

United States Department of the Interior  
Bureau of Land Management  
Northeastern States Field Office  
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# Draft Environmental Assessment

NEPA #: DOI-BLM-Eastern States-0030-2016-0002-EA

## Oil and Gas Leasing, Wayne National Forest, Marietta Unit of the Athens Ranger District, Monroe, Noble, and Washington Counties, Ohio

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**Date:** April 2016

**Type of Action:** Oil and Gas Leasing

**Locations:** Benton, Center, Green, Jackson, Lee, Perry, Summit, Washington, and Wayne Townships, Monroe County, Ohio  
Lawrence and Liberty Townships, Washington County, Ohio  
Elk Township, Noble County, Ohio

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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.

**Table i. Technical review.**

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\_\_\_\_\_  
Preparer

\_\_\_\_\_  
Date

\_\_\_\_\_  
Planning & Environmental Coordinator

\_\_\_\_\_  
Date

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Associate District Manager

\_\_\_\_\_  
Date

## EXECUTIVE SUMMARY

The Bureau of Land Management (BLM) proposes to lease up to approximately 40,000 federally-owned minerals located in the Wayne National Forest, Athens Ranger District, Marietta Unit in Monroe, Noble, and Washington Counties in Ohio. This approximate acreage figure represents the total amount of federally-owned minerals that could be nominated and potentially be made available for leasing on the Marietta Unit. Industry uses the BLM Expression of Interest (EOI) process to nominate federal minerals for leasing. To date, industry has submitted over fifty EOIs for parcels located on the Marietta Unit totaling approximately 18,000 acres. The BLM and the U.S. Forest Service (Forest Service) review deeds on a parcel-by-parcel basis to verify federal mineral ownership as leasing nominations are received.

Mineral ownership is highly fragmented and complicated throughout the WNF. Approximately 59% of the WNF surface ownership is underlain by private minerals. The remaining approximately 41% of surface ownership is underlain by federal minerals. The federal government owns a 100% mineral interest in approximately 10,000 acres and owns a partial mineral interest in approximately 8,200 acres underlying NFS lands on the Marietta Unit, totaling more than 18,000 acres. There are current leases on an additional 10,000 acres, which may be federally owned and more than 13,000 acres of reserved minerals that will revert to the federal government in the future. The Proposed Action also applies to the minerals that are reverting. The Forest Service has authority to purchase lands; therefore acreages listed above are subject to change through time.

Under the Proposed Action, the BLM would offer for lease, at future BLM Eastern States competitive oil and gas lease sales, nominated parcels that have been reviewed and approved by the BLM and the Forest Service. In accordance with 43 Code of Federal Regulations (CFR) 3120, approved parcels will be identified, along with any attached stipulations and notices, through a Notice of Competitive Lease Sale that will be posted at least 90 days prior to a lease sale.

As there are at least 50 EOIs to nominate parcels on the Marietta Unit and due to the complicated nature of the mineral estate on the Wayne National Forest, the final EA for this Proposed Action will be used to lease nominated parcels on the Marietta Unit that will undergo review by BLM and the Forest Service over the next few years. Any nominated parcels reviewed and approved for competitive leasing by the BLM and Forest Service after the initial lease sale in which parcels are auctioned would be addressed with a Determination of NEPA Adequacy (DNA) document tiered to the environmental analysis in the final EA. Approved lease parcels would then be auctioned at future BLM Eastern States competitive oil and gas lease sales.

The proposed leases would provide the lessee(s) exclusive rights to explore and develop oil and gas reserves on the leases but do not authorize surface disturbing activities. Although there would be no surface disturbance from the action of leasing, the Environmental Assessment (EA) analyzes a reasonably foreseeable development scenario (RFDS) to address the anticipated environmental effects from potential future oil and gas development. Before a lessee or operator conducts any surface-disturbing activities related to the development of these leases, the Bureau of Land Management (BLM)

must first approve an application for permit to drill (APD) as specified in 43 CFR 3162. In an APD, an applicant proposes to drill the well subject to the terms and conditions of the lease. Upon receipt of an APD, the BLM conducts an onsite inspection with the applicant and the landowner. The Forest Service and BLM would also conduct additional site-specific analysis in compliance with the National Environmental Policy Act (NEPA) and the appropriate consultations under the Endangered Species Act (ESA) and National Historic Preservation Act (NHPA) prior to approving the APD.

The purpose of the Proposed Action is to support the development of oil and natural gas resources that are essential to meeting the nation’s future needs for energy. It is the policy of the BLM as mandated by various laws, including the Mineral Leasing Act of 1920, as amended (30 United States Code [USC] 181 et seq.), the Federal Land Policy and Management Act of 1976 (FLPMA), and the Energy Policy Act of 2005 to make mineral resources available for development to meet national, regional, and local needs. The oil and gas leasing program managed by the BLM encourages the sustainable development of domestic oil and gas reserves which reduces the dependence of the United States on foreign sources of energy as part of its multiple-use and sustainable yield mandate. The leasing of federal minerals is vital to the United States as it seeks to maintain adequate domestic production of this strategic resource. The Proposed Action is therefore needed to respond to EOIs, consistent with the BLM’s mission and requirement to evaluate nominated parcels and hold quarterly competitive lease sales for available oil and gas lease parcels.

The Proposed Action and alternatives are in compliance with the *Final Revised Land and Resource Management Plan, Wayne National Forest (2006 Forest Plan)* (U.S. Forest Service, 2006). The BLM was a cooperating agency in development of the 2006 Forest Plan. This EA incorporates, where appropriate, the information from that plan and associated NEPA documentation. This EA also incorporates the information from a related review effort resulting in a Supplemental Information Report (SIR) on oil and gas (U.S. Forest Service, 2012), prepared by the Forest Service in coordination with the BLM.

The anticipated environmental impacts of the Proposed Action and No Action Alternative are summarized in Table ii.

**Table ii. Anticipated environmental effects of Proposed Action and No Action Alternative.**

Resource	No Action Alternative	Proposed Action
Air Resources	No effect	No direct impacts from leasing. Potential for minor, short and long-term emissions from potential future construction activities and well completion, including National Ambient Air Quality Standards (NAAQS) criteria contaminants and hazardous air pollutants. Effects from emissions may include health hazards, reduced visibility, and contribution to global climate change. Effects minimized by Standard Operating Procedures (SOPs), best

Resource	No Action Alternative	Proposed Action
		management practices (BMPs) and conditions of approval (COAs) at time of drilling.
Plant and Animal Habitat and Populations	No effect	No direct impacts from leasing. Potential for minor to moderate habitat modification through clearing vegetation for potential future construction of roads, pads, and other infrastructure. Potential effects dependent on locations of proposed wells. Some clearing would be temporary, and all areas would be restored during interim or final reclamation. Effects minimized by 2006 Forest Plan's objectives and stipulations protecting sensitive species and habitats.
Geology and Mineral Resources	No effect	No direct impacts from leasing. Induced seismicity unlikely from potential future oil and gas development, and no likely effects to other potentially marketable minerals.
Soils	No effect	No direct impacts from leasing. Potential for minor soil compaction, increased erosion, and polluted runoff from potential future mineral development. Future reasonably foreseeable effects minimized by lease stipulations and BMPs.
Water Resources and Water Quality	No effect	No direct impacts from leasing. Potential for large surface water withdrawals for drilling and completion associated with potential reasonably foreseeable future development. Some risk of chemical spills and erosion from roads and pads. Future reasonably foreseeable effects minimized by Forest Service policies for water withdrawal and waterway protection and soil-conservation measures.
Wastes, Hazardous or Solid	No effect	No direct impacts from leasing. Wastes would be generated from reasonably foreseeable development, with a potential for short- and long-term adverse impacts if wastes are not properly handled, stored, and disposed. SOPs, BMPs, and COAs at the APD stage would minimize risk from spills.
Recreation, Land Use and Noise	No effect	No direct impacts from leasing. Minor, short- and long-term changes to land use from reasonably foreseeable development activities due to conversion of undeveloped areas to areas that support oil and gas development. Future reasonably foreseeable effects minimized by stipulations and other Forest Service measures for

Resource	No Action Alternative	Proposed Action
		protecting recreation resources. Noise levels would lessen during the production phase.
Cultural Resources/Paleontology/Native American Religious Concerns	No effect	No direct impacts from leasing. Future surveys or consultation under the NHPA may be required at the APD stage. The BLM and Forest Service would conduct future tribal consultation at the site-specific level.
Visual Resources/Scenic Quality	No effect	No direct impacts from leasing. Minor, short- and long-term adverse noise and visual impacts possible from reasonably foreseeable development associated with the proposed lease parcels.
Socioeconomics and Environmental Justice	Loss, reduction, or delay of revenues generated through leasing and royalties.	Leasing would generate revenues that would be shared with counties. Reasonably foreseeable development may generate additional royalties, economic stimulation in form of additional employment, output, and support services. Environmental justice concerns are not expected to occur, since private landowners have the option to influence lease terms for operators using their lands to access federal minerals.
Cumulative Impacts	N/A	Minor cumulative impacts overall. Forest Service management of WNF provides long-term improvement of all resources through implementation of 2006 Forest Plan. Oil and gas leasing and potential development are considered in the 2006 Forest Plan along with other activities and do not threaten the Plan's desired outcomes or objectives for WNF.

## Acronyms

AMD – Acid Mine Drainage	HF – Hydraulic Fracturing
AMDAT - Acid Mine Drainage Abatement and Treatment	HUC – Hydraulic Unit Code
AML - Abandoned Mine Land	HVHF – High-Volume Hydraulic Fracturing
APD – Application for Permit to Drill	IBI - Index of Biotic Integrity
ATV – All Terrain Vehicle	ICI - Invertebrate Community Index
BE – Biological Evaluation	LOC – Levels of Concern
BLM - Bureau of Land Management	LRMP – Land and Resource Management Plan
BMP – Best Management Practice	LUP – Land Use Plan
BO – Biological Opinion	MACT – Maximum Achievable Control Technology
CAA - Clean Air Act	MBTA - Migratory Bird Treaty Act
CAIR – Clean Air Interstate Rule	MIwb - Modified Index of Well-Being
CFR - Code of Federal Regulations	MLA - Mineral Leasing Act
CEQ – Council on Environmental Quality	mm - millimeter
CERCLA - Comprehensive Environmental Response Compensation and Liability Act	NAAQS – National Ambient Air Quality Standards
CH <sub>4</sub> - Methane	NAGPRA – Native American Graves Protection and Repatriation Act
CO – Carbon Monoxide	NEPA - National Environmental Policy Act
CO <sub>2</sub> – Carbon Dioxide	NESHAP - National Emission Standards for Hazardous Air Pollutants
CO <sub>2</sub> e – Carbon Dioxide Equivalent	NFS – National Forest System
CSAPR – Cross-State Air Pollution Rule	NHPA - National Historic Preservation Act
CWA - Clean Water Act	NO <sub>x</sub> – Nitrogen Oxides
DAPC – Division of Air Pollution Control	NOI - Notice of Intent for Geophysical Exploration
DNA-Determination of NEPA Adequacy	NSD - Northeastern States District
DOGRM - Division of Oil and Gas Resources Management	O <sub>3</sub> - Ozone
DOI - Department of the Interior	ODNR – Ohio Department of Natural Resources
DR – Decision Record	OHV – Off-Highway Vehicle
EA - Environmental Assessment	Pb – Lead
EO - Executive Order	PCBs - Polychlorinated Biphenyls
EOI – Expression of Interest	PM – Particulate Matter
EPA – Environmental Protection Agency	PSD – Prevention of Significant Deterioration
ESA - Endangered Species Act	RCRA - Resource Conservation and Recovery Act
ESO - Eastern States Office	RFDS – Reasonably Foreseeable Development Scenario
FA – Flow Alteration	SIO - Scenic Integrity Objectives
FLPMA - Federal Land Policy and Management Act	SIP – State Implementation Plan
FONSI - Finding of No Significant Impact	SIR – Supplemental Information Report
FOOGLRA - Federal Onshore Oil and Gas Leasing Reform Act	SMS - Scenery Management System
GHG – Greenhouse Gas	SO <sub>2</sub> – Sulfur Dioxide
HA - Habitat Alterations	

## Acronyms

SOP – Standard Operating Procedure

TMDL - Total Maximum Daily Load

TSS - Total Suspended Solids

TT - Total Toxics

USC – United States Code

USFWS - U.S. Fish and Wildlife Service

UTV-Utility Task Vehicle

VMS - Visual Management System

VOC – Volatile Organic Compound

VQO - Visual Quality Objectives

VRM – Visual Resource Management

WNF – Wayne National Forest

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# 1. PURPOSE AND NEED

## 1.1. Introduction

The Bureau of Land Management (BLM) has prepared this draft Environmental Assessment (EA) to evaluate the anticipated environmental impacts of leasing federal mineral estate to support potential future oil and gas development within the proclamation boundary of the Wayne National Forest (WNF), Athens Ranger District, Marietta Unit, located in Monroe, Noble, and Washington Counties, Ohio (Marietta Unit). Interested parties such as private individuals or companies may file Expressions of Interest (EOIs) to nominate parcels for competitive bid and leasing by the BLM. The BLM has received at least 50 EOIs to nominate parcels on the Marietta Unit and due to the complicated nature of the mineral estate on the Wayne National Forest, the final EA for this Proposed Action will be used to lease nominated parcels on the Marietta Unit that will undergo review by BLM and the Forest Service over the next few years. Any nominated parcels reviewed and approved for competitive leasing by the BLM and Forest Service after the initial lease sale in which parcels are auctioned would be addressed with a Determination of NEPA Adequacy (DNA) document tiered to the environmental analysis in the final EA. Approved lease parcels would then be auctioned at future BLM Eastern States competitive oil and gas lease sales.

The parcels that could be leased as part of the Proposed Action consist of all federal mineral estate underlying National Forest System (NFS) lands within the proclamation boundary of the Marietta Unit and total approximately 40,000 acres. 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 but does not authorize surface-disturbing activities or obligate the lessee to drill a well on the parcel in the future. Should the parcel be leased and a detailed plan for oil and gas development on the parcel be identified, the BLM and Forest Service would conduct future site-specific environmental analysis prior to any ground disturbing activities. The Proposed Action evaluated in this EA is described in further detail in Chapter 2.

This EA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969; the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 Code of Federal Regulations [CFR] Parts 1500-1508), the United States Department of the Interior (DOI) NEPA requirements (Department Manual 516, Environmental Quality) and the BLM NEPA Handbook H-1790-1. The information presented within this document serves as the basis for the BLM Authorized Officer to decide whether the Proposed Action would result in significant impacts to the environment. Significant impacts would, require the preparation of an Environmental Impact Statement (EIS). If the BLM Authorized Officer determines that no significant impacts would occur, a Finding of No Significant Impact (FONSI) would be issued

## 1.2. Location of the Proposed Action

The Proposed Action is for lands located in Monroe, Noble, and Washington Counties in Ohio. Maps are included in Chapter 6 of this EA. Map 1 depicts an overview of the WNF showing each ranger

district/unit proclamation boundary. Map 2 is an overview of the Marietta Unit. Map 3 indicates the locations of EOIs on the Marietta Unit that have been received as of the release date of this EA.

### **1.3. Purpose and Need of the Proposed Action**

The purpose of the Proposed Action is to support the development of oil and natural gas resources that are essential to meeting the nation's future needs for energy. It is the policy of the BLM as mandated by various laws, including the Mineral Leasing Act of 1920, as amended (30 United States Code [USC] 181 et seq.), the Federal Land Policy and Management Act of 1976 (FLPMA), and the Energy Policy Act of 2005 to make mineral resources available for development to meet national, regional, and local needs. The oil and gas leasing program managed by the BLM encourages the sustainable development of domestic oil and gas reserves which reduces the dependence of the United States on foreign sources of energy as part of its multiple-use and sustainable yield mandate.

The leasing of federal minerals is vital to the United States as it seeks to maintain adequate domestic production of this strategic resource. Industry uses the BLM EOI process to nominate federal minerals for leasing. The Proposed Action is consistent with the BLM's mission and requirement to evaluate nominated parcels and hold quarterly competitive lease sales for available oil and gas lease parcels.

### **1.4. Management Objectives of the Proposed Action**

The management objective of the Proposed Action is to make federal minerals available for development in an environmentally sound manner.

### **1.5. Relationship to Statutes, Regulations, Land Use Plans, and Policy**

The Proposed Action and alternatives are in compliance with the 2006 *Final Revised Land and Resource Management Plan, Wayne National Forest* (2006 Forest Plan) (U.S. Forest Service, 2006). The BLM was a cooperating agency in development of the 2006 Forest Plan and its related Final Environmental Impact Statement (2006 Forest Plan Final EIS) (U.S. Forest Service, 2005). This EA incorporates by reference relevant information from the 2006 Forest Plan and the 2006 Forest Plan Final EIS. This EA also incorporates information from a related review effort resulting in a Supplemental Information Report (SIR) on oil and gas (U.S. Forest Service, 2012), prepared by the Forest Service in coordination with the BLM. Goal 10.1 in the 2006 Forest Plan states, "Provide a supply of mineral commodities for current and future generations, while protecting the long-term health and biological diversity of ecosystems. Facilitate the orderly exploration, development, and production of mineral and energy resources on land open to these activities" (2006 Forest Plan, p. 2-41).

