County, Ohio.**

Scientific name	Common name	Status	Habitat	Habitat present
<i>Quadrula cylindrica cylindrica</i>	Rabbitsfoot	CAN	Muskingum River	L
<i>Plethobasus cyphus</i>	Sheepnose	END	Shallow areas in larger rivers and streams	L
<i>Epioblasma triquetra</i>	Snuffbox	END	Small to medium-sized creeks and some larger rivers, in areas with a swift current	L

Key: END – Federally endangered; THR – Federally threatened; CAN – Federal candidate; E – State endangered; T – State threatened; SC – State species concern; L – likely; N – not present; P – possibly present

## Climate Change

The primary indicators of interest regarding climate change are emissions of greenhouse gases (GHG), primarily water vapor, carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), and a few other gasses of lesser importance. These gasses tend to trap heat from the sun in the Earth’s atmosphere, leading to global warming. The various GHGs trap different amounts of heat and persist in the atmosphere for different amounts of time. Therefore, the various GHGs have different levels of potency in causing global warming per unit volume in the atmosphere. These potencies are normalized with respect to the potency of CO<sub>2</sub> and expressed in terms of CO<sub>2</sub>e (carbon dioxide equivalent). For example, one metric ton of methane, which is 21 times as potent as carbon dioxide, represents 21 metric tons of CO<sub>2</sub>e. Carbon dioxide and CH<sub>4</sub> are the most abundant GHGs in terms of CO<sub>2</sub>e.

Because these gases circulate freely throughout Earth’s atmosphere, the Planning Area for this resource is the entire globe. The largest component of global anthropogenic greenhouse gas emissions is carbon dioxide. 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 2004 (Marland, 2007). Oil and gas production is a major contributor of greenhouse gases. In 2006, natural gas production accounted for eight percent of global methane emissions, and oil production accounted for 0.5% of global methane emissions (URS Corporation, 2010).

## Cultural Resources/Paleontology

A cultural resource is a location of human activity, occupation, or use identifiable through field inventory, historic documentation, or oral evidence. Cultural resources include both historic and prehistoric archaeological sites, structures, places of architectural significance, or places with important public and scientific uses and may include traditional cultural properties, which are well-defined locations of traditional or cultural importance to specific social or cultural groups. Cultural resources may be eligible for listing on the National Register of Historic Places (NRHP).

### Prehistory

Prehistoric resources are associated with human occupation and use prior to sustained European contact. These resources may include, but are not limited, to villages, subsurface deposits (middens), structures, artifacts, rock art, trails, and tool manufacturing sites.

Nomadic Paleo-Indians are believed to have inhabited the region beginning approximately 12,000 years ago. While there is little evidence of widespread occupation, artifacts from this time have been found across Ohio in a line roughly corresponding with the maximum extent of the Wisconsin glacial boundary and are frequently located in major stream valleys and confluences and in proximity to quality flint resources. Subsistence during this time focused on large woodland game such as musk ox, mastodon, caribou, and woolly mammoth.

The Honey Run site in Coshocton County, approximately 30 miles north of Zanesville, dates to this early period and contains evidence of fluted points, scrapers, knives, and hunting. Possible contemporary sites of the Coshocton Strata are found in southeastern Michigan, western Pennsylvania, and in the Shenandoah Valley, Virginia.

A large flint source northwest of Blue Rock State Forest between Zanesville and Newark was exploited during prehistoric times. Material from this location has been found in Louisiana and Kansas and along the Atlantic seaboard. During the historic period, settlers also used the flint as grindstones and firearm flints. Such an important, and practically inexhaustible, source of flint so close to Blue Rock increases the chance of finding archaeological sites from different periods of prehistory and the early historic era in the vicinity of the project area.

During the Early Archaic Period people continued to live as nomadic hunters but expanded their focus to small game, gathering, and fishing. Populations began to move based on seasonal availability of such resources, forcing adaptations to a wide variety of micro-environments. This period of cultural development was modified from the previous glacial oriented subsistence, with the appearance of regional systems that would shape the future of Native American social, political, and economic organization until European contact. By 3000 to 2000 Before Common Era (BCE), the Late Archaic Period, noticeable cultural traditions had appeared, including the Lamoka of western New York State, the Laurentian in eastern New York, the Old Copper Culture of the Illinois and Wisconsin area, the Panhandle Tradition of northern Ohio and western Pennsylvania, and Indian Knoll in Kentucky.

By 1000 BCE, the Early Woodland culture had formed in the northeastern United States. A stabilization of local economies had evolved by this date, accompanied by the first evidence of high-placed burials on knolls and ridges away from semi-permanent settlements. Around the same time, the Adena culture began to spread through southern Ohio. Life became more sedentary with increasing population and status differentiation. Simple agriculture appears during this period, with a sizeable percentage of the diet including cultivated squash, gourd, sunflower, marsh elder, and wild foods. When the Adena collapsed around 200 BCE, agriculture had become the single most important source of food, although hunting and gathering continued to make up the majority of subsistence. Many Adena sites contained earthworks and mounds, along with what is believed to have been a higher degree of social organization and political control than previously existed. Commerce flourished, as indicated by the discovery of mica, copper, incised pottery, beads, ornaments, textiles, and various art styles at archaeological sites from this time period.

Shortly after 100 BCE, the Hopewell tradition arrived in Ohio, eventually eclipsing the Adena in terms of regional influence, with ties to the Northeast, Midwest, Southeast, and Mexico. The Middle Woodland period from 500 to 700 Common Era (CE) saw the climax of the Hopewell culture as differentiation

between villages and ceremonial centers became common, with latter being located primarily along rivers and containing earthen mounds. Such sites included large, conical mounds and rectangular enclosures of smaller oval or circular mounds. Early archaeological surveys indicate the presences of mound locations between the western boundary of Blue Rock State Forest and the Muskingum River.

Although the Hopewell diet included agricultural products such as the “Three Sisters” of squash, beans, and corn, hunting and fishing remained vital to subsistence. Tobacco was also grown for ceremonial and trading purposes. The Hopewell built extensive trade networks to the Rocky Mountains, Gulf and Atlantic Coasts, and the Great Lakes Region, bringing items such as bear teeth, obsidian, seashells, mica, and copper into the Ohio area, allowing for a more varied and sophisticated tool assemblage.

The Hopewell-Adena traditions are the most commonly cited cultural sequence in the Ohio River Valley and its tributaries. With the collapse of the Hopewell around 700 CE, new cultural groups appeared throughout the Midwest and northeastern United States. This included the Mississippian tradition, one of the largest prehistoric cultural influence zones in North America. First appearing in the Mississippi River Valley, this new tradition incorporated traits from the Southwest, Northeast, Southeast, and Mexico. By 1000 CE the Mississippian began to diffuse throughout southern and eastern Ohio, introducing intensive corn-based agriculture located primarily on floodplains. Truncated ceremonial mounds appeared, reflecting possible cultural input from the Southwest and Mexico.

As settlements increased in permanency, agriculture became the primary source of subsistence between 1000 and 1600 CE. However, the Hopewell declined and disappeared during this period, eventually being replaced by the historically known tribes in Ohio, such as the Iroquois, who by 1200 CE had built solid foundations identifying them in western Pennsylvania, New York, and Ohio. Protohistoric tribes in Ohio developed a wide subsistence base, exploiting particular environments. They frequently hunted, fished, and raised corn, squash, beans, and pumpkins. Warfare is also evident during this period with an increase in the number of clubs, spears, tomahawks, and the bow and arrow. Intertribal treaties existed between neighboring groups for protection and cooperation in warfare.

At the time of European contact, the tribes of Ohio supplemented agriculture with wild rice, maple sugar, waterfowl, fish, and game. Long houses with adjoining gardens became the typical Iroquoian living quarters. Two major language groups overlapped in southeastern Ohio: Iroquoian from the Northeastern United States and western Ohio, and Algonquin. Spoken by the Delaware, Miami, and Shawnee in central and western Ohio, the Algonquin language covered a much larger area than that of Iroquoian, surrounding the smaller language group and stretching to the eastern seaboard and Hudson Bay.

## Historic Era

Robert de la Salle led the first known European incursion into Ohio in 1669. By 1754, French and English settlers and their respective Native American allies began to dispute land and trade rights in southeastern Ohio, leading to the French and Indian War. With the defeat of the French at Quebec in 1760 and end of the Seven Years War in Europe in 1763, the Ohio Valley was opened for speculation and fur traders by the British despite official Crown opposition. Tribes who had aligned themselves with the French, namely the Delaware and Shawnee, were effectively expelled from the region.