In addressing environmental considerations of the Proposed Action, the BLM is guided by relevant statutes (and their implementing regulations) and Executive Orders that establish standards and provide guidance on environmental and natural resources management and planning. These include but are not limited to the following:

- NEPA (1969) and the associated Council on Environmental Quality regulations at 43 CFR Parts 1500-1508
- FLPMA (1976) as amended and the associated regulations at 43 CFR Part 1600
- Mineral Leasing Act (MLA) (1920), as amended and supplemented (30 USC 181)
- National Historic Preservation Act (NHPA) (1966) as amended and the associated regulations at 36 CFR Part 800
- American Indian Religious Freedom Act
- Native American Graves Protection and Repatriation Act (NAGPRA) (1990)
- Endangered Species Act (ESA) (1973) as amended
- Clean Water Act (CWA) (1972) as amended
- Clean Air Act (CAA) (1970) as amended
- Federal Onshore Oil and Gas Leasing Reform Act (FOOGLRA) (1987)
- Migratory Bird Treaty Act (MBTA) (1918)
- Resource Conservation and Recovery Act (RCRA) (1976) as amended
- Executive Order (EO) 11988- Floodplain Management
- EO 11990 – Protection of Wetlands
- EO 12898 – Environmental Justice in Minority Populations and Low-Income Populations
- EO 13007 – Indian Sacred Sites
- Oil and Gas Leasing Reform – Land Use Planning and Lease Parcel Reviews (BLM WO IM 2010-117)

## 1.6. Decision to be Made

The BLM must decide whether or not to lease all or part of the federal minerals within the Athens Ranger District Marietta Unit of the WNF at future competitive oil and gas lease sale(s). The BLM, in coordination with the Forest Service, must also determine which stipulations and notices must be attached to such leases. The BLM's policy is to promote oil and gas development if it meets the guidelines and regulations set forth by the NEPA of 1969 and other subsequent laws and policies passed by the U.S. Congress.

## 1.7. Scoping and Issues

### 1.7.1. Internal scoping

A BLM interdisciplinary team consisting of Land Law Examiners, Natural Resource Specialists, NEPA Specialists, Geologists, GIS Specialists, and Cultural Resources Specialists prepared this EA in coordination with Forest Service personnel. The interdisciplinary team used various sources of information to prepare the EA, including existing data inventories, online resources, and information collected onsite. The BLM conducted site visits within the Marietta Unit on October 26 and 27, 2015 of portions of the Marietta Unit that have already been requested for leasing to document the physical characteristics of the area and collect information on baseline conditions. The BLM did not identify any issues of concern from internal scoping or the site visits.

### 1.7.2. External scoping

The BLM conducted required consultation with the Ohio State Historic Preservation Office (SHPO) and tribes. The BLM initiated consultation with the Ohio SHPO by letter dated November 16, 2015; the SHPO has yet to respond to the letter. On November 6, 2015, the BLM sent certified letters to seven federally recognized tribes who have a known connection to the area notifying them of the Proposed Action and asking to identify any concerns with respect to the Proposed Action. To date the BLM has received no responses. The following tribes were contacted:

- The Delaware Tribe of Indians
- The Delaware Nation
- The Shawnee Tribe
- The Eastern Shawnee Tribe of Oklahoma
- The Absentee Shawnee Tribe of Indians
- The Wyandotte Nation
- Peoria Tribe of Indians of Oklahoma

The Forest Service previously consulted with the U.S. Fish and Wildlife Service (FWS) under Section 7 of the Endangered Species Act with respect to federally listed species. Since the BLM was a cooperating agency in the 2006 Forest Plan, the consultation conducted with respect to the 2006 Forest Plan applies to the Proposed Action analyzed in this EA. The FWS's Biological Opinion (BO), dated November 22, 2005, provided a tiered approach to Section 7 consultation. The programmatic (Tier I) BO covers all the activities described in the 2006 Forest Plan at a programmatic, non-site-specific level. As the Forest Service (and, by extension, the BLM) analyzes particular projects, the Forest Service (and BLM) is responsible for reinitiating consultation at the project level by submitting to the FWS the following:

- description of the Proposed Action and area affected;
- list of the species that may be affected and their locations;
- description of the nature of the potential effects;
- determination of the effects;
- cumulative total of incidental takes to date under the Tier I BO;
- description of additional actions that were not described in the Tier I BO.

### 1.7.3. Public involvement

The BLM invites public participation in the NEPA process. Consideration of the views and information of all interested persons promotes open communication and enables more informed decision making. All agencies, organizations, and members of the public having a potential interest in the Proposed Action, including minority, low-income, disadvantaged, and Native American groups, are encouraged to participate in the decision making process.

The BLM conducted external scoping for leasing through a series of public meetings, requesting public comments, and through close coordination and data sharing with the Forest Service. Public notices appeared in local newspapers including the *Marietta Times*, *Athens Messenger*, and the *Ironton Tribune* for two consecutive weeks starting on November 1, 2015. The BLM also issued a press release to various news outlets on November 2, 2015, notifying the public of dates, times, and locations of the public meetings. Public meetings were held on November 17, 2015 in Marietta, November 18, 2015 in Athens, and November 19, 2015 in Ironton. The primary purpose for these public meetings was to provide information and gather public input regarding issues that the BLM should consider in this EA. At each meeting, the BLM and the Forest Service provided information regarding proposed oil and gas leasing activities throughout the WNF; displayed maps showing locations of requested leases and posters detailing the administrative processes associated with EOIs, leasing, and the NEPA; and answered inquiries regarding the project.

The BLM also created a project website for the EA in November 2015 that is accessible through the BLM national NEPA register at

**[https://eplanning.blm.gov/epl-front-office/eplanning/nepa/nepa\\_register.do](https://eplanning.blm.gov/epl-front-office/eplanning/nepa/nepa_register.do)**.

The website provides links to documents, opportunities for public involvement, including methods for comment submission, maps, EOI information, and links to additional project information.

The BLM Eastern States Office (ESO) leasing process and policy incorporates a mandatory 30-day public comment period on all completed EAs and unsigned FONSI. The documents were made available April 28, 2016 for public review and a comment period ending May 29, 2016.

#### **1.7.4. Issues identified through public scoping**

The BLM received approximately 3,400 responses during its scoping period (November 1, 2015 to January 22, 2016), which included three public meetings in November 2015. Many of these comments reflected common themes, which are summarized below:

1. Oil and gas activities will disturb forestlands and degrade the wildlife habitats of the WNF.
2. Oil and gas activities will cause toxic chemicals to be spilled or be discharged into the environment, threatening wildlife populations, degrading water quality, and harming human health.
3. Oil and gas activities will create air pollution.
4. Oil and gas activities will degrade recreational opportunities and the visual character of the WNF.
5. Leasing should be delayed until the oil and gas market improves.
6. Enabling oil and gas activities will provide private landowners the opportunity to develop their minerals, and withholding leasing the federal minerals will pose an obstacle to development of private minerals.

7. Restricting development of oil and gas minerals prohibits economic growth for the state of Ohio.

The BLM has considered comments received during the scoping period in the development of this draft EA. Following the conclusion of the 30-day public comment period for the draft EA, the BLM will analyze and incorporate (where appropriate) all substantive comments received during the public comment period and changes to the document are made, if necessary, and the EA becomes final.

## **2. PROPOSED ACTION AND ALTERNATIVES**

The CEQ's *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act* establish a number of policies for federal agencies, including "using the NEPA process to identify and assess reasonable alternatives to the Proposed Action that would avoid or minimize adverse effects of these actions on the quality of the human environment" (40 CFR 1500.2 (e)). This chapter provides a detailed description of the Proposed Action and alternatives carried forward for analysis in the EA, as well as the alternatives considered but dismissed.

### **2.1. Proposed Action**

The Bureau of Land Management (BLM) proposes to lease up to approximately 40,000 federally-owned minerals located in the Wayne National Forest, Athens Ranger District, Marietta Unit in Monroe, Noble, and Washington Counties in Ohio. This approximate acreage figure represents the total amount of federally-owned minerals that could be nominated and potentially be made available for leasing on the Marietta Unit. Industry uses the BLM Expression of Interest (EOI) process to nominate federal minerals for leasing. To date, industry has submitted over fifty EOIs totaling approximately 18,000 acres for parcels located on the Marietta Unit (see Map 3 in Chapter 6 of this EA). The BLM and the U.S. Forest Service (Forest Service) review deeds on a parcel-by-parcel basis to verify federal mineral ownership as leasing nominations are received.

Under the Proposed Action, the BLM would offer for lease, at future BLM Eastern States competitive oil and gas lease sales, nominated parcels that have been reviewed and approved by the BLM and the Forest Service. In accordance with 43 CFR 3120, approved parcels will be identified, along with any attached stipulations and notices, through a Notice of Competitive Lease Sale that will be posted at least 90 days prior to a lease sale.

Mineral ownership is highly fragmented and complicated throughout the WNF. Approximately 59% of the WNF surface ownership is underlain by private minerals. The remaining approximately 41% of surface ownership is underlain by federal minerals. The federal government owns a 100% mineral interest in approximately 10,000 acres and owns a partial mineral interest in approximately 8,200 acres underlying NFS lands on the Marietta Unit, totaling more than 18,000 acres. There are current leases on an additional 10,000 acres, which may be federally owned and more than 13,000 acres of reserved

minerals that will revert to the federal government in the future. The Proposed Action also applies to the minerals that are reverting. The Forest Service has authority to purchase lands; therefore acreages listed above are subject to change through time.

The proposed leases would provide the lessee(s) exclusive rights to explore and develop oil and gas reserves on the lease but do not authorize surface disturbing activities. The lease owner/operator is required under 43 CFR 3162 to obtain approval of an application for permit to drill (APD) before conducting any surface disturbing activities. Upon receipt of an APD, the BLM conducts an onsite inspection with the applicant in cooperation with the landowner. The BLM also conducts site-specific NEPA analysis and the appropriate consultations under the ESA and NHPA prior to approving the APD. Although there would be no surface disturbance from the action of leasing, the EA analyzes a reasonably foreseeable development scenario (RFDS) to address the potential environmental effects from potential future oil and gas development. For example, estimates can be made on the most likely number of wells that could be constructed, but the specific locations cannot be determined until APDs are filed. The detailed RFDS is included as an appendix to the 2006 Forest Plan, and a summary of the RFDS is included below in Section 2.2.

Oil and gas leases are issued for a 10-year period and continue for as long thereafter as oil or gas is produced in paying quantities.

## **2.2. Reasonably Foreseeable Development Scenario (RFDS) for Potential Oil and Gas Development**

The Proposed Action is located in Monroe, Noble, and Washington Counties, Ohio, within the proclamation boundary of the Athens Ranger District, Marietta Unit of the WNF. The area contains both Forest Service and private surface overlaying federal minerals. The future development of the area depends on many factors but this EA uses the RFDS developed as part of the 2006 Forest Plan Final EIS (Appendix G) and the updated 2012 SIR for oil and gas to analyze the anticipated impacts of future oil and gas development in the Marietta Unit. The 2012 SIR covered several resources of concern in relationship to the use of horizontal drilling and high-volume hydraulic fracturing (HVHF) technology:

- Water resources
- Wildlife
- Fragmentation (an impact that affects wildlife habitat)
- Botany
- Waste disposal
- Noise and light pollution
- Air quality
- Infrastructure/transportation
- Public safety
- Heritage
- Soils

The total surface disturbance analyzed in the 2006 Forest Plan Final EIS for the entire WNF included 272 acres for exploration and production with 121 acres needed to support long term production. The analysis assumed that after exploration and production, 151 acres would be reclaimed per BLM requirements. The projected surface disturbance included all acreage potentially affected by future oil and gas development. The 2006 Forest Plan and Final EIS covered the entirety of the WNF but provided analysis specific to the three units; Ironton, Athens and Marietta.

For the Marietta unit, the 2006 RFDS projected up to 110 vertical well pads (2006 Forest Plan, p. G-1), and the 2012 SIR projected 10 horizontal well pads (SIR, p. 3). The 2006 RFDS projects approximately 135 acres of surface disturbance for the Marietta Unit (see Table 2-1). The 2012 SIR was issued because horizontal wells were becoming more of the standard approach to mineral development on private surface in the area. The surface disturbance projected for 10 horizontal wells is 55 acres, substantially less than what was initially projected under the 2006 RFDS. As shown in Table 2-1, approximately 10 acres have already been disturbed from oil and gas development in the Marietta Unit; therefore, the remaining acreage of surface disturbance that could occur within the Marietta Unit, which is analyzed in this EA, is approximately 70 acres. Of those 70 acres, approximately 40 acres would be disturbed over the long term, after reclamation is completed. This disturbance is still well within the projected disturbance of the RFDS from the 2006 Forest Plan/Final EIS.

While the RFDS does not project any disturbance on private lands this EA analysis covers the potential impacts of future oil and gas development on both the Forest Service lands and on adjacent private lands within the Marietta Unit to allow for maximum NEPA flexibility and coverage in case conditions should change in the future.

**Table 2-1: Potential Disturbance in the Marietta Unit Projected by the RFDS**

	2006 RFDS projection of acres disturbed	2012 SIR forecast of acres disturbed by horizontal wells	Acres disturbed to date from oil and gas development	Net surface disturbance below 2006 RFDS
Total initial acres of surface disturbed by oil and gas drilling before reclamation	135	55	10	70
Total acres of surface needed to support long term production (i.e. remaining disturbance after reclamation)	59	13.8	5	40.2

Reasonably foreseeable activities that could occur as a result of future oil and gas development associated with leasing in the Marietta Unit include surface disturbance associated with preparation for

drilling including construction of a road, drilling pad, and reserve pit. Constructed access roads normally have a running surface width of approximately 24 feet; the length is dependent upon the well site location in relation to existing roads or highways. The average length of road construction is approximately 0.5 miles. Therefore, approximately two acres would likely be affected by road construction. Typically seven acres are cleared and graded level for the construction of the drilling pad. Each drilling pad could have up to eight lateral lines. If the well produces natural gas, and the flowline is in the road, another 0.5 acres may be affected by flowline construction. These disturbances are typical for private or federal ownership well pad locations but may be subject to adjustment based on site-specific conditions, which have not yet been determined. The excavation reserve pit is typically about five feet deep and is lined with bentonite clay to retain drilling fluids, circulated mud, and drill cuttings. Plastic or butyl liners (or an equivalent), that meet state standards for thickness and quality, are used on occasions when soils are determined incapable of holding pit fluids.

Drilling typically continues around the clock. Once drilling is completed, excess fluids are pumped out of the pit and disposed of in a state authorized disposal site and the drill cuttings are buried. The RFDS assumes that 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 likely be obtained from a local surface water source, such as the Ohio River, through a pipe laid on the surface or by tanker trucks. Approximately 1,500 barrels of drilling mud would be typically kept on the location. If water production is expected, then processing facilities may be needed on or offsite.

During well pad construction, the topsoil would likely be stockpiled for use during restoration activities. If the well is successful, the drill pad would be reduced to about 100 feet x 100 feet with the remaining surface area, including the reserve pit, re-graded and restored as per the 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 feet x 100 feet pad would be 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.

Chapter 5 contains the lease stipulations and lease notices for the Forest Service surface. 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. Additional surveys or consultations may be required after site-specific proposals have been received by BLM during the development phase.

### 2.2.1 Phases of Oil and Gas Development

Following is additional information on the phases of oil and gas development, from geophysical exploration through site reclamation. While site-specific activities are not yet proposed or known, the following types of activities have been considered in this EA for NEPA analysis.

**Geophysical exploration** and exploratory drilling occur in the first phases of mineral development. Geophysical exploration is used to obtain detailed geologic information. A variety of exploration methods are employed, ranging from placing electrodes in the ground, to detonating explosives to create shockwaves, to employing specially constructed off-road vehicles to produce vibrations. Exploratory drilling begins the actual development of the lease. An access road and a well pad are constructed for each well, if needed. No geophysical exploration is expected in the Marietta unit since there is a long history of oil and gas development.

**In-field drilling** of additional exploration wells typically occurs when initial exploratory drilling has located oil and gas, to define the limits of the oil and gas reservoir. The process of in-field drilling is the same as that employed for initial exploratory drilling, although new roads and well pads may not be required in every instance. Wells may be drilled vertically, if the end of the well (bottom hole location) is directly below the well pad; or directionally, if the well pad is not directly above the bottom hole location. For example, federal minerals under a state park with a “no surface occupancy” stipulation (i.e., no surface disturbance from mineral development is allowed on the state park itself) can be accessed by either directional or horizontal drilling from a surface location outside of the park. In horizontal drilling the wellbore may extend several thousand feet through the rock formation. For the purpose of this analysis, the BLM has assumed a typical maximum horizontal length of 7,500 feet.

Roads are typically cleared to a width of 24 feet, with a running surface width of 12 to 16 feet. The length is dependent upon the well pad location in relation to existing roads or highways. Land is cleared and graded for pad construction. If the well is productive, additional land may be affected by pipeline construction. The total number of disturbed acres for well pads for vertical wells drilled to the target formations in the Marietta Unit is expected to be 0.69 to 1.1 acre, and well pads for horizontal wells drilled to the Utica/Point Pleasant or Marcellus Shales are 3 to 5.5 acres and may contain up to 8 wells. Very little in-field drilling is expected.

**Well Stimulation/Hydraulic Fracturing (HF).** Well Stimulation may be used to enhance oil and gas recovery. Several methods of well stimulation could be used. HF is one of these methods that is reasonably foreseeable for leases in the WNF. HF is the process of applying high pressure to a subsurface formation via the wellbore, to the extent that the pressure creates fractures in the rock. Typically the induced fractures will be propped open with a granular “proppant” to enhance fluid connection between the well and formation. The process was developed experimentally in 1947 and has been used routinely since 1950. The Society of Petroleum Engineers estimates that over one million

HF procedures have been completed in the United States and tens of thousands of horizontal wells have been drilled and hydraulically fractured (IOM, 2014; King, 2012).

To ensure that oil and gas exploration and development is conducted in a safe and environmentally sound manner, the BLM approves and regulates all drilling and completion operations, and related surface disturbance on federal public lands. Prior to approving an NOI or APD, the BLM identifies all potential subsurface formations that will be penetrated by the wellbore. This includes all groundwater aquifers and any zones that would present potential safety or health risks that may need special protection during drilling.

Once the geologic analysis is completed, the BLM reviews the proposed casing and cementing programs to ensure the well construction design is adequate to protect the surface and subsurface environment, including the potential risks identified by the geologist and all known or anticipated zones with potential risks.

Before HF takes place, all casings from the surface to the bottom of the well bore are cemented and the mechanical integrity of the well is tested. The cemented well is pressure tested to ensure there are no leaks and a cement bond log is run to ensure the cement has bonded to the casing and the formation. If the fracturing of the well is considered to be a “non-routine” fracture for the area, the BLM would be onsite during those operations as well as when abnormal conditions develop during the drilling or completion of a well.

Wells that undergo HF may be drilled vertically, horizontally, or directionally and the resultant fracture induced by HF can be vertical, or horizontal, or both. Wells may extend to depths greater than 20,000 feet or less than 1,000 feet, and horizontal sections of a well may extend several thousand feet from the production pad on the surface.

Drilling muds, drilling fluids, water, and HF fluids are stored in on-site tanks or lined pits during the drilling and/or completion process. Equipment transport and setup can take several days, and the actual HF and flowback process can occur in a few days up to a few weeks. For oil wells, the flowback fluid from the HF operations is treated in an oil-water separator before it is stored in a lined pit or tank located on the surface. Where gas wells are flowed back using a “green completion process,” fluids are run through a multi-phase separator, which are then piped directly to enclosed tanks or to a production unit.

**Production** begins only if oil and gas can be transported to a market and sold at a profit. Production facilities may include one or more of the following: a well head, pumping equipment, a separation system, pipelines, a metering system, storage facilities, water treatment and injection facilities, cathodic protection systems, electrical distribution lines, compressor stations, communication sites, roads, salt water disposal systems, dehydration sites, and fresh/salt water plant sites. Drilling typically continues around the clock. The RFDS assumes that 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 obtained from a well drilled on the site, however, water could be pumped to the site from a local pond, stream, river or lake through a pipe laid on the surface. Approximately 1,500 barrels of drilling mud would be typically kept on the location. If water production is expected, then processing facilities may be needed on the site. 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.

**Well abandonment** may be temporary or permanent. Wells are sometimes shut-in because pipelines or roads needed for production and marketing do not exist and the cost for construction is not justified by the quantity of oil discovered. These wells may later be reentered when their production can be marketed. The permanent abandonment of a well occurs when the well is determined to no longer have a potential for economic production, or when the well cannot be used for other purposes.

**Reclamation** involves revegetation and recontouring of disturbed areas. During well pad construction, the topsoil would likely be stockpiled for use during restoration activities. If the well is successful, the drill pad would be reduced to about 100 feet x 100 feet with the remaining surface area, including the reserve pit, re-graded and restored as per the surface owner requirements. The BLM 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 surface owner. The remaining 100 feet x 100 feet pad would be 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.

### 2.3. No Action Alternative

Under the No Action Alternative, the BLM would not offer the proposed parcels for oil and gas leasing, nor would any future federal minerals be made available in the Marietta Unit. Ongoing oil and gas development would, however, likely continue on surrounding areas and it is likely that the same or nearly the same amount of development as described under the Proposed Action would occur on the adjacent private lands whether or not the federal minerals are accessed. The difference between the Proposed Action and No Action Alternative is that without the lease (No Action Alternative), the operators would not be authorized to access the federal minerals at the time of development but could continue to develop the adjacent privately owned minerals resulting in drainage of federal minerals without any benefit to the government. Not leasing the parcel would not meet the purpose of and need for the Proposed Action. CEQ guidelines stipulate that a No Action Alternative should be analyzed to assess any environmental consequences that may occur if the Proposed Action is not implemented and to serve as a baseline for comparing impacts of the Proposed Action. Therefore, the No Action Alternative has been retained for analysis in this EA.

## **2.4. Alternatives Considered but not Analyzed in Detail**

### **2.4.1. Offer all leases with a no-surface-occupancy stipulation**

Offering all leases with a no-surface-occupancy (NSO) stipulation was suggested through public comment; however, this alternative would not fulfill the purpose and need described in Chapter 1, for various reasons. First, requiring all future drilling to take place off the federal surface may force operators to use locations that result in greater adverse impacts to natural resources compared to impacts on the federal surface. Impacts from oil and gas development on federal surface would be minimized by the leasing stipulations provided in the 2006 Forest Plan. Second, the federal government has more authority to protect natural resources on federal lands than on private lands. As nominated parcels are reviewed, the BLM, in coordination with the Forest Service, determine which stipulations and notices must be attached to approved lease parcels, including, where appropriate, NSO stipulations.

### **2.4.2. Lease minerals for vertical drilling only**

As detailed in the findings from the 2012 SIR, which is incorporated by reference in Chapters 3 and 4, measures already existing in the 2006 Forest Plan and the Final EIS, along with existing laws, rules, and regulations, allow for the surface effects to be managed so that they are within the range already analyzed in the 2006 Forest Plan Final EIS (2012 SIR Findings, p 2).

## **3. DESCRIPTION OF THE AFFECTED ENVIRONMENT**

This chapter describes the environment that would be affected by implementation of the Proposed Action, as required by CEQ regulations for implementing NEPA (40 CFR Parts 1500-1508). The discussion in this chapter focuses on the relevant resources and issues and only those elements of the affected environment that have the potential to be impacted are described in detail.

Based on a review of the context and scale of the Proposed Action, the following resources are discussed in detail in this EA: Land Use; Air Resources; Plant and Animal Habitat and Populations; Geology and Minerals; Soils; Water Resources and Water Quality; Wastes, Hazardous or Solid; Recreation and Noise; Cultural Resources/Paleontology; Native American Religious Concerns; Visual Resources and Scenic Quality; and Socioeconomics and Environmental Justice.

Under the Proposed Action, operators could choose to locate potential future well pads and other infrastructure on land owned by the WNF or on adjacent private lands within the WNF. If infrastructure is located on adjacent private lands, the minerals would be accessed by directional or horizontal drilling. For this reason, the potential area of effect includes the entire proclamation boundary of the Marietta Unit of the WNF (Map 2; see Chapter 6 of this EA). The description of the affected environment presented in this chapter includes information from and refers to the 2006 Forest Plan Final EIS, with additional information provided to update and augment the 2006 Forest Plan Final EIS where applicable.

### 3.1. Land Use

The Marietta Unit lies mostly within the Ohio Valley Lowlands Subsection of the Southern Unglaciaded Allegheny Plateau Section. This subsection is characterized by steep, wooded lands with high-gradient, often ephemeral streams. Ongoing uses of the land in the WNF include timber harvest, recreation, and mineral development.

### 3.2. Air Resources

#### 3.2.1. Air quality

The primary sources of air pollution in the United States are dust from blowing wind on disturbed or exposed soil, exhaust emissions from motorized equipment, oil and gas development, agriculture, and industrial sources. The United States Environmental Protection Agency (EPA) was given the authority for air quality protection with the provision to delegate this authority to the state as appropriate under federal law. Most of the authority for air quality protection in Ohio has been delegated to the Division of Air Pollution Control (DAPC). 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<sub>2</sub>), ozone (O<sub>3</sub>), particulate matter (PM<sub>10</sub> & PM<sub>2.5</sub>), sulfur dioxide (SO<sub>2</sub>), and lead (Pb). The NAAQS pollutants are monitored in Ohio by the DAPC. 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. The primary and secondary NAAQS currently in effect are shown in Table 3.1.

**Table 3.1. National Ambient Air Quality Standards (U.S. Environmental Protection Agency, 2016f)**

Pollutant [final rule cited]	Primary Standards		Secondary Standards		Form
	Level	Averaging Time	Level	Averaging Time	
<b>Carbon Monoxide (CO)</b> [76 FR 54294, 8/31/2011]	9 ppm (10 mg/m <sup>3</sup> )	8 hours	None		Not to be exceeded more than once per year
	35 ppm (40 mg/m <sup>3</sup> )	1 hour			
<b>Lead (Pb)</b> [73 FR 66964, 11/12/2008]	0.15 µg/m <sup>3</sup> <sup>(1)</sup>	Rolling 3-Month Average	Same as Primary		Not to be exceeded
<b>Nitrogen Dioxide (NO<sub>2</sub>)</b> [75 FR 6474, 2/9/2010] [77 FR 20218, 4/3/2012]	53 ppb <sup>(2)</sup>	Annual (Arithmetic Average)	Same as Primary		Annual Mean
	100 ppb	1-hour	None		98 <sup>th</sup> percentile of 1-hour daily maximum concentrations, averaged over 3 years
<b>Particulate Matter (PM<sub>10</sub>)</b> [78 FR 3086, 12/14/2012]	150 µg/m <sup>3</sup>	24-hour	Same as Primary		Not to be exceeded more than once per year on average of 3 years
<b>Particulate Matter (PM<sub>2.5</sub>)</b>	12.0 µg/m <sup>3</sup>	Annual (Arithmetic)	15.0 µg/m <sup>3</sup>	Annual (Arithmetic)	Annual mean, averaged over 3 years

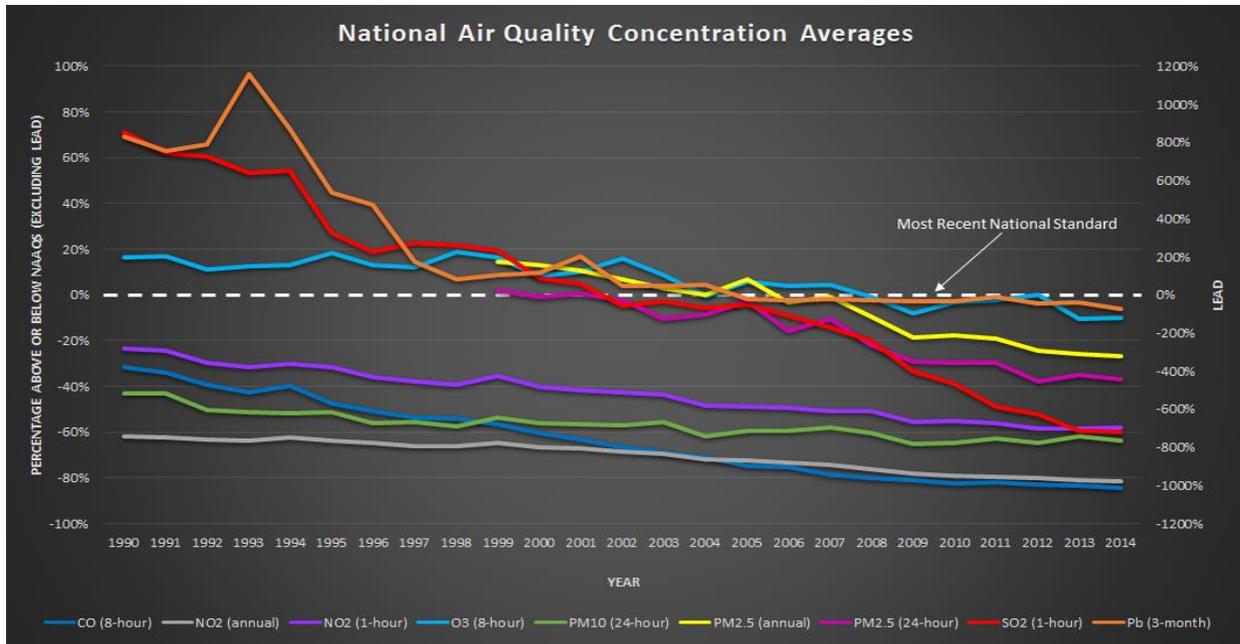
[78 FR 3086, 12/14/2012]		Average)		Average)	
	35 µg/m <sup>3</sup>	24-hour	Same as Primary		98 <sup>th</sup> percentile, averaged over 3 years
<b>Ozone (O<sub>3</sub>)</b> [80 FR 65292, 11/26/2015]	0.070 ppm <sup>(3)</sup>	8-hour	Same as Primary		Annual fourth-highest daily maximum 8-hr average concentration, averaged over 3 years
<b>Sulfur Dioxide (SO<sub>2</sub>)</b> [75 FR 35520, 6/22/2010] [77 FR 20218, 4/3/2012]	75 ppb <sup>(4)</sup>	1-hour			99 <sup>th</sup> percentile of 1-hour daily maximum concentrations, averaged over 3 years
			0.5 ppm	3-hour	Not to be exceeded more than once per year

- (1) In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m<sup>3</sup> as a calendar quarter average) also remain in effect.
- (2) The level of the annual NO<sub>2</sub> standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.
- (3) Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O<sub>3</sub> standards additionally remain in effect in some areas. Revocation of the previous (2008) O<sub>3</sub> standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.
- (4) The previous SO<sub>2</sub> standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (2) any area for which implementation plans providing for attainment of the current (2010) standard have not been submitted and approved and which is designated nonattainment under the previous SO<sub>2</sub> standards or is not meeting the requirements of a SIP call under the previous SO<sub>2</sub> standards (40 CFR 50.4(3)). A SIP call is an EPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the require NAAQS.

According to the EPA (2016a), nationwide air quality has improved significantly for all common NAAQS air pollutants since 1990 (Figure 1). Nationally, air pollution emissions were lower in 2014 than in 1990 for:

- Carbon Monoxide (CO), by 62%
- Nitrogen Oxides (NO<sub>x</sub>), by 51%
- Lead (Pb), by 80%
- Volatile Organic Compounds (VOC), by 38%
- Direct PM<sub>10</sub>, by 19%
- Direct PM<sub>2.5</sub>, by 25%
- Sulfur Dioxide (SO<sub>2</sub>), by 79%

**Figure 1. Comparison of national levels of the six common pollutants to the most recent NAAQS, 1990-2014. National levels are averages across all monitors with complete data for the time period (U.S. Environmental Protection Agency, 2016a).**



**Note: Air quality data for PM<sub>2.5</sub> starts in 1999.**

Nationally, annual PM<sub>2.5</sub> concentrations were 24% lower in 2014 compared to 1999 and 24-hour PM<sub>2.5</sub> concentrations were 38% lower in 2014 compared to 1999. Ozone levels did not improve in much of the East until 2002, after which there was a significant decline. Eight-hour ozone concentrations were 20% lower in 2014 than in 2002. This decline is largely due to reductions in nitrogen oxides (NO<sub>x</sub>) emissions required by EPA rules, including the NO<sub>x</sub> State Implementation Plan (SIP) call, preliminary implementation of the Clean Air Interstate Rule (CAIR), and Tier 2 Light Duty Vehicle Emissions Standards (U.S. Environmental Protection Agency, 2016c). In January 2015, the Cross-State Air Pollution Rule (CSAPR) replaced the CAIR and went into effect in Ohio and in 27 other eastern states, with the goal of significantly improving air quality by reducing power plant emissions that contribute to ozone and/or fine particle pollution in other states (U.S. Environmental Protection Agency, 2016b).

### Hazardous Air Pollutants

Hazardous air pollutants (HAPs) are substances that are known or suspected to cause cancer or other serious health effects. These include reproductive effects or birth defects, or adverse environmental impacts. The EPA classified 187 air pollutants as HAPs (U.S. Environmental Protection Agency, 2015a). Examples of listed HAPs associated with the oil and gas industry include formaldehyde, benzene, toluene, ethylbenzene, isomers of xylene (BTEX) compounds, and normalhexane (n-hexane).

Under the CAA, the EPA is required to regulate emissions of HAPs. These pollutants are specific to a published list of industrial sources called “source categories.” The EPA has developed a list of source categories that must meet control technology requirements for these toxic air pollutants. Section 112(d) of the CAA requires the EPA to develop regulations that establishing national emission standards for hazardous air pollutants (NESHAP) for all industries that emit one or more of the pollutants in major source quantities. NESHAP were established to reflect the maximum degree of reduction in HAP emissions through application of maximum achievable control technology (MACT). MACT standards have been implemented for source categories that include oil and natural gas production and natural gas transmission and storage.

### 3.2.2. 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 including: ammonium sulfate, ammonium nitrate, organic mass, elemental carbon, soil elements, and coarse mass (Malm et al., 2013). 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).

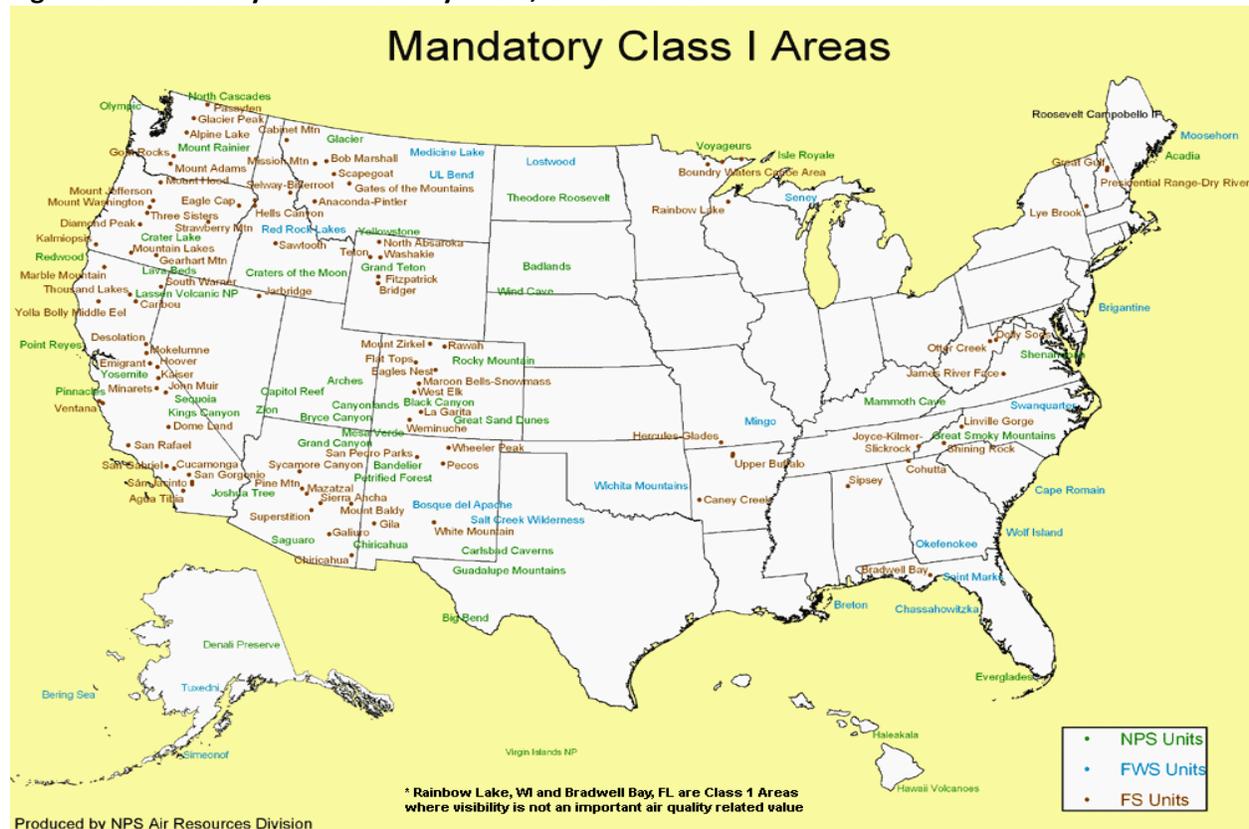
A wide variety of pollutants can impact visibility, including particulate matter, nitrogen dioxide, nitrates (compounds containing  $\text{NO}_3$ ), and sulfates (compounds containing  $\text{SO}_4$ ). Fine particles suspended in the atmosphere decrease visibility by blocking, reflecting, or absorbing light.