While no substantial Euro American settlements existed in the Ohio region during the Revolutionary War, conflict occurred between British outposts, American settlers, and Native Americans. With the end of the war in 1783, settlers began to push into the area; however, the British continued to support tribes resisting the Americans. In 1784 the Iroquois Confederacy signed a treaty with the United States relinquishing their lands in eastern Ohio, forcing other tribes who relied on the Iroquois for mutual defense to struggle for survival.

A year after the Iroquois ceded their claims to eastern Ohio the United States passed the Ordinance of 1785. This established a land survey system for providing a uniform acreage on which to base land sales. This was implemented on lands between the Great Lakes and Ohio River Valley, and large tracts were set aside for commercial enterprises and soldiers. In 1787 Congress established the Northwest Territory, which included a territorial government tasked with protecting large land holders and investments. Treaties with the Ohio tribes were broken, and hostilities escalated as the United States policy toward the Native Americans changed from one of tenuous coexistence to that of removal. After a long series of setbacks, the United States defeated the Western (Iroquois) Confederacy at the Battle of the Fallen Timbers in northwestern Ohio in 1794. This resulted in two significant treaties, Jay's Treaty of 1794 which led to the removal of all British troops and garrisons from within the boundary lines of the United States, and the Treaty of Greenville in 1795, which ceded all Native American rights to the Ohio region.

The expulsion of the British and Native Americans from Ohio led to increased settlement of the region. Settlers first arrived in the region around Blue Rock State Forest in the late 1790s, with the U.S. Postal Service officially naming Zanesville in 1801. By 1810, the town, with its salt works, wheat mills, and textile factories, had become such an important stop for riverboats on the Muskingum River that it was designated the Ohio state capital. The construction of the National Road in 1820 further increased trade and passage traffic through the region. With its well-maintained roadbed, the National Road reduced costs associated with land transportation and opened up new markets on the eastern seaboard to Ohio ranch and farm products including cattle, sheep, and hogs.

Despite the expansion of highways, Ohio continued to be a river-bound state, and the fortunes of many cities, such as Zanesville, relied on water-borne transportation for their livelihood. By the 1830s many such cities faced decline as they were bypassed by canals and other improved waterways. The arrival of the railroad in the 1850s further exacerbated this situation, shifting the focus of Ohio's economy from the agrarian south to industrial centers in the northern part of the state. Southeastern Ohio, which previously relied on a minimal farming economy, transitioned to the mining of coal and harvesting of other natural resources in order to supply the north. After World War I, agricultural and industrial development in southeastern Ohio could not keep pace with expansion of the northern Ohio communities, and the economy began to slip, resulting in an outward migration of population to the large industrialized areas that continued into the 1960s.

The area that would become Blue Rock State Forest had by the 1930s been logged excessively, resulting in the erosion of much of the topsoil. Farms which occupied the newly open land failed for this reason, leading to their purchase by the U.S. Resettlement Administration in the early 1930s. After the last of the farmers had been relocated, the area was managed for a short time by the Federal Government; the

surface land was then transferred to the State of Ohio, leading to the creation of Blue Rock State Forest, while the United States retained the subsurface mineral rights.

The Ohio Historic Preservation Office (OHPO) states that there are approximately 20 recorded archaeological sites within the decision area including several cemeteries and structures. The Philo II Archeological District, which consists of a burial mound, is also located in the decision area and is the sole property listed on the National Register of Historic Places. Previous environmental analysis indicates that there is a strong possibility of uncovering archaeological evidence located within the Blue Rock State Forest, and the OHPO currently states that there is a high probability for locating sites along the Muskingum River. Within the forest itself, creek bottoms and level ridge lines are noted as potential areas for unknown cultural remains.

The BLM would consider potential cultural resources with each APD that is submitted under any lease(s) that would be approved pursuant to this EOI in accordance with Section 106 of the National Historic Preservation Act of 1966. While no further analysis is warranted for this EOI, any future APD would require archaeological surveys and further consultation with the Ohio State Historic Preservation Office (OHSHPO) and appropriate Native American tribes.

## **Paleontology**

Paleontological resources are the remains, traces, or imprints of organisms that have had their organic materials replaced with minerals, becoming fossils. They are scientifically important in that they provide information about the history of life on Earth. Fossil remains may include bones, teeth, shells, leaves, and wood, and are almost exclusively found in sedimentary formations. Generally, fossils are the remains of extinct species and are over 10,000 years old. Locations where fossils are exposed and visible are called localities. Paleontological resources include not only the actual fossils, but also localities and the geological deposits that contain the fossils. Paleontological resources are considered nonrenewable resources because once destroyed, they can never be replaced. For the purpose of this analysis, and in accordance with existing BLM policy, scientifically significant paleontological resources are defined as vertebrate fossils that are identifiable to taxon and/or element, noteworthy occurrences of invertebrate and plant fossils, and vertebrate trackways.

The Decision Area is located atop rocks deposited during the Pennsylvanian and Mississippian Eras. These were associated primarily with swampy areas and deltas associated with an ancient coastline and are noted for preserving insect and amphibian fossils. All underlying rock in Muskingum County is sedimentary, which would mean a high possibility for fossil potential. However, no known fossil localities are located in or adjacent to the Decision Area.

The BLM would consider potential paleontological resources with each APD that is submitted under any lease(s) that would be approved pursuant to this EOI. While no further analysis is warranted for this EOI, any future APD would require literature reviews and possibly surveys to determine the feasibility or presence of any paleontological resources in the area.

## Environmental Justice

Executive Order 12898 (1994) formally requires Federal agencies to incorporate environmental justice as part of their missions. Specifically, it directs agencies to address, as appropriate, any disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority or low-income populations.

The Decision Area includes the EOI plus a 1.5-mile buffer around the EOI. Most of the land surrounding the state forest is privately owned forestland and agricultural land. It is anticipated that there would be no known adverse human health and environmental effects from potential development to minority and low-income populations or individuals near the Decision Area. No further analysis is warranted.

## Farmlands (Prime and Unique)

More than 4,200 acres (15 percent) of the Decision Area (Figure 2, Appendix A) is classified as *prime farmlands*, and 10,880 acres (40 percent) is classified as *farmlands of local importance*. 590 acres (2 percent) is classified as *prime if drained or prime if drained or protected from flooding or not frequently flooded during the growing season*. Most of the prime farmlands are associated with the floodplains (See **Floodplains, Wetlands, and Riparian Areas**), while the farmlands of local importance are roughly evenly distributed throughout the Decision Area.

## Fish and Wildlife

The Decision Area contains several bodies of water that are detailed in **Water Resources and Water Quality**, below. Cutler Lake has bass, trout, catfish, bluegill and nongame fish species. The Decision Area supports various game and non-game mammals, herptiles, birds, and other wildlife taxa. Most of the Decision Area is covered in second-growth, upland timber, pine plantations, and open croplands, as detailed in **Vegetation**, below.

## Floodplains, Wetlands, and Riparian Zones

The Muskingum River's floodplain is as wide as 1,700 feet in the Decision Area. Its floodplain and those of the streams flowing into it total 1,980 acres. The Ohio Wetlands Inventory accounts for 40 freshwater emergent wetlands, 31 freshwater forested/shrubby wetlands, and 145 freshwater ponds, scattered throughout the Decision Area, totaling more than 200 acres (Figure 3, Appendix A). Most of these are less than one acre in size. These figures are likely underestimating the number and aerial extent of wetlands within the Decision Area. The Decision Area contains several soils types that commonly have seeps, which are typically very small and likely would not be detected by the remote methods used to compile regional wetlands inventories. Several of these very small wetlands were observed by BLM personnel on a single site visit in 2012.

## Geology/Mineral Resources/Energy Production

Eastern Ohio is located on the western flank of the Appalachian Basin, a linear depression in the crust filled with sediments ranging in age from Cambrian to Permian. Exploration and development of oil and gas resources within the basin has occurred continuously since 1859 and began soon after in the state forest. Currently, about 40 recognized oil and gas plays occur within the basin, both conventional and unconventional. The BLM has identified specific exploration targets underlying the lands being

evaluated in this EA, including the conventional Berea and Clinton sandstones and the Beekmantown Dolomite, but much of the acreage therein may have been depleted by past production. Based upon the available data and exploration and development activity, the Utica Shale, an unconventional play, may also be explored and developed on the lands being evaluated in this EA. The Utica Shale underlies all of Muskingum County, but its production potential in this area is as yet unknown.

Coal resources also underlie the forest, but the potential for production is considered to be low.

## Hazardous Wastes

There are no Superfund sites in the Decision Area, and no facilities reported to the Toxics Release Inventory in 2011 (United States National Laboratory of Medicine, 2013).