Two types of visibility 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 (Malm, 1999).

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 areas are managed as high visual quality under the federal visual resource management (VRM) program. The 1977

Clean Air Act (CAA) Amendments, Section 169A 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 which impairment results from manmade air pollution” (42 U.S.C. § 7491(a)(1)). 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.

**Figure 5. Mandatory Class I Visibility Areas, United States**



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, recreational, scenic or historic value” (U.S. Environmental Protection Agency, 2015b).

PSD increments have been established for NO<sub>2</sub>, SO<sub>2</sub>, and PM<sub>10</sub>. Comparisons of potential PM<sub>10</sub>, NO<sub>2</sub>, and SO<sub>2</sub> 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.

### 3.2.3. 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  $\text{NO}_x$  and  $\text{SO}_2$ , 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 ( $\text{H}_2\text{SO}_4$ ) and nitric ( $\text{HNO}_3$ ), 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 ( $\text{NO}_3$ ) and ammonium ( $\text{NH}_4^+$ )

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 Forest Service and the National Park Service have established guidelines for Levels of Concern (LOC) for total deposition of nitrogen and sulfur compounds in Class I Wilderness Areas. Total nitrogen deposition of up to 1.5 kilograms (kg) per hectare (ha) per year is considered unlikely to harm terrestrial or aquatic ecosystems. For total sulfur deposition, the LOC is five  $\text{kg}/\text{ha}\cdot\text{yr}$ . The USFS is considering a sulfur LOC of 1.5  $\text{kg}/\text{ha}\cdot\text{yr}$  (U.S. Forest Service, National Park Service, and U.S. Fish and Wildlife Service, 2010).

### 3.2.4. Current pollution concentrations

The Marietta Unit in the WNF contains no Class I or sensitive Class II areas. Most of the area is in attainment for NAAQS pollutants; however, Washington County is in non-attainment for Sulfur Dioxide (Table 3.2) (U.S. Environmental Protection Agency, 2016g). The 2006 Forest Plan Final EIS also showed Washington County in non-attainment for eight-hour ozone and particulate matter (these designations were revoked in 2006 and 2012, respectively).

**Table 3.2. Ohio nonattainment/maintenance status for each county by year for all criteria pollutants.**

County	Pollutant	Area Name	Nonattainment in Year	Redesignation to Maintenance	Classification	City NA
Washington	8-Hr Ozone (1997) - NAAQS revoked	Parkersburg-Marietta, WV-OH	2004-2006	6/15/2007	Former Subpart 1	Whole
Washington	PM-2.5 (1997)	Parkersburg-Marietta, WV-OH	2005-2012	8/29/2013	Former Subpart 1	Whole
Washington	Sulfur Dioxide (1971)	Waterford Township (Washington County), OH	1992-1993	10/21/1994		Part
Washington	Sulfur Dioxide (2010)	Muskingum River, OH	2013-2015	Currently in Nonattainment		Part

### 3.2.5. Global 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).

Ohio has a geographically variable climate. Ohio is exposed equally to cool air from the arctic or Canada and warmer air from the tropics. Northern Ohio has a variety of lake related weather patterns from Lake Erie, while southern and eastern Ohio may experience varied local conditions due to extreme topography. Ohio experiences a wide range of temperature and climatic conditions, including cold winters and warm, humid summers. Hot, dry air can occasionally envelop the state (high temp 113°F 1934), but also cold, dry polar air masses during both winter and summer (low temp -39°F 1994). Ohio is often affected by mid-latitude storms, often originating in Canada, Colorado, or the Gulf of Mexico. These can increase precipitation in any season (Rogers, n.d.). From February 2011 to January 2016, Ohio has had a 0.7°C degree departure from the 20th Century average of 10.2°C degrees. The freeze free periods (growing seasons) vary from 160-180 days in South Ohio, to 125-155 in Northern Ohio. In coastal areas on Lake Erie, the growing season can extend up to 200 days. High humidity and dew points can also cause heavy fog, and Ohio experiences high levels of fog and cloudiness in the winter. Ohio also has abundant precipitation, especially during mid-latitude wave cyclones and storms (heaviest from October-March). Ohio has

also had a 635 millimeter (mm) departure in precipitation from the 20th century average of 5,493.77mm (3rd wettest 60 Month period) (National Oceanic and Atmospheric Administration, 2016). Also of note, El Nino and La Nina events have had increasing effects on Ohio's, and the regional, climate.

Greenhouse gases (GHGs) are gases in the atmosphere composed of molecules that absorb and emit infrared electromagnetic radiation. When present in the atmosphere, these gases contribute 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<sub>2</sub> 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<sub>2</sub>, methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), 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.

In 2010, the U.S. Energy Information Administration (EIA) ranked Ohio fourth in the United States for carbon dioxide emissions from fossil fuel consumption (2016). Ohio University and Ohio State University collaborated on a GHG emissions inventory for the state of Ohio in 2011. The inventory used standard approaches consistent with other state and EPA reporting inventory standards. The inventory also used guidelines from the Intergovernmental Panel on Climate Change (IPCC) report (2006) which provides conversion factors for CO<sub>2</sub> equivalency for common GHGs. The inventory found that 93% of CO<sub>2</sub>e (carbon dioxide equivalent) emissions were related to energy production, and the bulk of CO<sub>2</sub> emissions were the results of coal-fired power plants. Methane emissions were primarily from enteric fermentation in agriculture and solid waste landfills. Nitrous oxide emissions were mostly from manure management and manufacturing (Ohio University and The Ohio State University, 2011).

GHGs are commonly categorized as point, area, and mobile. These are often measured in their Carbon Dioxide Equivalency (CO<sub>2</sub>e), a metric that uses the global warming potential of each substance and relates it back to the equivalent. Of these, oil and gas factors into point and mobile (vehicle emissions associated with construction and transport). Point emissions from oil and gas wells occur from fugitive emissions during completion and production as well as from stationary equipment used in construction, also from end uses such as energy production and residential heating. Mobile sources are trucks and vehicles used in maintenance and transport after completion. Fugitive emissions from oil and gas were quantified as 1.67 MMTs CO<sub>2</sub>e, and energy production accounted for 117.63 MMT (mostly attributed to coal production). Monroe County contributed very little to the overall Ohio GHG emissions, but

Washington County was the second largest contributor in the southeast region of the state. Washington County emissions were mostly attributed to energy production, likely from the two coal combustion facilities (Muskingum River Power Plant and R.H. Gorsuch Station).

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 may cause a net warming effect of the atmosphere, primarily by decreasing the amount of heat energy radiated by the earth back into space. Although still debated, GHG levels have varied for millennia, and it is theorized that recent industrialization and burning of fossil carbon sources have caused CO<sub>2</sub>e concentrations to increase dramatically, and are likely to contribute to overall global climatic changes. The IPCC (2007) concluded that “warming of the climate system is unequivocal” and “most of the observed increase in global average temperatures since the mid-20<sup>th</sup> century is very likely due to the observed increase in anthropogenic GHG concentrations.”

GHGs have a sustained climatic impact over different temporal scales. For example, recent emissions of CO<sub>2</sub> 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<sub>2</sub> (Ramanathan and Carmichael, 2008). Black carbon is a highly light-absorbing component of particulate resulting from the incomplete combustion of fossil fuels, biofuels, and biomass. Most black carbon in the United States comes from mobile sources (diesel engines and vehicle use) or biomass burning (wildfires, residential heating, and industry) (U.S. Environmental Protection Agency, 2012). 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 may accelerate the rate of climate change in either a positive or negative direction depending upon location and site specific factors.

Global mean surface temperatures have increased nearly 1.0°C (1.8°F) from 1890 to 2006 (National Aeronautics and Space Administration Goddard Institute for Space Studies, 2007). In 2001, the IPCC (2007) 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 (Hansen et al., 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 indicate 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<sub>2</sub> and CH<sub>4</sub>. CO<sub>2</sub> emissions result from the use of combustion engines, while CH<sub>4</sub> 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<sub>2</sub>. Global anthropogenic carbon emissions reached about 7,000,000,000 metric tons per year in 2000 and an estimated 9,170,000,000 metric tons per year in 2010 (Boden, Marland, & Andres, 2013). 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.

### 3.3. Plant and Animal Habitat and Populations

#### 3.3.1. Introduction

The description of plant and animal habitat and population information is derived from the 2006 Forest Plan and incorporates by reference the supplemental information provided in the 2012 SIR.

The entire WNF harbors over 300 vertebrate species, although not all of them occur within the Marietta Unit. The NFS lands are concentrated along ridges and sideslopes, and most of the streams on NFS lands do not support large fish populations. The 2006 Forest Plan divides the WNF into 14 separate, non-contiguous management areas, which are defined by their history, geography, suitability for various types of use, and other factors. The Marietta Unit contains seven of these management areas, listed below by acreage in descending order and shown on Map 4 (see Chapter 6 of this EA):

1. **Diverse Continuous Forest.** More than half of the Marietta Unit, or more than 114,000 acres, is in this management area. This management area is characterized by large blocks of mature forest with a variety of species and ages providing diverse wildlife habitat types. Management of the Diverse Continuous Forest emphasizes habitat for forest interior species. Openings and patches of early-successional habitat are present generally around the edges of otherwise continuous blocks of mature forest. While wildland fire is used to promote oak and hickory stand types, many stands are becoming increasingly dominated by maple and other fire-intolerant species. Oil and gas development is permitted on NFS lands within this management area. This management area in the Marietta Unit contains 160 acres of managed wildlife openings, which are small breaks in forest canopy that are under special management for the benefit of targeted wildlife species or habitat types.
2. **Forest and Shrubland Mosaic.** This management area, which includes about 68,000 acres in the Marietta Unit, contains forests with a higher proportion of early- and mid-successional component than the Diverse Continuous Forest management area. There are permanent

herbaceous openings dispersed throughout the forests, and prescribed fire and even-aged timber harvests are used to ensure the desired amount of young habitat types. Oil and gas development is permitted on NFS lands within this management area. This management area in the Marietta Unit contains 49 acres of managed wildlife openings.

3. **River Corridors.** This management area, which includes 35,000 acres in the Marietta Unit, follows the Little Muskingum and Ohio Rivers. The primary emphasis of this management area is on habitats that comprise a healthy riparian area, such as floodplain forests, open wetlands, and properly functioning stream channels. Oil and gas activities are permitted but are subject to a controlled surface use stipulation. This management area in the Marietta Unit contains 112 acres of managed wildlife openings.
4. **Future Old Forest with Mineral Activity.** This management area, at 17,000 acres, is present only on the Marietta Unit, due to the abundance of existing oil and gas wells, pads, and access roads. This area contains a largely uneven-aged forest that is managed very non-intensively. Over time, the area is expected to become dominated by maples and other fire-intolerant, shade-tolerant species, while occasional, natural disturbances will maintain a small component of early-successional habitat. This management area is closed to timber production and open for oil and gas activities.
5. **Special Areas.** These areas are managed to preserve and study unique natural areas. There are seven Special Areas in the Marietta Unit, totaling about 2,600 acres, mostly in the eastern half of the Unit. Oil and gas activities are not permitted in this management area.
6. **Developed Recreation.** Two areas totaling 366 acres make up the federally-owned component of Developed Recreation management area within the Marietta Unit. This management area emphasizes providing safe areas for recreational activity. Oil and gas activities are not permitted on new leases in this management area.
7. **Research Natural Area.** This management area consists of “nationally significant areas with unique ecosystems deemed worthy of preservation for scientific purposes” (2006 Forest Plan, p. 3-53). The Marietta Unit contains one such area, known as Reas Run Research Natural Area, a 78-acre mature Virginia pine stand. Oil and gas activities are not permitted in this management area.

The 2006 Forest Plan emphasizes that various habitat types and all major successional stages are necessary for the WNF to meet its mandate of sustaining a diverse population of native plants and animals. The 2006 Forest Plan analyzed several habitat indicators in an effort to summarize the impacts of management activities:

- amount and trends in oak-hickory forest;
- amount and trends in pine forest and trends in pine warbler (*Setophaga pinus*) habitat and population;
- amount and trends in early successional habitat and trends in yellow-breasted chat (*Icteria virens*) and ruffed grouse (*Bonasa umbellus*, an upland game bird) habitat and populations;

- mature, interior forest – amount and trends cerulean warbler (*Setophaga cerulea*, a songbird) and worm-eating warbler (*Helmitheros vermivorum*), and pileated woodpecker (*Dryocopus pileatus*) habitat for and populations;
- mature riparian forest and headwater streams – amount and trends in Louisiana waterthrush (*Parkesia motacilla*);
- grassland habitat – amount and trends in Henslow’s sparrow (*Ammodramus henslowii*) population and habitat;
- species of viability concern – threatened and endangered species and Regional Forester Sensitive Species;
- species of public interest, such as white-tailed deer and ginseng;
- non-native, invasive species;
- amount of Forest Service land open for timber harvesting;
- amount of Forest Service land open for prescribed burning.

For this EA, the BLM analyzed all of these indicators except the last two, since they relate strictly to amounts of land allocated to certain land management practices, which are not affected by oil and gas leasing or on-the-ground mineral activities.

### 3.3.2. Oak-hickory forest

Oak-hickory and mixed oak communities dominate the WNF (2006 Forest Plan Final EIS, p. 3-40). The Southern Unglaciaded Allegheny Plateau ecological section was dominated by oak-hickory and mixed oak-pine communities at the time of first European settlement. The primary changes to the vegetation since then have been the initial cutover of the primeval forest and the broad suppression of wildfire that accompanied widespread European settlement. This second factor has resulted in the invasion of maples, beech, and yellow poplar into the oak-dominated communities, to such an extent in many areas that shade-intolerant, mast-bearing species (oaks and hickories) are declining. The primary factor in maintaining oak-hickory forest is periodic disturbance, primarily harvest and fire, either wild or prescribed.

### 3.3.3. Pine forest

Pine-dominated communities made up 6%, and mixed-pine communities 5% of the WNF in 2006 (2006 Forest Plan Final EIS, p. 3-55). As farms failed in southeastern Ohio in the 1930s, the Civilian Conservation Corps planted pines widely as an erosion-control practice. Pines on the WNF include four native species: shortleaf pine (*Pinus echinata*), pitch pine (*P. rigida*), Virginia pine (*P. virginiana*), and, in the eastern portion of the Marietta unit, white pine (*P. strobus*). Red pine (*P. resinosa*) is not native to Ohio but is widely planted and is present on the WNF. Pines are propagated by disturbances, such as blowdown, fire, and timber harvest.

Pine warbler is identified by the Partners in Flight Northern American Landbird Conservation Plan as a Stewardship Species for the Eastern Avifaunal Biome. This species has increased throughout the region

in the last half century. The 2006 Forest Plan Final EIS projects a decline in pine-dominated stands and pine warbler population.

#### **3.3.4. Early successional habitat**

As in the case of oak-dominated and pine communities, early successional habitat types depend on periodic disturbances. Disturbances such as fire and timber harvesting expose the ground to sunlight and permit the growth of shrubby communities that favor certain types of wildlife. Wildfire once provided periodic disturbance to a large portion of southern Ohio but has been widely suppressed over the past century. Abandoned farms created a large component of early successional habitat, but this component declined from 25% of the WNF in 1968 to the 2006 level of 5.4% (2006 Forest Plan Final EIS, p. 3-60). A large component of current early successional habitat is on reclaimed mine lands. Yellow-breasted chat and ruffed grouse are species of conservation concern on the WNF that require young stands with open canopies. These and many other early successional forest birds have experienced population declines as early successional habitat has given way to closed-canopy forests.

#### **3.3.5. Mature interior forest**

94% of the WNF and 80% of the surrounding landscape were forested in 2006 (2006 Forest Plan Final EIS, p. 3-70). Mature forests have been increasing throughout southern Ohio over the last half century. Most stands are even-aged or nearly so, since most stands originated following clearcuts or farm abandonment. Many wildlife species thrive in mature forest conditions, and there is a wide variety of types of structure in mature forests, such as semi-open canopies and tight canopies that provide dense shade. The most abundant management area on the Marietta Unit is Diverse Continuous Forest, which is managed to emphasize large blocks of unbroken forest.

Three bird species, cerulean warbler, worm-eating warbler, and pileated woodpecker, were selected as indicators of mature forest conditions because they represent a broad cross-section of the habitat needs of mature-forest-dependent wildlife. Cerulean warblers require uneven-aged forests with large trees for cavity-nesting. Worm-eating warblers nest on the ground and require well-developed understory with plenty of coarse, woody debris. Pileated woodpeckers favor old forests but will use less-mature habitats. All of these birds protect large territories and require large, unbroken tracts of mature forest.