## Invasive Species/Noxious Weeds

Many invasive species are present in and around the Decision Area and throughout Ohio and the Midwest. A list of invasive plant species that are common in Ohio or that may soon threaten ecosystems in Ohio can be found at

<http://ohiodnr.com/Portals/3/invasive/pdf/OHIO%20INVASIVE%20PLANTS.pdf>. Tree of heaven (*Ailanthus altissima*), autumn olive (*Elaeagnus umbellata*), and multiflora rose (*Rosa multiflora*) are the species that pose the greatest concern to the managers of the Blue Rock State Forest, and Japanese stilt grass (*Microstegium vimineum*) is a rapidly growing concern. These species are present in disturbed areas and are readily propagated along forestry roads and other openings. The Emerald ash borer (*Agrilus planipennis*), an insect that has destroyed millions of ash trees throughout the Midwest, has been identified in 63 of Ohio's 88 counties, including Muskingum County.

## Native American Religious Concerns

The BLM sent letters to the following Federally Recognized Indian Tribes who have ancestral lands in eastern Ohio asking whether they can identify any concerns that would need special consideration with respect to the proposed action:

- Delaware Nation (Anadarko, OK), on January 16, 2013
- Delaware Tribe of Indians (Bartlesville, OK), on January 17, 2013

The Delaware Nation responded by email on February 12, 2013, stating that they had no further comment on the EOI. The Delaware Tribe responded by letter on January 31, 2013, stating that, while they are unaware of any sites with cultural or religious significance within the project area, they recommend archaeological field surveys prior to any ground disturbing activity. The Delaware Tribe also requests copies of any archaeological survey reports that may be done in connection to this EOI.

## Recreation

The state forest has a 26-mile equestrian trail system (Figure 4, Appendix A) and a few miles of hiking trails. Blue Rock State Park, which is included in the proposed federal mineral lease area, has a campground. The Muskingum River Water Trail, which flows from Coshocton to Marietta, flows through

the Decision Area. The water trail features hand-operated locks and is passable by canoes, kayaks, and motorboats.

**Table 3. Selected types of recreational resources within the Decision Area.**

Type	Total	Notes
Hiking trails	3 miles	In Blue Rock State Forest
Equestrian trails	26 miles	In Blue Rock State Forest
Picnic areas	10	In Blue Rock State Park
Camping facilities	97 drive-in; 20 walk-in; 3 camper cabins	In Blue Rock State Park
Recreational rivers	1 river	Muskingum River, part of Muskingum R. Parkway
Recreational lakes	1 lake, 15 acres	Cutler Lake in BRSP, electric motors and non-motorized craft only

## Socioeconomics

Muskingum County is located in the southeastern part of Ohio, bordered by the counties of Licking and Perry (West), Guernsey and Noble (East), Coshocton (North) and Morgan (South), and is 664.58 square miles, with a population density of approximately 129 persons per square mile. Its population as of the 2010 U.S. Census was 86,074, a 1.8% increase from the 2000 census. The county seat is located in the city of Zanesville, in the central part of the county.

The distribution of population in Muskingum County is 92.5% White, 3.9% African American, 2.4% Two or More Races, 0.8% Hispanic or Latino, 0.4% Asian, and 0.2% Native American or Alaska Native. 76.3% of Muskingum County residents are 18 years of age or older, with 15.6% aged 65 years or older; the State of Ohio has a population 18 years of age and older of 76.7%, with 14.3% aged 65 or older.

In 2011, there were 38,327 housing units in the county with a homeownership rate from 2007-2011 of 69.8%, which is 1.1% higher than the state as a whole. The median value of these owner-occupied homes was \$111,800 for the period 2007-2011, well below that of the state (\$135,600).

For the period 2007-2011, median household income was \$40,590 for Muskingum County, \$7,481 lower than the state. Approximately 17% of persons lived below the poverty level, which is above the 14.8% statewide that live below the poverty level. 86.5% of the county population 25 years of age and over graduated from high school, similar to the percentage of the state (87.8%). 13.9% of county residents 25 years of age and older have a bachelor's degree compared to 24.5% for Ohio as a whole. About 3%

of residents speak a foreign language in the home; in total, about 6.5% of Ohio residents speak a foreign language in the home.

Demographically, Muskingum County is less affluent, less educated, more homogenous, rural, and older than many counties in the State of Ohio.

The non-seasonally adjusted unemployment rate for Muskingum County was 9.1% in December 2012, a 1.5% decrease from the 10.6% rate in December 2011 (U.S. Bureau of Labor Statistics, 2013), which is 2.4% higher than Ohio's seasonally adjusted unemployment rate of 6.7% in December 2012. In 2010, health care and social assistance employed the most people in the county (6,165), followed by retail trade (4,576), and manufacturing (3,505) (U.S. Census Bureau, 2013).

Mining activities in Muskingum County currently employ 319 people, and another 72 are employed in mining-related activities. These jobs account for approximately 1.2% of all employees in the county, well above the percentage employed in this industry in the U.S. as a whole (0.5%) (U.S. Department of Commerce, 2012). The average annual wage for mining positions in Muskingum County in 2011 was \$63,943, almost double the average annual wage of \$33,988 for non-mining positions in the county (U.S. Department of Labor, 2012).

## Soils

The Decision Area is in the unglaciated portion of the Appalachian Plateau. Soils in the Decision Area are generally well-drained, upland soils on moderate to steep slopes. More than half of the Decision Area has soils with erosion hazard rating of *severe* or *very severe* (Figure 4, Appendix A). The Omulga and Zanesville series, which are present throughout the Decision Area and on ODNR-preferred pad sites, contain a fragipan horizon, which is a coarse, blocky layer with very few roots with very low permeability. Water tends to perch atop the fragipan in late winter and spring, making the layers above more susceptible to mass wasting, especially if disturbed. Several soil series present, notably the Westgate series, in the Decision Area have acidic horizons, which may pose a problem for reestablishing vegetation on sites during reclamation.

## Vegetation

Muskingum County is 52 percent forested. Muskingum County produces an average of 6,373 board feet per acre, and the state forest has a much higher density of timber than the rest of the county. The State Forest is dominated by oak-hickory forest, with scarlet, chestnut, white, post, black, and northern red oaks, yellow poplar, pignut, shagbark, and mockernut hickories, white ash, and sassafras. The state forest has significant acreage in white and red pine plantations, and native pitch and Virginia pines make up a significant component of the overstory. The understory in the state forest consists of sugar maple, red maple, blackgum, and ash. The Decision Area appears to be more than half forested, with the remaining area in pasture and other open, grassy cover types.

## Visual Resources

Most of the Decision Area – almost all of the state forest – is forested, and a significant proportion is in agricultural use. This rural area has about 250 feet of relief between the Muskingum River and other

valleys and the many ridges and knobs. A fire tower in the state forest provides sweeping views over the surrounding landscape.

### **Water Resources and Water Quality**

The Decision Area contains 44 miles of streams, including 4.7 miles of the Muskingum River and all of the 15-acre Cutler Lake. The Muskingum River's mean discharge figures at the two nearest gauges to the Decision Area are 7,360 cubic feet per second, or 47,300 gallons per second (Dresden, upstream of the Decision Area, 2009-present) and 7,260 cubic feet per second, or 46,670 gallons per second (McConnelsville, downstream of the Decision Area, 1992-present). Two bedrock aquifers overlap the Decision Area, each yielding less than five gallons per minute. All of the Decision Area's streams are classified as suitable for bodily contact, although the Ohio Environmental Protection Agency (OEPA) has declared a fish-consumption advisory for seven species from the Muskingum River due to PCB and mercury contamination.

### **Wild and Scenic Rivers and Wilderness**

There is no designated Wild and Scenic Rivers or Wilderness in the Decision Area.

## **CHAPTER 4 – ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION AND ALTERNATIVES**

### **Introduction**

This chapter assesses potential consequences associated with direct, indirect, and cumulative effects of the Proposed Action. The No-Action Alternative, which would be to withhold the Federal minerals from leasing, would have no impacts on resources.

Much of the land in the Blue Rock State Forest was marginally productive farmland that was acquired by the Federal Government in the 1930s and transferred to the State of Ohio in 1957. Acquired lands were planted with trees, and Cutler Lake and associated recreational facilities were transferred to the Division of Parks and Recreation in 1948, forming Blue Rock State Park. The forest lands have been managed since for timber and forest products, and the park is managed for public recreational use. The Blue Rock State Forest harvested timber on an average of 120 acres (minimum 89 acres, maximum 155 acres) during the years 2009-2012, and the ODNR estimates that these figures will continue for the next few years. The Decision Area contains 864 historical oil and gas wells, 88 of which are in the state forest.

The maximum land disturbance associated with the proposed action would last for the duration of well construction, after which a large portion of the cleared area would be reclaimed, reducing the long-term impacted areas to 0.5 acres per conventional well and 2 acres per horizontal well pad.

### **Air Quality**

The proposed action is not expected to produce emissions in excess of *de minimis* amounts, which are defined by the U.S. EPA as maximum amounts that will not threaten a state's efforts to attain or maintain conformity with the National Ambient Air Quality Standards (NAAQS). An MOU between the

Departments of the Interior and Agriculture and the U.S. Environmental Protection Agency 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 Prevention of Significant Deterioration (PSD) increment

The Decision Area includes no Class I or sensitive Class II areas. Because the RFDS projects no more than 15 wells, it is expected that the Proposed Action will not meet the emissions criteria listed above. The primary air quality impact of the proposed action is likely to be a temporary increase in dust from the intensive truck traffic on forest roads. Traffic would include construction vehicles and heavy equipment during the drilling and completion phases. Traffic for hauling water would be greatly intensified if horizontal drilling and hydrofracture are used unless water is supplied by on-site wells or pipelines. The distance to be travelled on unimproved roads would affect the amount of dust produced by traffic, and warm, dry, or windy weather would also facilitate dustier conditions on and around roadways. This impact would persist through the period of well construction.

## Climate Change

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<sub>2</sub> 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 methane – methane that escapes from wells (both gas and oil), oil storage, and various types of processing equipment. This is a major source of global methane 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 methane emissions to the EPA. More information on this requirement is available at <http://www.epa.gov/climatechange/emissions/subpart/w.html>.
- 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<sub>2</sub> into the atmosphere. Fossil fuel combustion is the largest source of global CO<sub>2</sub>.

In recent years, many states and other organizations have initiated GHG inventories, tallying GHG emissions by economic sector. Links to statewide GHG emissions inventories can be found at <http://www.epa.gov/statelocalclimate/state/state-examples/ghg-inventory.html>. Guidelines for estimating project-specific GHG emissions are available, but some necessary data, such as quantities of oil produced and number of wells, are not available for such an estimate 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, site-specific information on GHG impacts and mitigation measures would be described in greater detail.

Many oil and gas operators are already participating in Natural Gas STAR, a voluntary EPA program that identifies sources of fugitive methane sources and seeks to minimize fugitive methane through careful tuning of existing equipment and technology upgrades. The BLM would encourage operators to participate in this voluntary program.

## **Fish and Wildlife**

The proposed action would likely result in the clearing of no more than 20 acres of land, based on the figures presented in Chapter 2. Much of this land is likely to be agricultural land, for two reasons. First, as described in the RFDS, at least some of the wells would likely be located on private lands in order to minimize the need to construct or improve roads in the steep terrain. A second, related reason is that many potential well sites in the Decision Area are agricultural lands that would not need to be logged for well development.

The BLM will impose conditions of approval (COAs) on proposing operators that are intended to reduce direct mortality to birds and other animals in open pits, tanks, secondary containment structures, and venting stacks. These COAs will require netting and/or fencing to keep animals such as mammals, birds, and amphibians from entering stored saltwater, spilled or leaked chemicals, or other toxic fluids, and grated covers to keep birds and bats from perching or roosting in vent stacks.

## **Cumulative Effects to Fish and Wildlife**

Cumulative impacts include actions that have been done in the past, are being done presently, or are planned for the future and which have an impact on a resource under consideration. The entire state forest was once cleared and was allowed to revert to forest after the government acquired the land. Some portions of the forest have been actively planted, and most of the forest is managed to promote native hardwoods. The average annual acres of timber harvest listed in the introduction to this chapter represent both commercial timber harvests and cuttings that are done for silvicultural purposes, such as removing competition to enhance the growth of a target species, and these activities have various temporary and long-term effects on wildlife. Over 800 oil and gas wells have been constructed in the Decision Area, representing potentially thousands of acres of land cleared for construction. As shown in Figure 5, Appendix A, these wells are in forested and non-forested areas, and their impacts to vegetation are highly variable.

## **Floodplains, Wetlands, and Riparian Zones**

A lease stipulation (see Appendix B) will prohibit surface occupancy in wetlands. This will prevent direct filling of wetlands. Because wells could potentially be directionally drilled from outside the EOI, prohibiting surface occupancy in wetlands would not necessarily prevent accessing the minerals under the wetlands. The BLM will closely analyze areas proposed for drilling in APDs, since the Decision Area likely contains many small wetlands that do not appear on regional wetland inventory maps and because construction of pads on slopes may impact the hydrology of wetlands downslope.

## Geology/Mineral Resources/Energy Production

Oil and gas resources are known to be present beneath the lands that are being evaluated in this EA. The production potential cannot be known without further exploration. However, it is certain that any oil and gas produced from these lands is a nonrenewable resource that will not be available in the future. At least 865 oil and gas wells have been drilled within the Decision Area, dating back as least to 1922, and about half of those wells are currently producing.

## Hazardous Wastes

Drilling introduces various chemicals into the environment that become waste products after use. These include drilling and completion fluids, which may contain heavy metals, hydrochloric acid, hydrocarbons, and brine. These materials may be stored temporarily in excavated pits and may be injected into underground formations that are isolated from freshwater or, in certain cases, disposed of in the annular spaces between strings of casing. These wastes are exempt from the Federal definition of hazardous waste and are referred to as *special wastes* by the EPA. Groundwater contamination may result from leaks in temporary storage facilities or injection wells.

## Invasive Species/Noxious Weeds

Construction of roads, well pads, pipelines, and other structures associated with oil and gas development can be expected to spread invasive species and/or noxious weeds in two general ways. First, increased vehicle traffic may carry seeds, plant parts, or other live organisms that may become established within the Decision Area. This could introduce new species from outside the Decision Area or from one part of the Decision Area to another. The risk of such propagation may be estimated in terms of the area disturbed, calculated in Chapter 2 at five acres per productive well; the volume of vehicle traffic; and the presence of invasive species in locations along the routes that traffic uses on the way to and within the Decision Area. While the last two variables would be unreasonable to attempt to quantify without site-specific analysis, we may consider various scenarios of infestation. Up to 20 acres of disturbed land would be susceptible to direct infestation by non-native, invasive plant species that thrive in disturbed conditions. However, many of these species are able to propagate into undisturbed areas, and large areas of otherwise intact habitat could be infested by plant parts that are introduced into the Decision Area on equipment and vehicles. Therefore, it is possible that far more than the directly-disturbed area of land could be infested in non-native, invasive plant species as a result of the disturbance.

The second way that oil and gas development may result in the propagation of invasive species is by creating open corridors and forest edges that are highly susceptible to invasion by edge-loving species. Where the forest canopy is broken, invasive species that thrive in sunny conditions may out-compete the native, shade-tolerant species.

The BLM would stipulate that operators conduct an inventory of invasive species within areas to be disturbed and prepare an invasive species management plan before construction begins (see Appendix B). The ODNR's BMPs for oil and gas activities on state-owned lands (Ohio Department of Natural Resources, 2012) include using pipelines instead of trucks and roads to move water to a drilling site. Th

use of pipelines would reduce the amount of disturbances – road construction and truck traffic – that are responsible for a large proportion of movement of invasive species.

### **Cumulative Effects to Invasive Species/Noxious Weeds**

The development and use of roads, well construction, agriculture, forestry, and other actions have caused the species listed in Chapter 3 to proliferate throughout the Blue Rock State Forest and Decision Area. The proposed action may cause these species to be spread into areas where they are currently not present. It may also result in species being controlled or eradicated from certain areas or introduce new invasive species to the Decision Area.

### **Recreation**

Well construction, operation, and, eventually, abandonment will create noise and change views in ways that will make the area less attractive to people who desire solitude and natural surroundings. Also, the noise from construction will drive away game animals.

Noise that is generated by construction or operation is naturally damped as it travels through an environment, and the nature of the environment through which it travels, such as open air, buildings, or woods, determines the rate at which noise is damped. Finally, the time during which the woods are disturbed with noise affects the value of the impact, since hunters and wildlife are present and/or active at some times of the year more than at others.

Construction equipment generates between 70 and 115 decibels (dB) (BLM, 1998), and a forest may damp noise by five to 20 dB per 100 feet. Hunters are unlikely to tolerate noise above 40 dB. Using these figures, the affected radius with respect to hunting around construction operation would range from 150 feet to 1500 feet (0.28 mile). The damping effect of the woods would be at its highest during summer, when leaves aid in damping the sound, or in winter under thick snow cover. The areas to be affected by these minimum and maximum radii are, respectively, 1.6 acres and 160 acres per point source of the described construction noises.