#### **3.3.6. Mature, riparian forest/headwater streams**

Riparian areas are the zones of interaction between the terrestrial and aquatic ecosystems, including the floodplains and the land whose vegetation, microclimate, and wildlife are directly influenced by the presence of the aquatic ecosystem. The WNF provided a GIS file showing riparian areas within the Marietta Unit. There are almost 15,000 acres of riparian area within the Marietta Unit, and the Forest Service manages 15 percent of this area. Most of the federally-managed riparian areas are forested, and some of the lands in riparian areas are used for agriculture and roads.

Louisiana waterthrush is a bird species that lives in large riparian forests. The Louisiana waterthrush is considered a good indicator of riparian area health because it eats insects that live in various

microhabitats that are present in a healthy riparian area. Louisiana waterthrush is listed as a Stewardship Species in the Partners in Flight North American Landbird Conservation Plan with a goal of maintaining its current population, and the species is considered stable on the WNF.

### **3.3.7. Grassland habitat**

Periodic disturbances have created small patches of grassland in southeastern Ohio since before European settlement, but extensive prairies are not considered a native community to this area. Much of the grassland habitat on the WNF was created by reclaimed mine lands. The Marietta Unit does not contain any of the WNF's major prairie areas, and the Unit contains no land allocated to the Grassland Forest Mosaic management area.

Henslow's sparrow, a grassland-dependent species, has been declining in southeastern Ohio in recent decades and is not known to be present on the Marietta Unit.

### **3.3.8. Species of viability concern**

#### ***3.3.8.1. Federally endangered or threatened species***

Sensitive species managed by the Forest Service include federally listed endangered, threatened, and candidate species under the Endangered Species Act and Regional Forester Sensitive Species. The Forest Service, including both the WNF and the Region 9, has previously consulted with the U.S. Fish and Wildlife Service (FWS) under Section 7 of the Endangered Species Act with respect to federally listed species. Since the BLM was a cooperating agency in the 2006 Forest Plan, the consultation conducted with respect to the 2006 Forest Plan applies to the Proposed Action analyzed in this EA. The FWS's BO, dated November 22, 2005, lays out a tiered approach to Section 7 consultation. The programmatic (Tier I) BO covers all the activities described in the 2006 Forest Plan at a programmatic, non-site-specific level. As the Forest Service (and, by extension, the BLM) analyzes particular projects, the Forest Service (and BLM) is responsible to reinitiate consultation at the project level by submitting to the FWS the following:

- description of the Proposed Action and area affected;
- list of the species that may be affected and their locations;
- description of the nature of the potential effects;
- determination of the effects;
- cumulative total of incidental takes to date under the Tier I BO;
- description of additional actions that were not described in the Tier I BO.

Table 3.3 lists the species that were covered in the 2005 BO and two additional species that the FWS recommended the BLM include in new consultation for the proposed leasing action analyzed in this EA.

**Table 3.3. Species addressed in the Tier I Biological Opinion and in the current consultation.**

Common name	Scientific name	Listing status	Determination, Tier I BO
<b>Mammals</b>			
Indiana bat	<i>Myotis sodalis</i>	endangered	LAA
Northern long-eared bat	<i>Myotis septentrionalis</i>	threatened	n/a
<b>Insects</b>			
American burying beetle	<i>Nicrophorus americanus</i>	endangered	NLAA
<b>Birds</b>			
Bald eagle		delisted, but still protected under Bald and Golden Eagle Protection Act	NLAA
<b>Mussels</b>			
Fanshell	<i>Cyprogenia stegaria</i>	endangered	NLAA
Pink mucket pearlymussel	<i>Lampsilis abrupta</i>	endangered	NLAA
Sheepnose	<i>Plethobasus cyphus</i>	endangered	n/a
Snuffbox	<i>Epioblasma triquetra</i>	endangered	n/a
<b>Plants</b>			
Northern monkshood	<i>Aconitum noveboracense</i>	threatened	NLAA
Running buffalo clover	<i>Trifolium stoloniferum</i>	endangered	LAA
Small whorled pogonia	<i>Isotria meleoloides</i>	threatened	NLAA

Common name	Scientific name	Listing status	Determination, Tier I BO
Virginia spirea	<i>Spirea virginiana</i>	threatened	NLAA

LAA - likely to adversely affect; NLAA - not likely to adversely affect; n/a - not included in the Tier I BO

The area analyzed by the WNF in 2005 includes the entire Forest proclamation boundary and a one-mile buffer around the Forest, which fully encompasses the area being analyzed for potential oil and gas activities on the Marietta Unit. Bald eagle is a Regional Forester Sensitive Species and is protected under the Bald and Golden Eagle Protection Act.

#### 3.3.8.1.1. Indiana bat

Indiana bat, which has similar habitat requirements to the northern long-eared bat, is well-documented on all units of the WNF and is present year-round. The WNF contains one documented hibernaculum, and it is not on the Marietta Unit. Likewise, lactating and post-lactating females and adult males have been captured within the WNF, which indicates that roost trees are most likely present on the WNF. While suitable summer habitat exists on all three units of the WNF, the Athens and Ironton Units most likely contain the most heavily concentrated populations of Indiana bat.

#### 3.3.8.1.2. Northern long-eared bat

Northern long-eared bats live in forested areas during the summer, where they forage on flying insects and roost in trees with exfoliating bark and other natural or artificial crevices. This species was listed as threatened in April 2015 and, as such, was not addressed in the 2006 Forest Plan or its related BO. The primary threat to this species is a widespread disease, called white-nose syndrome, which is related to a fungal infection that is highly contagious between communally hibernating bats. White-nose syndrome is caused by the fungus *Pseudogymnoascus destructans* and generally inflicts hibernating bats, resulting in up to 100 percent mortality in hibernacula. Because the primary threat to this species is a disease and not anthropogenic activities, the FWS has instituted a rule, known as a 4(d) rule, which permits take of this species under certain circumstances. The FWS has drafted a BO for this 4(d) rule (U.S. Fish and Wildlife Service, 2016), and the BLM's Section 7 consultation for this EA includes the determination that the proposed leasing activities would not result in any take that is not exempted by the 4(d) rule.

#### 3.3.8.1.3. American burying beetle

American burying beetles live in various types of habitats. They require dove- or chipmunk-sized carrion, which they bury and feed to their young until the larvae pupate. This species was released on state-owned lands near the WNF and on the WNF Athens Unit in 2009. These locations are all far enough from the Marietta Unit that it is unreasonable to think that the American burying beetle would have naturally migrated to, and established a population on, the Marietta Unit.

**3.3.8.1.4. Freshwater mussels**

Fanshell and pink mucket pearlymussel are not documented anywhere on the WNF. The WNF contains suitable habitat for fanshell’s host fish species but not for fanshell or pink mucket pearlymussel. Sheepnose and snuffbox may be present on waterways within the WNF, but the U.S. Fish and Wildlife Service agreed with the Forest Service’s determination in 2012 that neither of these species would be affected by activities on the national forest.

**3.3.8.1.5. Northern monkshood, small whorled pogonia, and Virginia spirea**

Northern monkshood lives in shaded to partially-shaded habitats cliffs, talus slopes, or other locations with cool air, soil, or groundwater. One of the three populations known to exist in Ohio is in Hocking County, which overlaps the Athens Unit, but is not on federal land. The WNF contains no known potential reintroduction sites (U.S. Forest Service, 2006).

One population of small whorled pogonia is near the Athens Unit, and the Ironton District contains abundant suitable habitat. However, this species has not been identified on the Marietta Unit.

Virginia spirea has not been identified on the WNF. The nearest known population is near the Ironton District, outside of the WNF.

**3.3.8.1.6. Running buffalo clover**

This species is known to occur on the Ironton District on lands that are protected from minerals development and was recently discovered on the Athens Unit in 2013. There are no known occurrences in the Marietta Unit.

**3.3.8.2. Regional forester sensitive species**

Regional Forester Sensitive Species include candidate species under the Endangered Species Act, species that have been federally delisted within the past five years, and species documented within the proclamation boundary with a global, trinomial, or national rank of G1-G3, T1-T3, or N1-N3. The Biological Evaluation (BE) that was drafted for the 2006 Forest Plan addressed 14 animal species and nine plant species, and several have been added and/or removed from the list since then, as detailed in Tables 3.4 and 3.5.

**Table 3.4. RFSS animal species.**

Common name	Scientific name	2006	2016	Occurrence/Habitat
Mammals				
Bobcat	<i>Lynx rufus</i>	X		Forest-wide
Black bear	<i>Ursus americanus</i>	X	X	Forest-wide
Little brown bat	<i>Myotis lucifugus</i>		X	Forest-wide

Common name	Scientific name	2006	2016	Occurrence/Habitat
Tri-colored bat	<i>Perimyotis subflavus</i>		X	Forest-wide
Birds				
Bald eagle	<i>Haliaeetus leucocephalus</i>		X	Forest-wide but no documented nests
Cerulean warbler	<i>Dendroica cerulea</i>	X	X	Forest-wide
Henslow's sparrow	<i>Ammodramus henslowii</i>	X	X	Athens Unit and Ironton Ranger District
Reptiles				
Timber rattlesnake	<i>Crotalus horridus</i>	X	X	Athens Unit and Ironton Ranger District
Amphibians				
Eastern hellbender	<i>Cryptobranchus alleganiensis</i>	X	X	Marietta Unit (Little Muskingum River)
Four-toed salamander	<i>Hemidactylium scutatum</i>		X	Ironton Ranger District
Green salamander	<i>Aneides aeneus</i>		X	Ironton Ranger District
Mud salamander	<i>Pseudotriton montanus</i>		X	Ironton Ranger District
Fishes				
Ohio lamprey	<i>Ichthyomyzon bdellium</i>	X	X	Marietta Unit (Little Muskingum River)
Western lake chubsucker	<i>Erimyzon sucetta</i>	X	X	Ironton Ranger District
Eastern sand darter	<i>Etheostoma pellucidum</i>	X		
Redside dace	<i>Clinostomus elongatus</i>		X	Witten Fork and Ohio River tributaries

Common name	Scientific name	2006	2016	Occurrence/Habitat
Mollusks				
Round hickorynut	<i>Obovaria subrotunda</i>	X		
Lilliput	<i>Toxolasma parvus</i>	X		
Little spectaclecase	<i>Villosa lienosa</i>	X	X	Ironton Ranger District (Symmes Ck.)
Salamander mussel	<i>Simpsonaias ambigua</i>	X	X	Marietta Unit (Little Muskingum R.), Ironton RD (Symmes Creek)
Insects				
Grizzled skipper	<i>Pyrgus wyandot</i>	X	X	Athens Unit (Dorr Run area)
Northern metalmark	<i>Calephelis borealis</i>		X	Athens and Ironton Units
Green-faced clubtail	<i>Gomphus viridifrons</i>		X	Marietta Unit (Little Muskingum R. watershed)
Rapids clubtail	<i>Gomphus quadricolor</i>		X	Marietta Unit (Little Muskingum R. watershed)

**Table 3.5. RFSS plant species.**

Common name	Scientific name	2006 Forest Plan	Current	Habitat
Juniper sedge	<i>Carex juniperorum</i>	X	X	Open woodland, fire-adapted
Yellowish gentian	<i>Gentiana alba</i>	X	X	Open woodland, fire-adapted
Striped gentian	<i>Gentiana villosa</i>	X	X	Semi-open woodland
Butternut	<i>Juglans cinerea</i>	X	X	Semi-open woodland
Umbrella magnolia	<i>Magnolia tripetala</i>	X	X	Mature woodland
Blue scorpionweed	<i>Phacelia ranunculacea</i>	X	X	Semi-open woodland; Ironton Ranger District
Yellow-fringed	<i>Platanthera ciliaris</i>	X	X	Open woodland, fire-adapted

Common name	Scientific name	2006 Forest Plan	Current	Habitat
orchid				
Rock skullcap	<i>Scutellaria saxatilis</i>	X	X	Mature woodland
Pigeon grape	<i>Vitis cinerea</i>	X		Riparian
Dwarf iris	<i>Iris verna</i>		X	Semi-open woodland
Sparse-lobed grape fern	<i>Botrychium biternatum</i>		X	Mature woodland
Lined sedge	<i>Carex striatula</i>		X	Mature woodland
Pinxter flower	<i>Rhododendron nudiflorum</i>		X	Semi-open woodland
Carolina thistle	<i>Cirsium carolinianum</i>		X	Open woodland, fire-adapted
Hirsute sedge	<i>Carex complanata</i>		X	Open woodland, fire-adapted
Slender blazingstar	<i>Liatris cylindracea</i>		X	Open woodland, fire-adapted
Wild pea	<i>Lythyrus venosus</i>		X	Open woodland, fire-adapted
Fern-leaf false foxglove	<i>Aureolaria pedicularia</i>		X	Open woodland, fire-adapted
Yellow crownsbeard	<i>Verbesina occidentalis</i>		X	Open habitat
Featherbells	<i>Stenanthium gramineum</i>		X	Open habitat
Bushy broom-sedge	<i>Adropogon glomeratus</i>		X	Open habitat
Small white snakeroot	<i>Ageratina aromatica</i>		X	Open habitat
Large sedge	<i>Carex gigantea</i>		X	Riparian
Louisiana sedge	<i>Carex louisianica</i>		X	Riparian

### 3.3.9. Species of public interest

Species of public interest are defined as meeting one or more of the following criteria:

- Fish, wildlife, and plant species commonly enjoyed and used by the public for hunting, fishing, trapping, gathering, observing, or sustenance
- The conditions and trends in the 2006 Forest Plan area are associated with these species
- The use and enjoyment of these species contributes to social and economic sustainability.

Species of interest considered in this EA are Whitetail deer and Wild American ginseng, discussed below.

#### 3.3.9.1. Whitetail deer

The southeastern third of Ohio has the state's highest population densities. The ODNR attempts to manage the deer herd throughout the state through harvest management. The objectives are to maintain a healthy deer population and hunting opportunities while mitigating damage to crops. Most of the federal land throughout the WNF is open for hunting. Table 3.6 contains deer harvest data for Monroe, Washington, and Noble Counties combined, gleaned from the ODNR website (Ohio Department of Natural Resources, 2016b).

**Table 3.6. Deer harvested in Monroe, Washington, and Noble Counties.**

Year	Harvest	Year	Harvest
2006-07	15,018	2011-12	11,886
2007-08	13,020	2012-13	11,024
2008-09	15,156	2013-14	9,012
2009-10	15,289	2014-15	7,535
2010-11	12,808	2015-16	9,006

#### 3.3.9.2. Wild American ginseng

Wild ginseng is a medicinal herb that may be harvested by permit in most of the Marietta Unit. Management areas in the Marietta Unit where harvest is prohibited include special areas and future old forest with minerals. Overharvesting poses the greatest threat to populations on the WNF (2006 Forest Plan Final EIS, p. 3-150).

### 3.3.10. Non-native, invasive species

Non-native, invasive species include non-native plants, animals, and plant diseases that aggressively displace native species and alternative plant communities and ecosystems. Roughly one-third of the WNF is infested with one or more non-native, invasive species. Most of the documented non-native,

invasive species in Ohio and on the WNF are plants, and the 2006 Forest Plan lists 47 non-native, invasive plant species known to occur on the WNF. Staff from the BLM observed garlic mustard, Japanese stilt grass, and multiflora rose on multiple locations on the Marietta Unit during site visits conducted in 2015 as part of this EA effort.

Non-native, invasive diseases include several fungal pathogens that attack particular tree species, such as butternut canker and Dutch elm disease.

Invasive insects include Gypsy moth and emerald ash borer. Gypsy moth feeds on hundreds of plant species, but its most common hosts are oaks and aspen, which are abundant on the WNF. The Ohio Department of Agriculture conducts treatments to suppress Gypsy moth populations in cooperation with willing landowners.

Emerald ash borer, an insect that kills all species of ash (genus *Fraxinus*), is widespread in Ohio and has been identified on the Athens Unit of the WNF. It may be present on the Marietta Unit as well (Ohio Department of Agriculture, 2016).

### 3.4. Geology and Minerals

Bedrock outcrops on the WNF are composed of clay, shale, siltstone, sandstone, conglomerate, and limestone, mostly from Pennsylvanian and Permian systems. Some Mississippian rocks also occur on the surface. Coal seams are found interbedded in the Pennsylvanian and Permian formations. These rock units – as well as the thick sequence of sedimentary rocks of Devonian, Silurian, Ordovician and Cambrian Ages – overlie an igneous and metamorphic Pre-Cambrian complex.

Formations in the vicinity of the WNF generally strike in a northeast-southwest direction and dip gently to the southeast, averaging less than five degrees.

The correlation between the Appalachian Plateau and a subsurface feature called the Appalachian Basin accounts for the southeasterly dip of rock formations underlying the WNF. This basin was likely formed by slow subsidence during the Paleozoic era. The subsidence is believed to have been most rapid towards the center of the basin, which lies southeast of the Forest. Sedimentation into the basin kept up with the subsidence during most of the basin's formation, consequently, sedimentary rock units thicken as they dip towards the basin's center, resulting in an increased dip of older (deeper) rock units.

This dip represents the only known major structural feature within the Athens Ranger District, Athens Unit and Ironton Ranger District, Ironton Unit. However, within the Marietta Unit the major structural feature is the north-south trending Burning Springs Anticline, which has smaller features on its flanks. No large faulting is known in the area, although small faults do occur. Despite the large number of wells drilled in the area, the stratigraphy of eastern Ohio remains poorly understood.

Additionally, there are as many as 15 discontinuous coal beds within the Pennsylvanian Conemaugh and Allegheny Groups.

Given the nature of the sedimentary formations outcropping or close to the surface, mineral materials (sand and gravel, dolomite, limestone, clay, etc.) are abundant within the WNF.