These noises are expected to continue non-stop for 30 days for each well that is constructed. The time of year of construction has a critical effect on the value of the disruption. For example, noise created at the height of a hunting season would impact the hunting in the affected area. It may also force animals to move to other, nearby areas, making them easier for hunters to target and improving hunting success. If the noise were created outside of a hunting season, the animals may reacclimate to the site and behave naturally by the time hunting begins, and hunters may not even be aware of the disturbance if they do not see the well(s).

Since a large proportion of the equestrian trail system uses ridges, which are also the location of the ODNr's preferred pad sites, equestrian trail use may be impacted by construction-related noise. Seven miles of equestrian trail is within 150 feet of a preferred pad site in the state forest, and 15 miles, or 58 percent, of the state forest equestrian trail system is within 1500 feet of these potential pad sites. Since invasive species control, soil conservation practices, and other seasonal issues may constrain the time during which construction may take place, the BLM will not restrict locations or timing with respect to use of equestrian trails.

## Cumulative Effects to Recreation

Forestry operations in the state forest and on private lands within the Decision Area produce noises exceeding 100 dB. About 20 oil and gas wells have been constructed within 1,500 feet of the equestrian trail system, and about 20 wells have been constructed within 1,500 feet of Blue Rock State Park. These developments most likely took place at various times of year and had highly variable effects on recreational activities. Also, since these developments are spread out across almost a century, some of these activities predate public ownership of the state forest and the recreational opportunities therein.

## Socioeconomics

Potentially, several hundred direct and indirect mining-related jobs could be expected if marketable quantities of oil and/or natural gas are eventually produced in the project area. The wages for these mining and mining-related jobs, in most cases, will exceed the average annual wage of most non-mining jobs in the county (see *Socioeconomics*, Chapter 3). Royalty payments to the State of Ohio resulting from any production would help to offset the tax burden of state residents. As described in the *Recreation* section above, decreased recreational opportunities during well construction, operation, and abandonment would adversely affect revenue from, and enjoyment derived from, the various outdoor activities that draw the public to the Blue Rock State Forest. The mitigation measures described throughout Chapter 4 of this EA can help to alleviate some of the impacts of increased mining activity.

## Soils

The primary impact of the proposed action to soils would be erosion caused by construction on steep slopes and poorly designed or constructed roads and pads. Removal of vegetation exposes soil to rainfall and makes it highly susceptible to erosion, and this effect is compounded on steep slopes. Likewise, roads cause erosion if they are not constructed to certain specifications to account for slope, intensity of use, seasonal freezing and thawing, and other factors. The amount of land that can be impacted by poor design and construction exceeds the area directly disturbed by well pads, roads, and other infrastructure. This is because erosion on a steep slope is not necessarily confined to the disturbed area but may cause other, undisturbed areas to become unstable and erosion-prone.

Disturbance of soils with fragipan horizons on slopes may destabilize slopes. This may be an important issue to consider if roads are proposed on slopes leading up to ridgetop pad sites. Reclamation may be problematic in strongly acid soils. The BLM would incorporate the ODNR's BMPs (see *Invasive Species/Noxious Weeds*, in this chapter) and other appropriate BMPs (Michigan DNR/DEQ, 2009), in consultation with the ODNR, as a stipulation on the lease(s) (see Appendix B).

Due to the abundance of steep slopes in the Blue Rock State Forest, the Ohio DNR has specified its preferred for well pad locations, which occur on broad ridgetops. The BLM would stipulate that any wells constructed inside the state forest be in these locations (see Appendix B).

## Bureau-Sensitive Species and Migratory Birds

Since stipulations will restrict construction activities in and near wetlands, most habitat-related impacts to aquatic species are not expected to result from the proposed action. Applicants for drilling permits would be required to conduct surveys of areas that may contain endangered species, notably Indiana bat, and to adhere to the recommendations provided by the Fish and Wildlife Service for avoiding and

minimizing impacts to species. Depending on locations of proposed wells and the timing of drilling, migratory birds could be impacted by the removal or degradation of stopover and/or nesting habitat. As with endangered species, these site- and time-specific factors would be considered in appropriate detail as APDs are submitted to the BLM.

## Vegetation and Visual Resources

Impacts for vegetation and visual resources are combined because the primary visual quality of the Decision Area is defined by the vegetation or the agricultural or industrial activities that displace the vegetation. Since surface occupancy will be prohibited in wetlands, any drilling that takes place will be in uplands, which may impact forest vegetation, croplands, pastures, or other types of vegetation. Using the figures provided in Chapter 2, the BLM estimates that up to 20 acres of vegetation could be cleared for drilling-related construction during the term of the lease. These areas would be cleared and maintained for various durations and restored after their uses as roads, staging areas, or well pads, and then restored as described in Chapter 2.

## Cumulative Impacts to Vegetation and Visual Resources

The ODNR has conducted an average annual harvest of 176,091 board feet, 19 percent of annual timber growth in the state forest, in the ten years leading up to 2010.

If drilling were to coincide with prescribed cutting, so that drilling were done in an area already prescribed to be cut, the *additional* impacts of drilling in upland stands would be as follows:

- Complete vegetation removal – while prescribed forestry practices leave trees of selected species and ages as well as shrubs and herbaceous vegetation, well pad construction would result in total vegetation clearing.
- Retention of cleared areas – while harvested areas would be allowed to regenerate or would be actively planted, well pads would be maintained in a cleared state until the wells were abandoned.

Before the government purchased the land that became the Blue Rock State Forest, most of the proposed lease area was cleared of timber. Since then, much of the land has regenerated in native hardwoods, while portions have been planted in pines. The more than 800 oil and gas wells that have been constructed in the Decision Area have resulted in the clearing of thousands of acres of land in the last century.

## Water Resources and Water Quality

Wetlands and waterways will be protecting from filling by lease stipulations that prevent surface occupancy in wetlands and within certain distances of waterways, and the same Best Management Practices that are applied to protect potentially highly erodible soils will be used to protect surface waters from runoff.

The Muskingum River is the likely source for water to be used in drilling and well completion. The volume of water required would depend on the depth of the oil/gas well. Conventional wells using up to 50,000 gallons of water would be using roughly one second's worth of the Muskingum River's mean annual discharge. If this volume of water is used over a period of three days, then the process would be

using an average of 23 gallons per second, or 0.05 percent of the Muskingum River's mean annual flow. The City of Zanesville, just upstream of the Decision Area, used water at a rate about 370 times as high in 1994, and the tiny Village of Philo, in the northwestern edge of the Decision Area, used 132,000 gallons per day, or 183 gallons per second, through the same year. The State of Ohio requires that anyone operating a water withdrawal system capable of withdrawing more than 100,000 gallons per day to register the system with the State.

Some of the water that is used in hydrofracture remains in the producing formation, and some of that water returns to the surface, where it can be disposed of or treated and reused. Water that returns to the surface, known as *produced water* or *frack water*, may be injected into deep disposal wells. This is one option in Ohio, although treatment technologies are also economical alternatives to deep-well disposal.

Both hydrofracture and deep-well disposal take place in formations thousands of feet below the lowest potable water, making contamination of potable water supplies unlikely (Abdalla, 2012). Fluids have been found not to migrate such long distances through single fractures, but it is feasible that multiple fractures may permit migration over longer distances (Mooney, 2011). Likewise, natural fissures in the bedrock may allow fluids to travel toward potable water supplies. Fractures may also connect to existing wells, allowing contaminants to travel through the wells' annular spaces to fresh water aquifers. These spaces are sealed with cement, and failure of these cement seals is considered to be an important vulnerability in well construction and permitting.

There is anecdotal evidence of fracking chemicals contaminating drinking water wells (Lustgarten, 2011), and there are studies demonstrating that horizontal drilling in shale gas formations does not contaminate them (Boyer, 2012). The U.S. EPA is planning to conduct a study of the issue (USEPA, 2011), and the BLM will continue to consider ongoing scientific evidence as it becomes available throughout the APD process.

## CHAPTER 5 – PERSONS, GROUPS, AGENCIES, and FEDERALLY RECOGNIZED TRIBES CONSULTED

### Consultation and Coordination

#### List of Persons, Agencies and Organizations Consulted

Name	Purpose & Authorities for Consultation or Coordination	Findings & Conclusions
Bob Boyles, State Forester, Greg Guess, District Silviculturalist, and Nate Jester, Southern District Manager, Division of Forestry, Ohio Department of Natural Resources	General information regarding the Blue Rock State Forest	Provided information regarding current and historical timber management and oil and gas development.
Mark Epstein Department Head, Resource Protection and Review Ohio Historic Preservation Office (OHPO)	Antiquities Act, Section 106	In a letter dated March 15 <sup>th</sup> , 2013, the OHPO stated that there are 20-plus recorded archaeological sites in the decision area including one listed on the National Register of Historic Places, the Philo II Archaeological District (mound). Most of these sites are cemeteries and structures. They also state there is a high probability of finding archaeological sites along the Muskingum River. OHPO asks to be consulted on any future APDs or other ground disturbing activities.

### Federally Recognized Indian Tribes

The BLM initiated government to government consultation by letter with the Delaware Tribe of Indians of Anadarko, OK, on January 17, 2013, and the Delaware Nation of Indians, on January 16, 2013. The Delaware Nation responded by email on February 12, 2013 that they had no further comments on this project. The Delaware Tribe responded by letter on January 31, 2013 that they had no knowledge of sites with cultural or religious significance but requested an archaeological survey be conducted prior to any ground disturbing activities; they also request a copy of any archaeological survey reports done in connection to this project. Consultation will be ongoing throughout the project.

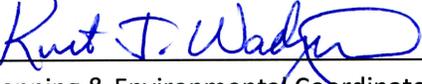
## List of Preparers

### BLM Preparers

Name	Title	Responsible for the Following Section(s) of this Document
Derek Strohl	Natural Resources Specialist	Air Quality, Climate Change, Cultural Resources, Native American Religious Concerns, Prime and Unique Farmlands, Fish and Wildlife, Floodplains, Hazardous Wastes, Invasive Species/Noxious Weeds, Recreation, Soils, Threatened, Endangered, or Candidate Animal Species/Migratory Birds, Vegetation, Visual Resources, Water Resources/Quality (Drinking/Surface/Ground), Wetland/Riparian Zones, Wild and Scenic Rivers, and Wilderness
Kurt Wadzinski	Planning and Environmental Coordinator	Environmental Justice, Socioeconomics
Jeff Nolder	Geologist	Geology/Mineral Resources/Energy Production

  
 \_\_\_\_\_  
 Preparer

3/22/2013  
 Date

  
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 Planning & Environmental Coordinator

3/22/2013  
 Date

  
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 Assistant Field Manager, Mineral Resources

3/22/2013  
 Date

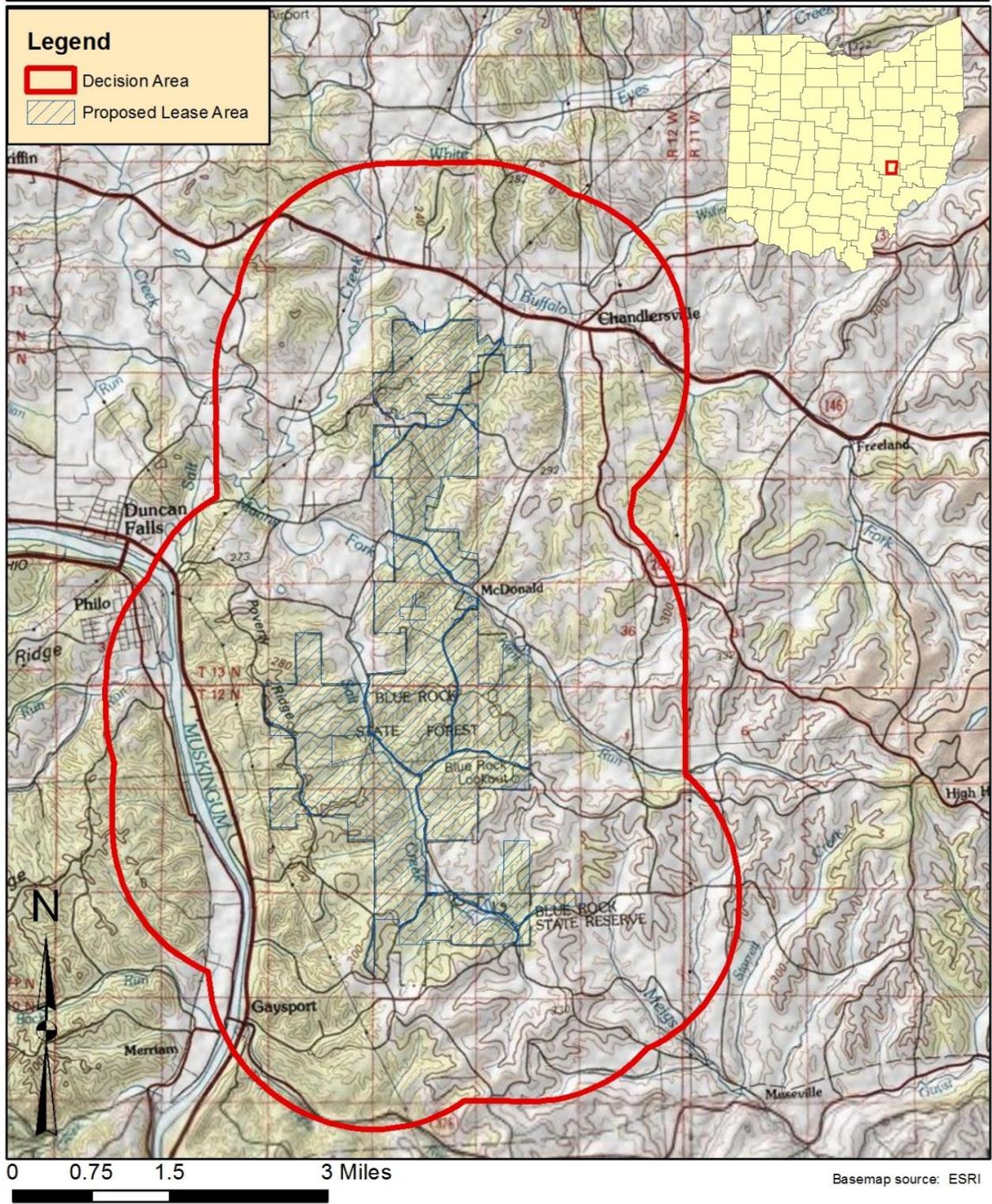
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## **APPENDIX A - FIGURES**

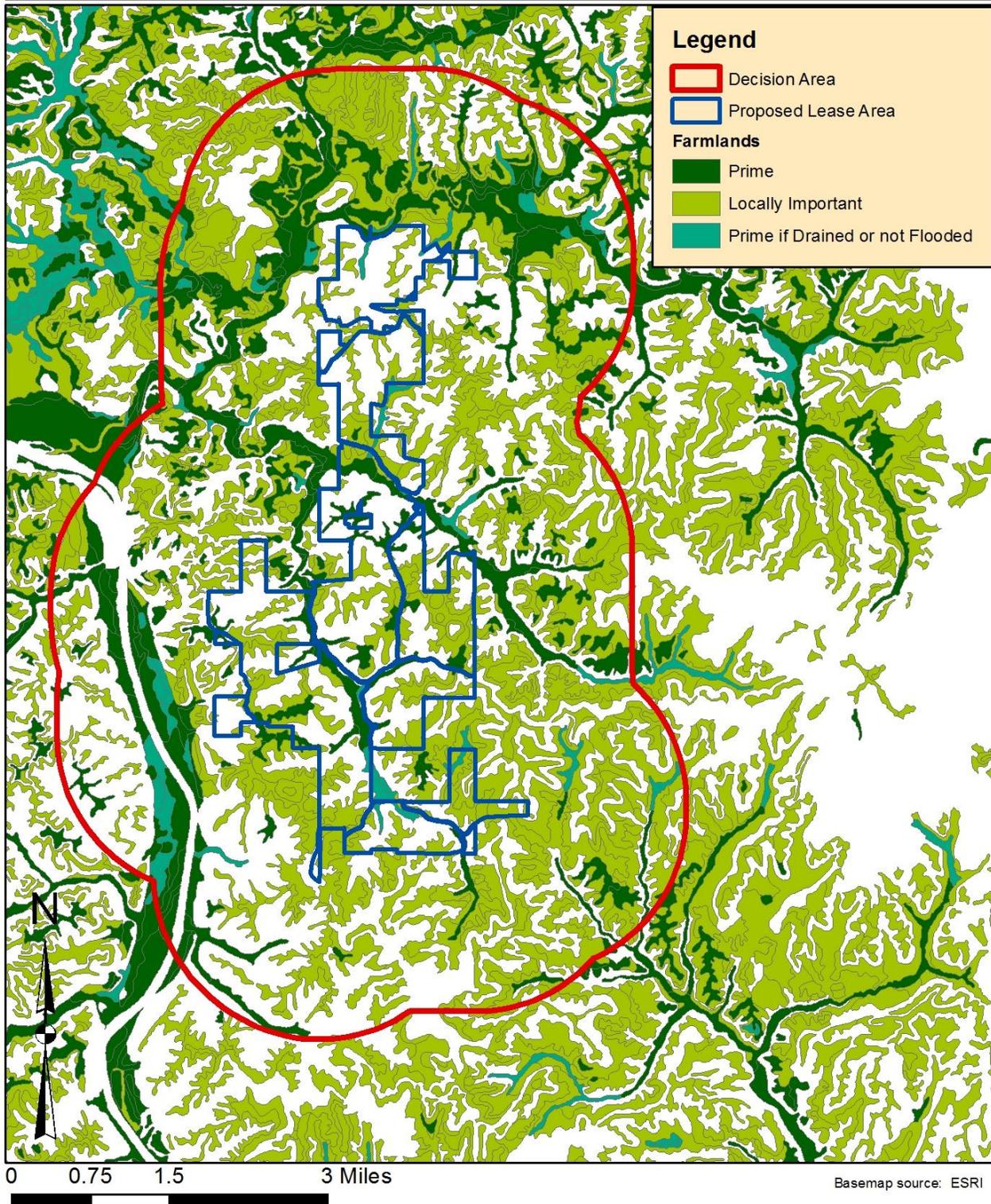
Figure 1. Proposed Lease Area and Decision Area