There are several fossiliferous marine members of the Pennsylvanian system. The marine fossils within these members consist of gastropods, corals, cephalopods, fusulinid protozoans, clams, brachiopods, bryozoans, and trilobites. These are all fairly common invertebrate fossils. A few formations have yielded fish fossils and scales. Plant fossils in the form of plant fragments, fern fronds, trunks, pyritized logs, stumps, spores, and roots, can be found in a variety of deposits including coal, clay, shale, sandstone, and limestone. Some formations have an abundance of plant fossils. Others only have traces, while the majority has none (2006 Forest Plan Final EIS, pp. 3-253 – 3-255).

#### 3.4.1. Minerals

Ohio has a long history of oil and gas exploration and production. The location of the first discovery of oil was from a drilled well in Noble County in 1814 and Ohio's first commercial oil well began production in 1860 in Washington County (Ohio Oil and Gas Energy Education Program, 2016). Beginning in the late 1800's oil and gas exploration and production focused on the Devonian Ohio -Bedford shales and the Berea sandstone, and earlier Ordovician Trenton limestone. During the 1960s the Cambrian Trempealeau, Rose Run, and Beekmantown reservoirs became targets for drilling and continue to be active drilling targets. The Clinton sandstone was extensively drilled in the 1970's and 1980's and remains a major petroleum reservoir (Ohio Oil and Gas Energy Education Program, 2016). In eastern Ohio the major hydrocarbon source rock groups can be divided into six general units;

- Pennsylvanian Pottsville, Allegheny, Conemaugh, and Monongahela Groups
- Upper Devonian Olentangy, Ohio, and Bedford Shales
- Middle Devonian Marcellus Shale
- Silurian Rochester Shale
- Upper Ordovician Utica and Queenston Shales
- Middle Ordovician Point Pleasant Formation

Hydrocarbon source rocks and adjacent porous rock formations constitute a petroleum reservoir from which oil and gas are produced. Major oil and gas producing zones in eastern Ohio include;

- Devonian Ohio, Bedford, and Marcellus Shales, and Berea Sandstone
- Ordovician Trenton and Lexington limestones, Point Pleasant and Utica shales, and the Clinton Sandstone
- Cambrian Knox Dolomite including the Trempealeau Dolomite, Rose Run Sandstone, and Beekmantown Dolomite

Since the early 2000s, the focus of petroleum exploration and production has moved to the Marcellus, Utica, and Point Pleasant Shales. Previously oil shales were not considered good hydrocarbon producers due to their low permeability but advances in horizontal drilling and hydraulic fracturing methods have

enabled the production of oil, natural gas, and gas liquids possible from these reservoirs in paying quantities.

The Marcellus Shale is a large natural gas reservoir of black, organic-rich shale of middle Devonian age. It extends an estimated 95,000 sq. miles under large portions of New York, Pennsylvania, West Virginia, and Ohio (Pickett, 2011). In eastern Ohio the Marcellus Shale lies approximately 5,000 to 6,000 feet below the surface. Due to the thinness of the Marcellus Shale in eastern Ohio there has been relatively little drilling compared to locations further east.

Below the Marcellus Shale, some 2,000 – 3,000 feet, is a thicker and more extensive hydrocarbon reservoir known as the Utica Shale. This Ordovician-aged formation consists of a dark-gray to black, calcareous, organic-rich shale that contains light oil and natural gas. In contrast to the Marcellus Shale, the thickness of the Utica in Ohio increases from east to west (Pickett, 2011).

The deepest and oldest of the shale formations is the Point Pleasant. Resting on top of the Trenton Limestone and immediately below the Utica Shale, the Point Pleasant Shale is found 6,000 to 10,000 feet deep in eastern Ohio. As the Trenton Limestone trends westward it gradually thins into the interbedded limestone and organic-rich shale of the Point Pleasant formation (Wickstrom, Riley, Erenpreiss, & Perry, 2012). This interlayered formation is thicker and higher in total carbon content than the Utica (Pickett, 2011) suggesting a larger reservoir than the Utica. In the eastern Ohio counties of Washington and Monroe, the Point Pleasant formation is rich in oil and natural gas liquids, also known as wet gas.

### **3.4.2. Mineral development**

Since 2010, Ohio has seen an increase in the drilling and production of oil and gas. The ODNR reported that 15,707,339 barrels of oil and 651,193,106 million cubic feet (Mcf) of gas were produced from Ohio's horizontal shale wells in the first nine months of 2015. This exceeds the 15,062,912 barrels of oil and 512,964,465 Mcf of gas produced by all wells in Ohio for the entire year of 2014. Approximately 715 new wells were drilled in Ohio with Monroe and Washington counties ranking fourth and tenth respectively in the number of new wells drilled (Stucker, 2015). The majority of exploration and production in 2014 occurred in the Ohio - Marcellus, Utica/Point Pleasant, and Trempealeau producing zones.

Mineral ownership on the WNF is complicated and consists of a mix of Forest Service and private surface ownership along with federal and private mineral ownership. Table 3.7 details the ownership within the Marietta unit of the WNF. Approximately 59% of the WNF surface ownership is underlain by private minerals. The remaining approximately 41% of surface ownership is underlain by federal minerals (U.S. Forest Service, 2012). When the federal minerals are leased by BLM they come under federal jurisdiction and all surface and down hole activity must comply with federal regulations.

**Table 3.7. Wayne National Forest surface/mineral ownership (2006 Forest Plan Final EIS, Table 3-62).**

Ownership		Marietta Unit (acres)	Athens Unit (acres)	Ironton District (acres)	Forest Totals (acres)	
Federal Surface	Federal Minerals	100% minerals Unencumbered	8,507	10,382	43,491	62,380
		100% minerals with deed lease <sup>1</sup>	8,760	8,069	17,037	33,866
	<b>Total Federal Minerals</b>		<b>17,267</b>	<b>18,451</b>	<b>60,528</b>	<b>96,246</b>
	Private Minerals <sup>2</sup>	Reserved Minerals	4,384	5,663	9,182	19,229
Outstanding Minerals		7,622	12,468	11,000	31,090	
Combination <sup>3</sup>		34,725	36,565	21,642	92,932	
<b>Total Private Minerals</b>		<b>46,731</b>	<b>54,696</b>	<b>41,824</b>	<b>143,251</b>	
<b>Total Federal Surface</b>		<b>63,998</b>	<b>73,147</b>	<b>102,352</b>	<b>239,497</b>	
Private Surface	Federal Minerals	7	116	708	831	
	Private Minerals	204,053	195,682	214,273	614,008	
<b>Total Private Surface</b>		<b>204,060</b>	<b>195,798</b>	<b>214,981</b>	<b>614,839</b>	
<b>Total Acres within the WNF</b>		<b>268,058</b>	<b>268,945</b>	<b>317,333</b>	<b>854,336</b>	

<sup>1</sup> Most of these leases appear to be inactive and/or may have expired, but their legal status is currently unknown.

<sup>2</sup> Reserved, Outstanding, and Combination minerals may not all be 100% private minerals. Partial Federal interests may exist as well.

<sup>3</sup> Combination indicates a parcel with two or more outstanding, reserved or deed lease rights.

### 3.5. Soils

The 2006 Forest Plan Final EIS states that the forest is located in Ohio's Hill Country, consisting of a long series of narrow ridges and U-shaped valleys. The slopes tend to be benched or segmented with alternating sections of steep and moderately sloped gradients due to the resistance of different strata to erosion. Due to the steep gradients and soil textures (surface texture = silt loam, loam, or sandy loam; subsoil texture = sandy loam to clay) erosion is probable if the duff layer is disturbed.

Soil loss within the Marietta Unit proclamation boundary ranges from up to one-half ton per acre per year on undisturbed forested lands and to up to seven tons per acre per year on croplands. Soil mass movement is possible on the steepest areas of the forest, with nearly all valleys containing evidence of slide areas. Serious erosion is usually limited to road use during excessively wet periods where roads are poorly located or not engineered for proper drainage or flow, which is usually most likely on unauthorized roads and trails. Intermingled farms and rural roads, rather than forested land, are the major sources of soil erosion. Serious soil erosion is common on private forest land due to lack of appropriate mitigation measures being implemented.

For more detailed information refer to the Soils section of the 2006 Forest Plan Final EIS, pages 3-21.

## 3.6. Water Resources and Water Quality

### 3.6.1. Surface water

#### 3.6.1.1. Overview

The Marietta Unit is entirely contained within the Little Muskingum Middle Island Hydraulic Unit Code (HUC)-8 sub-basin (also known as a level-4 watershed). The Marietta Unit overlays five HUC-10 (level-5) watersheds, as shown in Map 5 (see Chapter 6 of this EA). This analysis omits the small portions of the Seneca Fork-Wills Creek and Sunfish Creek watersheds, since there are no federal lands associated with the Marietta Unit in those watersheds. The Ohio River forms the southern edge of the Marietta Unit, and all of the watersheds in the Marietta Unit drain to the Ohio River. The Marietta Unit contains over 1,250 miles of streams.

**Table 3.8. HUC-10 (Level-5) Watersheds in the Marietta Unit.**

<b>Watershed</b>	<b>Area in Marietta Unit (acres)</b>	<b>Federally owned area (acres)</b>
West Fork Duck Creek	2,523	164
East Fork of Duck Creek	15,001	1,484
Clear Fork Little Muskingum River-Little Muskingum River	100,597	28,421
Headwaters Little Muskingum River	92,956	15,009
French Creek- Ohio River	53,686	19,560
Total	264,763	64,638 (24%)

Most of the streams within the proclamation boundary are low-order or ephemeral streams and headwaters for the Little Muskingum River or Ohio River. Low order streams do not have many tributaries contributing to their flow, and about two-thirds of that length is intermittent. Within the Marietta Unit there are approximately 1,250 miles of streams. Water levels are variable depending on the season. On average the state of Ohio sees approximately 133 days with rain each year with an annual average of 56.11 inches (U.S. Climate Data, 2016); this average annual precipitation can vary by 15 inches. Levels of precipitation are lowest in the northwestern part of the state and highest in the south/southwest of Ohio. The inconsistent quantities of evapotranspiration combined with a consistent level of precipitation throughout the year increases the average monthly streamflow; therefore, there are higher flow rates in winter and early spring and lower flow rates in the summer and fall months (Schiefer, 2002).

### 3.6.1.2. *Surface water quality*

In 1996 the Forest Service assessed 200 miles of impaired streams within the WNF finding that 11% of the streams met Ohio's water quality standards, 48% were impaired, and 41% had not been assessed yet by the Ohio EPA or Forest Service. The causes of impairment are generally attributed to abandoned mines and agriculture. In the Marietta Unit, impairment is attributed to nutrients, siltation, pasture land run-off, agricultural run-off, and on-site wastewater systems.

In 2010, the U.S. EPA conducted an assessment analyzing stream impairment was conducted on the Little Muskingum-Middle Island Watershed (HUC-12 Watersheds). Of the 36 watersheds (1555 miles of streams) in the Little Muskingum-Middle Island Watershed, 25 (1245.7 miles) were impaired and the remaining 9 (309.3 miles) were not assessed. Of the streams that were analyzed in the Little Muskingum-Middle Island Watershed, 19 are within the Marietta Unit. In the Marietta Unit, 17 of the streams were impaired and the remaining 2 were not analyzed. The causes of impairment include: flow alterations (FA), sedimentation or siltation (S), total suspended solids (TSS), total toxics (TT) or unknown toxicity, organic enrichment/ low dissolved oxygen/ Oxygen Depletion (O), polychlorinated biphenyls (PCBs), Pesticides/DDT (P), nutrients (N), metals (M), habitat alterations (HA), or other toxicity levels exceeding Total Maximum Daily Load (TMDL) standards. According to the Clean Water Act (CWA) each state is required to identify a prioritized list of their Section 303 (d) impaired waters. Each state submits their TMDLs to the EPA and the TMDLs are either approved or denied. TMDLs are determined by taking into account the loading capacity of the water body as it relates to different pollutants and what actions would need to occur in order to control them. TMDLs are significant because they are the link between causes of impairment and the actions needed to meet water quality standards. Once the causes of point and non-point pollution or impairment are identified TMDLs for each pollutant are determined. The probable causes for impairments in the Marietta Unit are non-irrigated crop production, pasture land, and acid mine drainage (AMD). The reasons for impairment are listed in Table 3.9 as they correspond with the risks they pose on aquatic life, human health, recreation, or public drinking (United States Environmental Protection Agency, 2016).

This most recent *Ohio Integrated Water Quality Monitoring and Assessment Report* was conducted in 2014, also known as the Integrated Report. The Integrated Report satisfies the CWA requirements for both Section 305 (b) for biennial reports on the state's waters conditions and Section 303 (d) for prioritized list of impaired waters. Overall it indicates that larger rivers in Ohio are more likely to be in attainment than smaller streams; that is where most of the non-attainment waterways are found. There are four major components to the Integrated Report; human health use, recreation use, aquatic life use, and public drinking water use. Human health evaluation occurs by comparing contaminated fish tissue to determine fish consumption advisories. Recreation evaluation methodology is a bacterial water assessment. Aquatic life is evaluated through the use of a biological assessment and a biocriteria program which measured by using two indices, the Index of Biotic Integrity (IBI) and the Modified Index of Well-Being (MIwb) for fish and Invertebrate Community Index (ICI) for aquatic macro invertebrates. Public drinking water conditions are determined by the level of algae and associated cyanotoxins. The

populations of certain micro or macro invertebrates can be indicators of poor or good stream health. Human health use analysis found that one-third of the Watershed Assessment Units (AUs) or HUC-12 watersheds and more than half of the lakes in Ohio were unimpaired for this use. Most of the impairments for human health were attributed to polychlorinated biphenyl (PCB) contamination. Recreation use assessment found that beaches located near population centers had a higher frequency of swimming advisories because of elevated bacteria levels. The only areas that were identified as impaired or put on a watch list for public drinking water use are located in the northwestern part of Ohio and parts of central Ohio. AU impairments are listed in Table 3.9 (Ohio Environmental Protection Agency, 2016).

**Table 3.9. Impairment of Little Muskingum- Middle Island Watershed streams within Marietta Unit.**

Waterbody Name	Waterbody ID	Waterbody Type	Size (miles)	Status	Aquatic Life	Human Health	Public Drinking	Recreation
<a href="#">Archers Fork</a>	OH050302010702	Stream	28.6	Impaired	impaired: FA, N, S	not assessed (na)	na	na
<a href="#">Clear Fork Little Muskingum River</a>	OH050302010701	Stream	73.2	Impaired	impaired: FA, N, S	na	na	na
<a href="#">Cranenest Fork</a>	OH050302010602	Stream	43.6	Impaired	impaired: S	na	na	na
<a href="#">Eightmile Creek-Little Muskingum River</a>	OH050302010705	Stream	64.2	Impaired	impaired: FA, N, S	na	na	na
<a href="#">Fifteen Mile Creek</a>	OH050302010704	Stream	28.7	Impaired	impaired: FA, N, S	na	na	na
<a href="#">Haynes Run-Ohio River</a>	OH050302011004	Stream	27.9	Not_Assessed	na	na	na	na
<a href="#">Leith Run-Ohio River</a>	OH050302011007	Stream	38.1	Not_Assessed	na	na	na	na
<a href="#">Lower East Fork Duck Creek</a>	OH050302010805	Stream	26.1	Impaired	impaired: HA, FA, M, O, S, TSS, TT	na	na	na
<a href="#">Middle East Fork Duck Creek</a>	OH050302010803	Stream	60.9	Impaired	impaired: HA, FA, M, O, S, TSS, TT	na	na	na
<a href="#">Middle Sunfish Creek</a>	OH050302010103	Stream	35.5	Impaired	impaired: unknown	na	na	na

Waterbody Name	Waterbody ID	Waterbody Type	Size (miles)	Status	Aquatic Life	Human Health	Public Drinking	Recreation
<a href="#">New Years Creek-Duck Creek</a>	OH050302010903	Stream	44.6	Impaired	impaired: FA, O, S, TT	impaired: unkown	na	na
<a href="#">Paw Paw Creek</a>	OH050302010804	Stream	43.9	Impaired	impaired:HA, FA, M, O, S, TSS, TT	na	na	na
<a href="#">Rich Fork</a>	OH050302010601	Stream	38.3	Impaired	impaired: S	na	na	na
<a href="#">Straight Fork-Little Muskingum River</a>	OH050302010605	Stream	53.1	Impaired	impaired: Sedimentation	na	na	na
<a href="#">Sugar Creek-Duck Creek</a>	OH050302010904	Stream	26.4	Impaired	impaired: FA, O, S, TT	impaired: P, PCBS	na	na
<a href="#">Upper East Fork Duck Creek</a>	OH050302010801	Stream	54	Impaired	impaired: HA, FA, M, O, S, TSS, TT	na	na	na
<a href="#">Wingett Run-Little Muskingum River</a>	OH050302010703	Stream	55.4	Impaired	impaired: FA, N, S	na	na	na
<a href="#">Witten Fork</a>	OH050302010604	Stream	71.6	Impaired	impaired: S	na	na	na
<a href="#">Wolfpen Run-Little Muskingum River</a>	OH050302010603	Stream	37.5	Impaired	impaired: S	na	na	na
Total			851.6					

Impaired HUC-12 watershed within Marietta Unit from 2010 EPA report, the causes of impairment include: flow alternations (FA), sedimentation or siltation (S), total suspended solids (TSS), total toxics (TT) or unknown toxicity, organic enrichment/ low dissolved oxygen/ Oxygen Depletion (O), polychlorinated biphenyls (PCBs), Pesticides/DDT (P), nutrients (N), metals (M), habitat alterations (HA) and Ohio Integrated Water Quality Monitoring and Assessment Report from 2014 (Ohio Department of Natural Resources, 2016).