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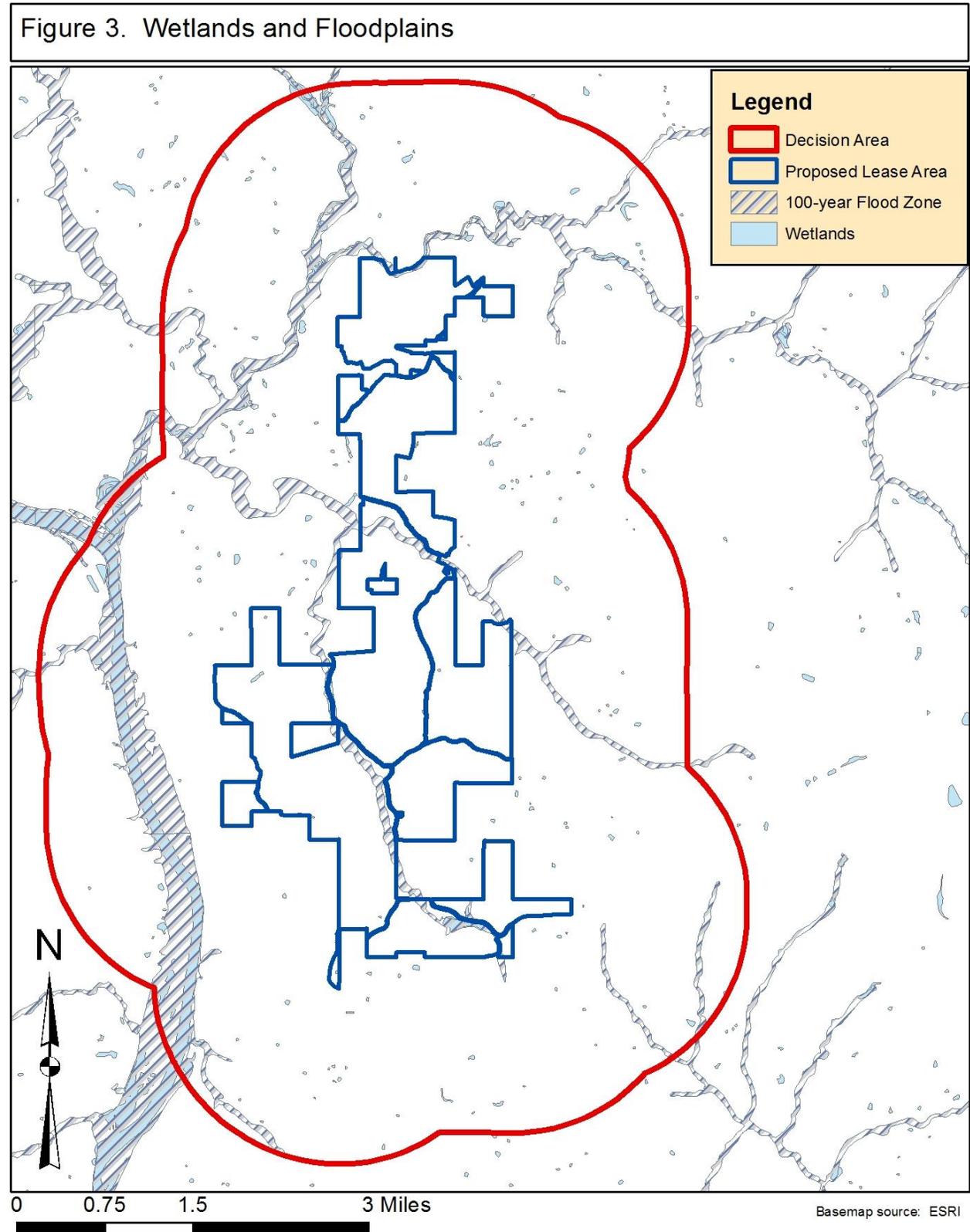


Figure 2. Prime and Locally Important Farmlands



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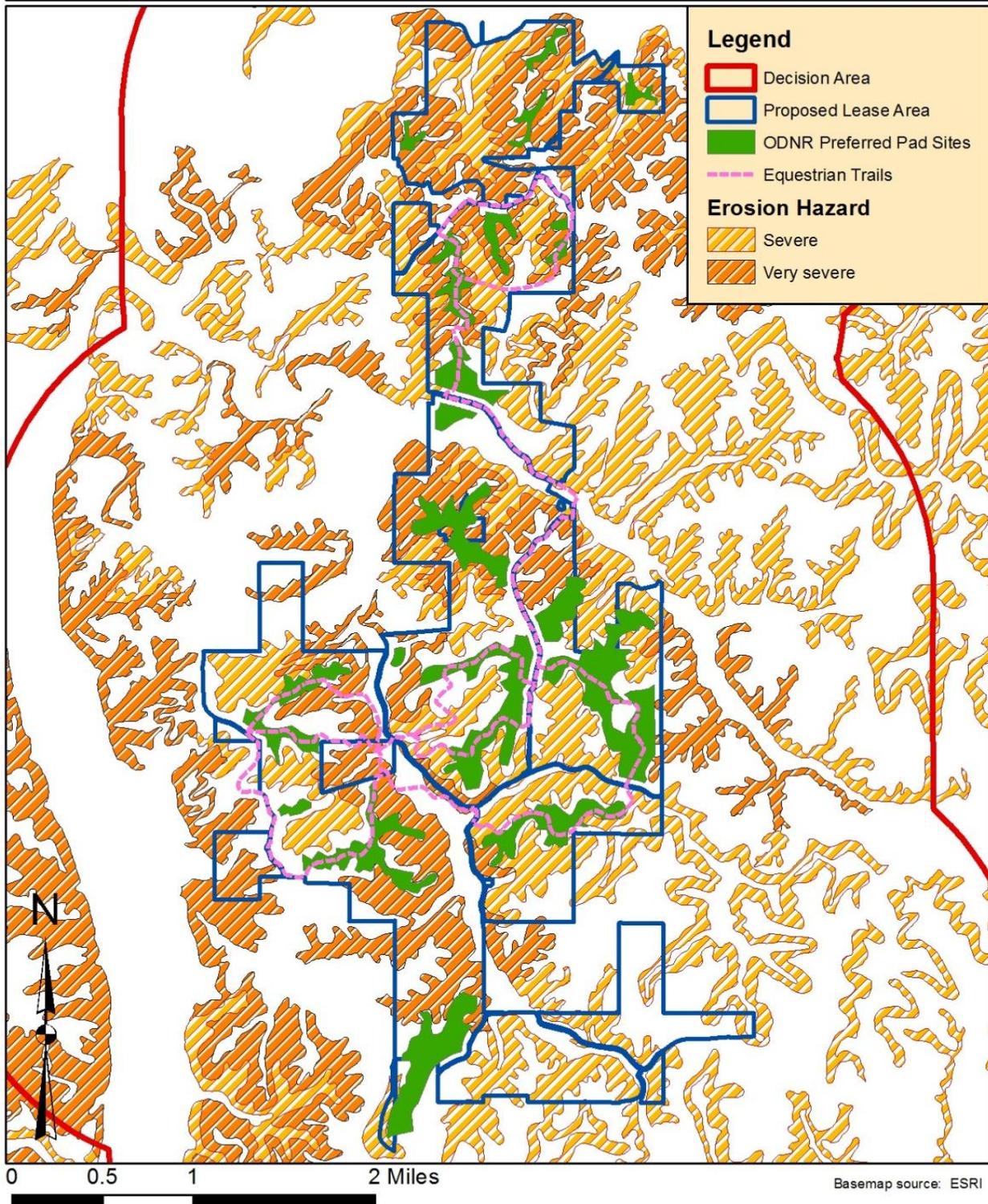