### Acid Mine Drainage

Southeastern Ohio has several abandoned mine sites and these point sources of pollution have been known to impact watershed health and alter the flow of groundwater. During the 19th and 20th centuries, significant damage was done to riparian areas. In some cases, streams were overloaded with sediment polluted by AMD that may have collapsed the limestone cap over underground mines causing freshwater to be captured and contaminated in abandoned mines. Gob piles (accumulated spoil piles)

contaminated the water and surrounding areas, and the natural landscape was altered by strip-mining (2006 Forest Plan Final EIS, pp. 3-6 & 3-7). In 1972, Ohio statutes began to require restoration of desirable environment that had been disturbed by mining. Prior to these reclamation standards, Ohio was left with 1,300 miles of AMD-polluted streams, 500 miles of streams affected by sediment deposition, and polluted domestic water supplies. In March 1995, the ODNR established the Acid Mine Drainage Abatement and Treatment (AMDAT) fund to aid in long-term cleanup of AMD problems. This program addresses source control and then treatment which can be active or passive (Ohio Department of Natural Resources, 2015a). The way AMD is addressed is continuously evolving. An example of active treatment would be using chemical treatment systems and an example of passive treatment would be allowing natural occurring chemical or biological processes to aid in AMD treatment. In 1977, the federal government passed the Surface Mining Control Reclamation Act in recognition of all the abandoned mines, and then created the federal Abandoned Mine Land (AML) Program. The results of this program up until 2014 include a total of more than 10,000 acres of reclaimed lands in Ohio that were impacted by the 200 years of coal mining in Ohio. Through 2014, the AML Program has also replaced 339 supplies of polluted residential water supplies, completing 94.7% of the completed current inventory (Ohio Department of Natural Resources, 2016a).

### **3.6.2. Groundwater**

#### **3.6.2.1. Groundwater quantity**

Nearly all rural populations in Ohio obtain drinking water from groundwater sources (USGS). There are 888 drinking water wells within the Marietta Unit proclamation boundary (Ohio Department of Natural Resources, 2015b and 2015c). Their static water levels range from zero feet below surface to 183 feet below surface with a mean of 32 feet. The mean depth of drinking water wells in the Marietta Unit is 86 feet, with a maximum depth of 475 feet. Most of these wells have a yield of less than ten gallons per minute. The higher-yielding wells are located in the floodplains of the Ohio River and Little Muskingum River.

#### **3.6.2.2. Groundwater quality**

Groundwater under the Marietta Unit flows largely through fractures in bedrock (Thompson, 2012). These fractures are most abundant near the surface, and at depths of a few hundred feet, the relative absence of fractures prevents groundwater from flowing and allows it to dissolve minerals from the bedrock, producing brackish water. The potable groundwater under the Marietta Unit is largely free of contaminants at levels above human health standards (Ohio Environmental Protection Agency, 2012). There are sites in Washington County with elevated nitrates, and Washington County has two sanitary landfills that are sources of groundwater contamination. Groundwater pollution potential is highest in the riparian areas, most likely because of the short depth to groundwater in those areas (Ohio Department of Natural Resources, 2002).

### 3.6.3. Riparian areas

Riparian areas connect terrestrial habitat to aquatic habitat creating an essential and dynamic ecosystem for a variety of species. Riparian areas can also be defined as wetlands, floodplains, or shoreline that can occasionally be submerged in water. The Marietta Unit contains about 15,000 acres of riparian areas, as detailed in Table 3.10. Mining practices, the impoundment of water, and early settlements near and in the WNF impacted riparian areas. In the Marietta Unit, the creation of the Ohio River Lock and Dam system allowed water to back up into embayments and the barges created waves that caused erosion of riverbanks and additional negative impacts on riparian areas (U.S. Forest Service, 2006).

**Table 3.10. Riparian areas in the Marietta Unit.**

Watershed	Total riparian area (acres)	Federally owned riparian area (acres)
West Fork Duck Creek	556	5
East Fork Duck Creek	2,285	53
Clear Fork Little Muskingum R.-Little Muskingum R.	5,182	1,046
Headwaters Little Muskingum River	4,515	777
French Creek-Ohio River	2,459	387
Total	14,997	2,266

### 3.7. 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 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 a 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.

At this time there are no known hazardous waste sites, including those related to oil and gas operations, within the WNF boundary. Most public lands, however, are victim to illegal trash/waste dumping typically related to private landowners in the area or the illegal production of drugs, both of which can include hazardous waste products.

### 3.8. Recreation and Noise

The WNF is a popular location for both dispersed and developed recreation activities and is located within a one day drive of several urban areas including Akron, Columbus, Cleveland, Cincinnati, and Pittsburgh. It is also the “second largest supplier of public recreation lands” in Ohio after the State Park system (U.S. Forest Service, 2006). Hiking, fishing, hunting, boating, canoeing wildlife viewing, off-highway vehicle trails, camping, and visiting historic site are all popular activities on the Marietta Unit. There are several access points to the Ohio River for watercraft and fishing, and the Little Muskingum River is a popular site for canoeing. The WNF is also a popular area for off-highway vehicle (OHV) use and contains several OHV trails; however, there are no designated OHV trails located on the Marietta Unit, although such activities are done on forest roads.

As listed below in Table 3.11, the WNF manages seventeen developed or designated recreation sites on the Marietta Unit including trailheads, campgrounds, and boat launches. Unless otherwise noted, the open season for all recreation sites is April 15 to December 15. An in-depth review of recreational activities and sites can be found in the 2006 Forest Plan Final EIS.

**Table 3.11. Developed Recreation Sites, Marietta Unit (U.S. Forest Service (2016d)).**

Name	Notes
Frontier Boat Launch	Access to the Ohio River. Includes 70 parking spaces for truck/trailers and cars. Open year round, weather river flood stage permitting.
Haught Run Campground	Closed as of 2/1/2016 due to erosion and safety issues. Normally contains four campsites and access to the Muskingum River and local trails.
Hune Bridge Campground	Three developed campsites which provide access to the Little Muskingum River and the North Country Trail. Five-mile trail to Haught Run Campground is closed as of 2/1/2016 (see above). Site also includes interpretive panels discussing the history of the Hune Bridge and local oil and gas industry (see Cultural Resources for more information).
Lamping Homestead	Developed recreation complex with six walk-in campsites, eight picnic sites, a picnic shelter, five miles of hiking and horse trails, and a 2-acre fishing pond. Includes a small cemetery and several structures related to the Lamping Homestead, which dates to the late-1800s (see Cultural Resources for more information).
Lane Farm Campground	Four developed campsites along Little Muskingum River. Canoe access to river closes as of 2/1/2016.

Name	Notes
Rinard Covered Bridge	Interpretive site with discussing the history of the Rinard Bridge, originally built in 1875 (see cultural resources for more information). The Bridge is open to pedestrian traffic only.
Ring Mill House	Remains of grist mill, saw mill, and renovated house (see Cultural Resources for more information).
Leith Run Recreation Area	Developed campground with 21 campsites, RV dump station, picnic areas, horseshoe pit, and volleyball court, and showers. Site provides access to the Ohio River with a canoe launch and various piers for fishing. Also serves as trailhead for the Scenic River Trail.

In addition to the developed recreation sites, the WNF also manages approximately 300 miles of designated trails for hiking, horse riding, mountain biking, and off-highway vehicles. Unless otherwise noted, trails are open year round to hiking and horseback riding, as well as mountain biking from April 15 to December 15. Distances are for trails located on WNF land unless otherwise noted.

**Table 3.11. Trails and scenic roads on the Marietta Unit (U.S. Forest Service (2016d)).**

Name	Description
Archers Fork Trail	9.5-mile loop trail which visits several areas of natural interest including Irish Run Natural Bridge and a rock shelter.
Covered Bridge Trail	5-mile trail between Haight Run and Hune Bridge Campground along the Little Muskingum River.
Covered Bridge Scenic Byway	35 miles of SR26 between Marietta and Woodsfield, paralleling the Little Muskingum River. Provides access to four covered bridges located in the decision area and numerous other historic era sites (see Cultural Resources section for more information).
Davis Spur Run	3.9 miles, hiking and horse trail, offshoot of the Kinderhook Trail.
Green Wood Trail	6.5-mile linear trail connecting North Country Trail and Scenic River Trail. Hiking and mountain biking. Open year round.
North Country National Scenic Trail/Buckeye Trail	Trails are co-located. Consist of approximately 53 miles of trail which travels through the Marietta Unit, approximately 39 of which are WNF managed land.
Ohio River Scenic Byway	750-mile National Scenic Highway which travels along the Ohio River from Indiana to the Ohio/West Virginia border.

Name	Description
	Approximately 30 miles of the Byway travels through the Marietta Unit on CR7.
Lamping Homestead Trails	Two loop trails of 3.5 and 1.5 miles. Provides access to the Lamping Homestead area.
Kinderhook Trail	12.3-mile trail open to hiking, horses, and mountain biking.
Ohio River Scenic Byway	Covers approximately 35 miles of SR7 along the Ohio River.
Ohio View Trail	7-mile trail which follows the Ohio River between SR7 and SR260. Connects to the North Country Trail. Open year round.
Scenic River Trail	9.5-mile linear trail which connects to the North Country Trail at CR9 and ends at Leith Run Recreation Area. Open year round.
Shay Ridge Trail	3-mile trail connecting Archers Fork and Covered Bridge trails.

The decision area currently is impacted by the sound of recreational activities including, but not limited to All Terrain Vehicles (ATVs)/Utility Task Vehicles (UTVs), hunting, and other vehicle noise along roadways. The forest also permits logging activities and prescribed fire to treat and manage lands. All of these approved activities contribute to the current levels of noise in the forest that could affect recreational and wildlife utilization.

### 3.9. Cultural Resources/Paleontology

A cultural resource is a location of human activity, occupation, or use identifiable through field inventory, historical documentation, or oral evidence. Cultural resources include both historic and prehistoric archaeological sites, structures, places of architectural significance, locations with important public and scientific uses, and may include traditional cultural properties, which are definite locations of traditional and or cultural importance to specific social and or cultural groups. Cultural resources include but are not limited to the following types: prehistoric archaeological resource, ethnographic resource, and historic-period archaeological and built environment resources. Cultural resources may be, but are not necessarily eligible, for the National Register of Historic Places (NRHP).

Most of the Marietta Unit has not been surveyed for cultural resources and there is little known about its prehistoric component (A. Cramer, personal communication, October 29, 2015). The BLM sent a consultation letter to the Ohio State Historic Preservation Office on November 16th, 2015, asking for information on archeological sites in the Marietta Unit and has not received a response.

The Ohio River Valley is known for its history dating to the early European exploration and settlement in the 1600s. During the 1700s and early 1800s, southeastern Ohio saw the most intensive settlement in what was then called the Northwest Territory because of its proximity to Pennsylvania and Virginia, with Marietta becoming the first major town in the region (Arbogast, 2004). The majority of the land in the Marietta Unit was subjected to farming and logging. The Forest Service began to acquire such land in 1935 with official boundaries being determined in 1951. Until 1993, the WNF was managed as a section of the Wayne-Hoosier National Forest until official separation in 1993 (Arbogast, 2004).

Most of the known historic era resources in the Marietta Unit consist of covered bridges and the remains of homesteads and farms. Most of the land of the Covered Bridge Scenic Byway allows access to four covered bridges and several historic locations located along the Little Muskingum River in the decision area. Several of these sites are listed in the NHRP, including the Rinard Bridge, originally built in 1879 (Buonopane, Ebright, & Smith, 2012). The Hills Covered Bridge, built in 1878, contains an interpretive display discussing the history of the bridge and its Howe Truss design (U.S. Forest Service, 2015). Hune Bridge, built in 1877 and listed in the NHRP, is the only covered bridge on the byway still open to traffic and allows access to the Hune Campground. The campground contains interpretive panels discussing the history of the bridge and the local oil and gas industry; part of this display includes an active tank which collects oil from nearby wells and an interpretive panel discussing the process and history of the oil and gas industry in the region (U.S. Forest Service, 2016a). The Walter Ring House, originally constructed in the 1850s and also listed in the NHRP, includes interpretative panels discussing its prior use as a grist mill and sawmill (U.S. Forest Service, 2016e).

Other sites accessed by the Covered Bridge Scenic Byway include the Lamping Homestead. The Lamping Homestead contains the remains of several buildings constructed by the Lamping family during the 1800s as well as the family cemetery (Reed, 2014). The Lane Farm Campground is located at the former site of the Lane Family Farm, of which there are little remnants except a walnut plantation (U.S. Forest Service, 2016b).

### **Paleontology**

There are no known paleontology localities within the Marietta Unit.

### **3.10. Native American Religious Concerns**

The BLM sent letters to seven Federally Recognized Tribes who have a known connection to the area on November 6, 2015, asking to identify any concerns which would need special consideration with respect to the Proposed Action (see Section 1.7.2 for list of Tribes). The BLM has received no responses to date.

### **3.11. Visual Resources and Scenic Quality**

Visitors to the WNF are not only attracted to the area for the many recreational opportunities it offers, but also to enjoy the natural scenic beauty of its landscape. Most of the land that became the WNF consisted of land cleared for timber, agricultural use, or mined for coal and other minerals. During the Great Depression in the 1930s, much of the land was abandoned and reverted back to the federal

government. The landscape is highly dissected by rolling hills, striking rock bluffs and shelters, and caves of sandstone and shale. There are areas of unique natural beauty and cultural history.

The natural appearing landscape is composed predominantly of oak-hickory forest with scattered pines and is interspersed with private farms and pastureland. The character of the landscape includes such cultural features as historic barns, log structures, iron furnaces, covered bridges and minerals development. Also contributing to the scenic quality are the temporary openings created by timber harvests, mineral development and natural events (i.e. ice storms, fire, or insect infestations). These openings can seem visually out of place; however, they do contribute to the spatial diversity and opportunities for viewing the progression of successional vegetative stages. The deep valley bottoms consist of a network of streams and rivers. Artificial lakes are remnants of past strip mining practices.

The scenic resources of the WNF are currently managed in accordance with the 1988 Forest Plan, which lays out how the scenic resources will be managed under the Visual Quality Objectives (VQO) determined by the Visual Management System (VMS). The VQS defines acceptable levels of alteration of scenic resources with the WNF. In the 2006 Forest Plan Final EIS, the VMS language was updated to the newer Scenery Management System (SMS) utilizing Scenic Integrity Objectives (SIO) that were developed for each management area. The SMS responds to the deficiencies of, builds on, and validates the original VMS inventories.

**Table 3.12: Cross-walk of VMS and SMS Objectives (U.S. Forest Service, 1995).**

Visual Quality Objective (VQO)	Appearance to Casual Observer	Scenic Integrity Objective (SIO)
Preservation (P)	Unaltered	Very High (VH)
Retention (R)	Appears Unaltered	High (H)
Partial Retention (PR)	Slightly Altered	Moderate (M)
Modification (M)	Moderately Altered	Low (L)
Maximum Modification (MM)	Heavily Altered	Very Low (VL)

For more information on scenic quality and scenic integrity objectives refer to the 2006 Forest Plan Final EIS and Map 6 (see Chapter 6 of this EA).

### 3.12. Socioeconomics and Environmental Justice

This analysis focuses on the counties that are in or adjacent to the Marietta Unit: Monroe, Noble, and Washington Counties in Ohio and Pleasants and Tyler Counties in West Virginia.

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 WNF compiled an economic assessment in 2004 (Arbogast, 2004). This report states that the counties that comprise the WNF generally have lower per capita incomes, higher unemployment rates, and lower rates of college graduation than the rest of Ohio. They also had a higher degree of economic diversification, which is an index of the spread of economic activity across economic sectors.

The counties in or adjacent to the Marietta Unit are all within the purview of the Appalachian Regional Commission (ARC), a regional economic development agency that seeks to build community capacity and strengthen economic growth in the 420 counties in the 13 Appalachian states. The ARC ranks the Appalachian counties on a continuum ranging from *distressed* to *attainment*, using unemployment, per capita income, and poverty data. These rankings are defined as follows:

- attainment - ranking among the nation’s top 10%,
- competitive - ranking in the top quartile but not in the top 10%,
- transitional - ranking in the middle two quartiles,
- at-risk - ranking in the bottom quartile but not in the bottom 10%,
- distressed - ranking in the bottom 10%.

Aggregate economic data take time to collect, process, and vet, and the rankings provided by the ARC are typically based on data that are three or more years old. Table 3.13 lists the rankings of the counties in or adjacent to the Marietta Unit since 2002 (Appalachian Regional Commission, 2016).

**Table 3.13. Economic status as ranked by the Appalachian Regional Commission.**

Fiscal Year	Noble	Monroe	Washington	Pleasants	Tyler
2002	transitional	distressed	transitional	transitional	transitional
2003	transitional	distressed	transitional	transitional	transitional
2004	transitional	transitional	transitional	transitional	transitional
2005	transitional	transitional	transitional	transitional	transitional
2006	transitional	transitional	transitional	at-risk	transitional
2007	at-risk	at-risk	transitional	transitional	at-risk
2008	at-risk	at-risk	transitional	transitional	at-risk
2009	at-risk	distressed	transitional	transitional	at-risk
2010	at-risk	distressed	transitional	transitional	at-risk

Fiscal Year	Noble	Monroe	Washington	Pleasants	Tyler
2011	at-risk	at-risk	transitional	transitional	at-risk
2012	distressed	at-risk	transitional	transitional	at-risk
2013	distressed	at-risk	transitional	transitional	at-risk
2014	distressed	at-risk	transitional	at-risk	at-risk
2015	at-risk	transitional	transitional	transitional	at-risk
2016	at-risk	at-risk	transitional	transitional	at-risk

Southeastern Ohio and the adjacent portion of West Virginia are largely rural, with the largest city, Marietta, Ohio, comprising about 15% of the population. The region is roughly 95% white, with the most populous minority populations being Black/African American and Latino or Hispanic. Unemployment rates for considered counties in 2014 ranged from 6.9% (Pleasants County, WV) to 10.6% (Tyler County, WV). Mean household incomes ranged in 2014 from about \$50,000 to about \$57,000, and about 11% of families and 17% of individuals fell below the poverty line. The city of Marietta had higher unemployment, lower mean income, and higher poverty than Washington County as a whole (U.S. Census Bureau, 2016).