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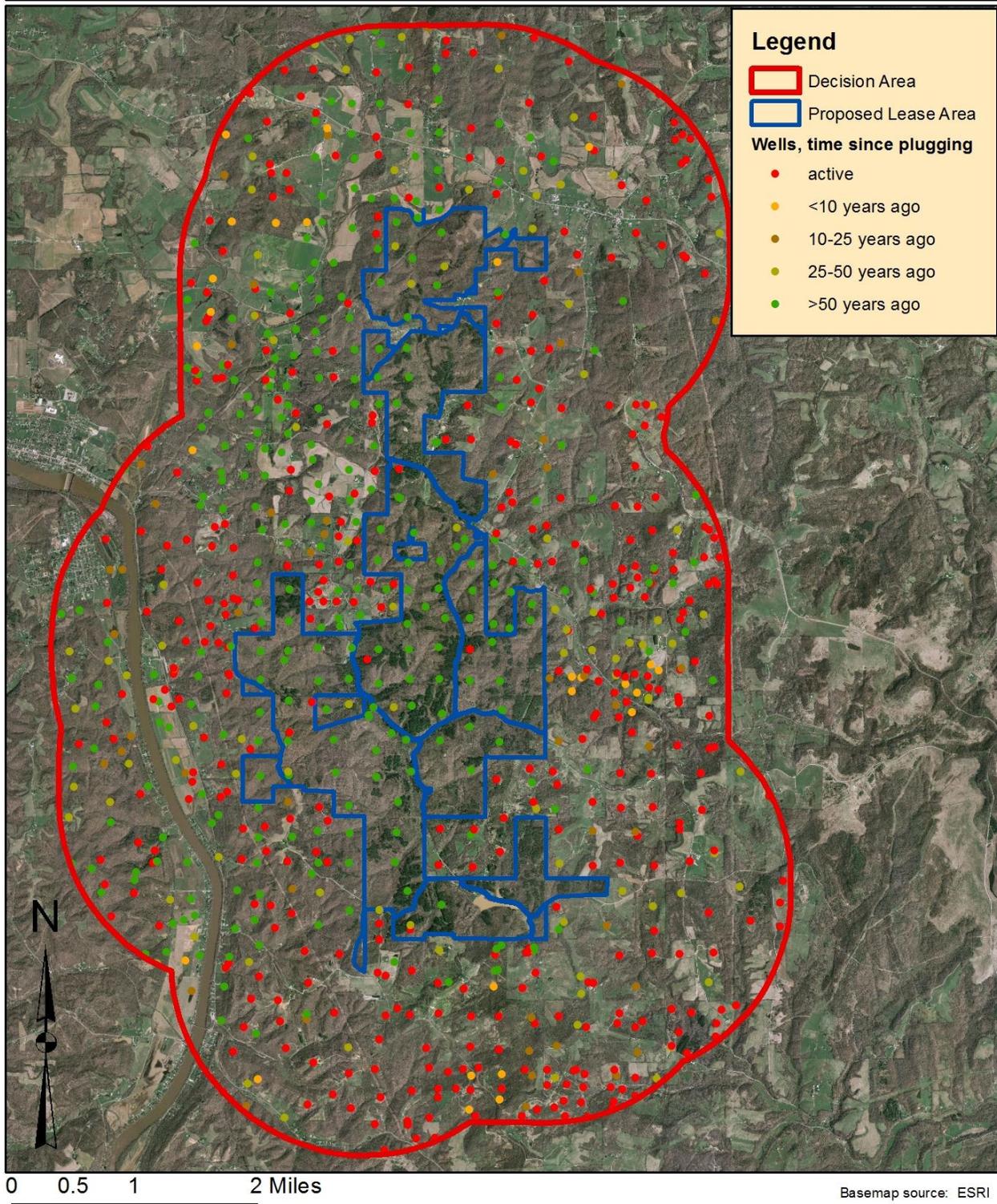
Figure 4. Erosion Hazard Areas, ODNR Preferred Pad Sites, and Equestrian Trails



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Figure 5. Oil and Gas Wells and Time Elapsed Since Plugging



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## **APPENDIX B – STIPULATIONS AND NOTICES**

### **LEASE NOTICES**

1. The area that may be developed contains many wetlands, including many small seeps and other wetlands that do not have saturated soils year-round. Disturbance in or discharge into wetlands must comply with the Clean Water Act, notably Sections 401 (Water Quality Certification) and 404 (wetland filling), and Ohio Revised Code 6111.02 to 6111.028. Applicants for drilling permits will be required to conduct a wetland survey of areas to be disturbed.
2. Applicants for drilling permits will be required to conduct a cultural resources Phase I survey. Cultural Resource surveys may also be required prior to the start of subsequent well operations which involve additional surface disturbance. Mitigation measures or movement of planned ground disturbance may be necessary to avoid adverse effects to cultural resources. The need and requirements for mitigation or alterations will be based on consultation between the lessee, Bureau of Land Management, the Ohio State Historic Preservation Office, and the Advisory Council on Historic Preservation.
3. Applicants for drilling permits may be required to submit a Discovery Plan for accidental archaeological discoveries, occurring during ground-disturbing activities, that were not detected during initial surveys. This may include consultation between the Bureau of Land Management, Ohio State Historic Preservation Office, and the Advisory Council on Historic Properties.

**No Surface Occupancy Stipulation**

No surface occupancy will be permitted on or within 300 feet of the Blue Rock State Park.

Purpose: Protect recreational use of the state park.

Exception/modification/waiver: No exceptions, modifications, or waivers will be made to this stipulation.

**No Surface Occupancy Stipulation**

No surface occupancy will be permitted within 200 feet of a navigable waterway.

Purpose: Protect surface water quality.

Exception: The BLM may grant exceptions for use of existing roadways and utility rights-of-way. Exceptions must be made in writing by the BLM and the Chief, Division of Forestry, ODNR.

Waiver/modification: No waivers or modifications will be made to this stipulation.

**Controlled Surface Use Stipulation**

On all portions of the lease outside of the ODNR-identified ***Preferred Pad Locations*** (Appendix A, Figure 4), surface use must meet these performance measures:

- a. Operator shall delineate soil types with *severe* erosion rating or fragipan horizon within area to be disturbed,
- b. Operator shall prepare soil management plan identifying BMPs and other practices to be employed to minimize erosion, including storm contingency plan, topsoil stockpiling location(s), and road designs. Plan must be approved by BLM and the ODNR.

This stipulation affects 3,800 acres of the EOI, leaving about 730 acres (preferred pad locations) unaffected by the stipulation.

Purpose: Protect soil within state forest.

Exception: The BLM may grant exceptions to this stipulation in cases of trenching through existing utility rights-of-way and utilization without expansion of existing roads.

Modification: No modifications may be made to this stipulation.

Waiver: No waivers may be made to this stipulation.

**Controlled Surface Use Stipulation**

Surface occupancy on the entire lease is subject to the following:

Operator shall delineate, within area to be disturbed, infestations of non-native, invasive plant species, including, but not limited to, tree of heaven (*Ailanthus altissima*), autumn olive (*Elaeagnus umbellata*), multiflora rose (*Rosa multiflora*), and Japanese stilt grass (*Microstegium vimineum*). Operator shall prepare an invasive species control plan for approval by the Chief, Division of Forestry, ODNR and BLM. Guides to the use of recommended best management practices for controlling the spread of invasive plant species are found in the Wisconsin Council on Forestry's invasive species best management practices at <http://council.wisconsinforestry.org/invasives/> and *BMPs and Recommendations for Oil and Gas Activities on State of Ohio Lands*, available from the Division of Forestry, ODNR. Many of the same practices that are employed for preventing soil erosion also function to prevent the spread of invasive species.

Purpose: Protecting native vegetation communities and timber resources.

Exception/modification/waiver: No exceptions, modifications, or waivers will be made to this stipulation.