## 4. ENVIRONMENTAL IMPACTS

### 4.1. Introduction

This chapter assesses the anticipated environmental consequences associated with direct, indirect, and cumulative effects of the Proposed Action and No Action Alternative. The Proposed Action of leasing parcels would, by itself, have no direct impact on any resources in the lease area since there would be no surface disturbing activities. All anticipated resource impacts would be associated with potential future oil and gas development. Such activities, described in Chapter 2, are analyzed at a very broad scale in the 2006 Forest Plan Final EIS.

For the purpose of this EA, a RFDS is used to assess the potential impacts from reasonably foreseeable, but yet uncertain, future oil and gas development as a result of leasing federal minerals in the Marietta Unit. In the event that the BLM were to issue a lease or leases, short-term impacts from potential development 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. 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. Cumulative impacts are addressed at the end of this Chapter. Possible best management practices, standard operating procedures, and

mitigation measures that could be implemented are also discussed within the context of each resource section below.

## 4.2. Air Resources

### 4.2.1. Air quality

An MOU between the U.S. Departments of the Interior and Agriculture and EPA (U.S. Department of Agriculture, U.S. Department of Interior, and U.S. Environmental Protection Agency, 2011) 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

While the act of leasing the parcels would produce no substantial air quality effects, potential future development of the lease could lead to increases in area and regional emissions. Since it is unknown if the parcels would be developed, or the extent of the development, it is not possible to reasonably quantify potential air quality effects through dispersion modeling or another applicable method at this time. Further, the timing, construction and production equipment specifications and configurations, and specific locations of activities are also unforeseeable at this time. Additional air effects will be addressed in a subsequent analysis when lessees file an APD. All proposed activities including, but not limited to, exploratory drilling activities would be subject to applicable local, State, and Federal air quality laws and regulations.

The following sources of emissions are anticipated during 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;
- electric generators to power drill rig engines, pumps, and other equipment;
- compressors used to increase the pressure of the oil or gas for transport and use;
- 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 future drilling activities including: CO, NO<sub>x</sub>, SO<sub>2</sub>, Pb, PM, CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O. Venting may release VOC/HAP, H<sub>2</sub>S, and CH<sub>4</sub>. Mobile source emissions are likely to include fugitive particulate matter from dust and NO<sub>x</sub> associated with vehicle engine combustion, traffic and/or construction activities.

The actual emissions of each pollutant are 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<sub>2</sub>. VOCs and NO<sub>x</sub> contribute to the formation of ozone. The EPA's Natural Gas STAR Program (2014) is a voluntary program that identifies sources of fugitive methane sources and seeks to minimize fugitive CH<sub>4</sub> 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 are 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<sub>4</sub>, along with air toxins such as benzene, ethylbenzene, and n-hexane. The typical flowback process lasts from three to ten days. Additional emissions from other processes and equipment during production and transportation of the oil and gas from the well to a processing facility may occur.

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. Selective Catalytic Reduction (SCR) on diesel powered drill rigs, natural gas fired drill rig engines, the use of "green" completion technology, and multi-stage flare stacks)
- 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, if needed
- The number and type of facilities utilized for production operations.

The degree of impact will also vary according to the characteristics of the geological formations from which production occurs but emissions associated with oil and gas operations 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) 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. Sensitive individuals or those at high risk appear to be at even 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. Operations that would violate a state and/or federal air quality standard would not be approved.

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<sub>2</sub> from the atmosphere and can then indirectly affect the larger ecosystems.

#### **4.2.2 Visibility**

Section 169A of the CAA requires the examination of certain categories of air pollution sources on atmospheric clarity in downwind National Park or wilderness areas (Implemented in 64 FR35714 and 70FR39104) using Guidelines for Best Available Retrofit Technology (BART). An air pollution source meeting the specific criteria are considered BART-eligible. The Ohio EPA published a report on BART-eligible sources and impacts in 2011, which were all in adjacent states (Ohio Environmental Protection Agency, 2011). Twelve facilities were found to need more analysis for potential impacts to 17 total Class 1 Areas. Impacts for all but one coal combustion facility fell well below the eight days/year exceedance levels for Sulfur Dioxide, Nitrous Oxide, and particulate matter. Sulfur Dioxide was the only contributing factor to two Class 1 areas after a zero out test, and the facility was put on a five-year reduction permit to eliminate 90% of the emissions.

Potential reasonably foreseeable oil and gas activities would only contribute short-term and negligible amounts to local visibility, and would not impact any Class 1 or Sensitive Class 2 areas in adjacent states.

#### **4.2.3 Possible Future Best Management Practices, Standard Operating Procedures, and/or Mitigation Measures**

The BLM encourages industry to incorporate and implement Best Management Practices (BMPs) 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.

In October 2012, EPA promulgated air quality regulations for completion of hydraulically fractured gas wells (U.S. Environmental Protection Agency, 2015b). These rules require air pollution mitigation measures that reduce the emissions of volatile organic compounds during gas well completions. Mitigation includes utilizing a process known as a “green” completion in which natural gas brought up during flowback is captured in tanks rather than in open fluid pits. The captured gas is automatically sent to the gathering line.

### 4.3. Plant and Animal Habitat and Populations

#### 4.3.1. Introduction

The 2012 SIR notes that the anticipated environmental impacts of high-volume, horizontal fracturing technology are within the range of impacts analyzed and disclosed in the 2006 Forest Plan Final EIS for two primary reasons. First, the amount of surface disturbance projected on the WNF with the use of high-volume, horizontal fracturing technology is within the amount of surface disturbance analyzed in the 2006 Forest Plan Final EIS (2012 SIR, p. 45, 47, 49). Second, the regulations enforced by the BLM and ODNR and measures prescribed by the 2006 Forest Plan reduce impacts from land clearing and other activities that may impact wildlife habitat and populations (2012 SIR, p. 45).

There would be no direct impacts on fish and wildlife or vegetation communities from leasing, since there would be no surface disturbance at this stage. Future development of the proposed lease parcels could potentially result in the clearing of land, which may include either forested or open habitat. Affected areas would be reclaimed at the end of their use as well pads or construction areas. The Forest Service seeks to maintain a particular range of open habitat for each management area, and these ranges are as follows:

- Diverse Continuous Forest - 2-4%
- Forest and Shrubland Mosaic - 3-6%
- Future Old Forest with Mineral Activity - 0-1%
- River Corridors - 3-6%

While some stipulations (see Chapter 5 of this EA) target particular species, some measures would be taken to protect wildlife in general. Notably, as described in the 2012 SIR, the Forest Service would require operators to use closed-loop systems (i.e., tanks) for containing wastewater (2012 SIR, p. 45). The only fluids that may be contained in open pits would be fresh water and drill cuttings, and pits would be backfilled promptly after they are used. The Forest Service would also require operators to minimize the duration of unproductive wildlife habitat from pad development, either by promptly drilling all the planned wells on a pad or by partially reclaiming portions of the pad while drilling is not occurring on the pad (2012 SIR, p. 63).

Two related types of impact that may occur as a result from clearing land are *fragmentation* and *edge effects*. These two terms refer to effects to portions of forested habitat that are adjacent to open habitat. Fragmentation is the division of a large block of one type of habitat – in this case, forest – into

smaller blocks. Certain species require large blocks of unbroken forest, and the removal of a few acres of forest canopy for a road through the forest may render the entire forest block unsuitable for that species. Edge effects are similar; they include the loss of suitable habitat due to proximity to another, unsuitable habitat type. This can be due to predation from predators that browse near a forested edge.

Fragmentation and edge effects pose more of a risk to habitat types and management areas that emphasize large, unbroken forests. For example, construction of a temporary road would present a larger impact in a Diverse Continuous Forest management area, which emphasizes habitat for forest interior species, than it would in the Forest and Shrubland Mosaic management area, which contains abundant, small openings and breaks in the forest canopy. Any proposed oil and gas activity in a managed wildlife opening would be subject to additional conditions of approval by the Forest Service in order to protect the particular management objectives of the managed opening.

#### **4.3.2. Oak-hickory forest**

Development in a forested area would result in longer-term impacts than development in an area dominated by herbaceous vegetation, since the forest vegetation takes longer to replace than grasses and wildflowers. However, periodic disturbance, which can be mimicked by timber removal, is necessary for the propagation of oaks. For this reason, construction that results in clearing a portion of oak-hickory forest would not necessarily result in a negative impact to the forest as a whole. For example, since the 2006 Forest Plan's goal for herbaceous or shrubby habitat in the Diverse Continuous Forest Management Area is 2 to 4%, the Forest Service would not approve an APD that threatened to create open habitat in excess of that goal. Likewise, the management area in the Marietta Unit that contains the most oak-hickory forest - Forest and Shrubland Mosaic - is intended to contain openings in the forest canopy for diverse wildlife and to ensure the long-term health of the oak-hickory ecosystem.

#### **4.3.3. Pine forest**

Impacts to pine forests would be similar to the impacts described above for oak-hickory forests. In addition to the beneficial impact of having well-distributed openings in a pine or mixed-pine landscape, pines are relatively fast-growing, enabling pines to reinvade openings where desired by land managers.

#### **4.3.4. Early-successional habitat**

Land cleared for future oil and gas development would result in an increased amount of early-successional habitat. If early-successional habitat is cleared for roads or well pads, then the vegetation and plant structure that were removed would take less time to recover upon reclamation than would forested habitat, since the vegetation in early-successional habitat consists of grasses, forbs, and young shrubs and trees.

#### **4.3.5. Mature interior forest**

Some future oil and gas development would likely occur within mature interior forest areas, including the Diverse Continuous Forest management unit and a smaller block of Future Old Forest with Mineral Development. This management unit does have a target proportion of open habitat and contains 160

acres of managed openings. Development in this area may create new openings and/or hold existing openings longer in an open condition. Since the desired outcome for this management area is some component of oaks, which require disturbances such as timber removal, some clearing in this management area may be desirable. Even if all the projected future mineral development were to occur on the Marietta Unit within this management area, the total area of disturbance would not exceed the WNF's management goal for this area.

Cerulean warbler, the indicator species for this habitat type, is a Regional Forester Sensitive Species and, as such, is protected by a controlled-surface-use stipulation.

The amount of land that these projects would alter is very small in relation to the total acreage of the WNF. Therefore, these projects would not have a major effect on efforts to restore and maintain an oak ecosystem on the Forest. Some projects could have a beneficial effect on the oak ecosystem such as the wildfires if they are not too hot and/or in the wrong season, or the control of non-native plants which may allow the oaks to regenerate more effectively depending on the type of non-native and where it is growing.

As described above, fragmentation and edge effects have greater implications in a mature interior forest than in oak-hickory forests or early-successional habitat, which depend on periodic disturbance. In a mature interior forest, the loss of a few acres of canopy can result in the loss of suitability of hundreds of acres of habitat for a wildlife species, such as Cerulean warbler, that depends on the presence of large blocks of unbroken forest.

#### **4.3.6. Mature, riparian forest/headwater streams**

As discussed in the 2006 Forest Plan, riparian areas and floodplains are protected in the 2006 Forest Plan by a controlled-surface-use stipulation, which enables the Forest Service to protect certain critical elements of those areas. Stipulations #15 and #16 allow the Forest Service to set additional conditions of approval on proposed development in riparian areas and floodplains.

#### **4.3.7. Grassland habitat**

Development in a grassland area would have less durable impact on vegetative structure than would development in a forest, since grassland vegetation can be restored to preconstruction conditions more quickly than woody vegetation. Since the Marietta Unit contains less abundant grassland habitat than the rest of the forest, and since most management areas are managed to include some component of open habitat, it is possible that the Forest Service may choose to have a cleared area restored with grassland species even if it is originally woodland, which would assist in the Forest Service in obtaining its desired component of open habitat. Stipulation #14 enables the Forest Service to protect managed openings.

#### 4.3.8. Species of viability concern

##### 4.3.8.1. Federally endangered or threatened species

The Forest Service consulted with the FWS under Section 7 of the Endangered Species Act for the 2006 Forest Plan, and the BLM was a cooperating agency in developing the 2006 Forest Plan. As such, the BLM has reinitiated consultation with the FWS pursuant to the BO that the FWS issued for the 2006 Forest Plan, with supplemental information from the 2012 SIR. The Forest Service reinitiated consultation with the FWS again in 2012 pursuant to the 2012 SIR (Appendix G). Since the northern long-eared bat was not listed at the time of the 2006 Forest Plan's development, the BLM is using the new, programmatic BO that the FWS issued in 2016 for the northern long-eared bat (U.S. Fish and Wildlife Service, 2016).

Any new information pertaining to threatened or endangered species that arises before an APD is submitted would be considered at the APD stage, as specified in Notification #3 in Chapter 5 of this EA. The Forest Service would require the use of closed-loop systems (i.e., tanks instead of open pits) for containing drilling and completion fluids, which would remove the risk of animals ingesting toxic fluids or becoming entangled in nets over open pits (2012 SIR, p. 47).

##### 4.3.8.1.1. Indiana bat

As detailed in the BO, the activities described in the 2006 Forest Plan are expected to have a net beneficial impact on Indiana bat, through habitat restoration and management and targeted projects, but have the potential to harm individual bats. The Forest Service determined that oil and gas activities are likely to adversely affect Indiana bat (2006 Forest Plan Final EIS, p. F1-58). The FWS determined that the 2006 Forest Plan's activities are ***not likely to jeopardize the Indiana bat's continued existence*** (BO, p. 75). Potential negative impacts to individual bats are not expected to have measurable negative impacts on colonies or discrete populations. Based on this finding, the FWS issued an incidental take permit that applies to activities conducted pursuant to the 2006 Forest Plan, including oil and gas activities.

##### 4.3.8.1.2. Northern long-eared bat

The 4(d) rule for northern long-eared bat exempts take from tree-removal activities that take place more than one-quarter mile from a known hibernaculum, and it exempts the removal of roost trees and other trees within 150 feet of a roost tree outside of the pup season (June 1 - July 31). There are no known bat hibernacula on the Marietta Unit. The tree-removal restrictions in place to protect Indiana bat are more restrictive than those in the 4(d) rule, and any incidental take of northern long-eared bat will comply with the exemption provided by the 2016 4(d) rule.

##### 4.3.8.1.3. American burying beetle

Potential future oil and gas activities on the Marietta Unit would have no effect on burying beetle because the species is most likely not present on the Marietta Unit. Stipulations requiring pre-

construction habitat surveys, minimal disturbance, and prompt reclamation would further reduce the potential for suitable habitat to be degraded.

#### 4.3.8.1.4. Freshwater mussels

The U.S. Fish and Wildlife Service agreed with the Forest Service on November 22, 2005, that forest activities proposed in the 2006 Forest Plan are **not likely to adversely affect** fanshell and pink mucket pearly mussel (BO, p. 6) and on April 12, 2012, agreed with the Forest Service determination that forest activities would have **no effect** on sheepsnose and snuffbox (2012 SIR, Appendix G).

#### 4.3.8.1.5. Northern monkshood, small whorled pogonia, and Virginia spirea

The U.S. Fish and Wildlife Service agreed with the Forest Service on November 22, 2005, that forest activities proposed in the 2006 Forest Plan are **not likely to adversely affect** Northern monkshood, small whorled pogonia, and Virginia spirea (BO, p. 8).

#### 4.3.8.1.6. Running buffalo clover

The only known populations of running buffalo clover are located outside of the Marietta Unit in Lawrence and Vinton Counties. The Proposed Action would have no effect on this species.

### 4.3.8.2. Regional forester sensitive species

The 2006 Forest Plan's BE details that oil and gas activities have the potential to impact water quality, which may therefore impact aquatic species (mussels, aquatic insects, amphibians, and fishes). Water quality impacts may affect also bats and other mammals that drink from contaminated water sources or bald eagles that hunt from them. Such impacts to bald eagles are unlikely, since eagles in the area likely hunt from large waterways, where the volume of water would quickly dilute minor spills that may occur from oil and gas activities. Water quality impacts in general are mitigated by no-surface-occupancy stipulations pertaining to steep slopes, controlled-surface-use stipulations pertaining to riparian areas and floodplains, and berms around stored fluids. Oil and gas activities may impact terrestrial species through conversion of habitat to more open conditions, in the case of species that require closed canopies. Stipulation #13 in Chapter 5 of this EA enables the Forest Service to protect known locations of Regional Forester Sensitive Species.

The BE concludes that the alternatives considered in the 2006 Forest Plan would potentially impact individuals of the species considered but would not negatively impact them to the point of reducing their viability or moving their populations in the direction of needing protection under the Endangered Species Act. The BE extended this conclusion to the species that had not yet been designated as RFSS, since those species had been proposed for listing and were analyzed in the BE.

### 4.3.9. Species of public interest

#### 4.3.9.1. Whitetail deer

The primary effects of the 2006 Forest Plan on deer are the long-term management of oak-dominated stands, which provide abundant food for deer, and management for early-successional habitat types,

which provide cover. Oil and gas activities may affect local deer populations for the duration of construction by scaring deer away. Habitat modifications would likely have little effect on deer populations overall, since deer are highly adaptable to human presence on the landscape.

#### **4.3.9.2. *Wild American ginseng***

Ginseng harvests across Ohio declined significantly in the decade leading up to the 2006 Forest Plan, and overharvesting is considered the greatest threat to the species. The WNF requires collectors to obtain an annual permit, which allows the collection of up to one pound, dry weight, of ginseng. Future construction from oil and gas development in wooded areas may destroy American ginseng plants or convert shady habitats to open habitats.

#### **4.3.10. Non-native, invasive species**

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 proposed lease area. This could introduce new species from outside the proposed lease area, and could result in them spreading from one area to another. The risk of such propagation may be estimated in terms of the area disturbed, 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 Marietta Unit. While it would be unreasonable to attempt to quantify the last two variables without site-specific analysis, this analysis considers various scenarios of infestation. Areas that are disturbed by well pads or other development 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 Marietta Unit 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 initial 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 edge-loving species. Where the forest canopy is broken, invasive species that thrive in sunny conditions may be introduced into the newly cleared area and quickly populate areas of disturbed soil.

### **4.4. Geology and Minerals**

There would be no direct effects from issuing new oil and gas leases because leasing does not directly authorize oil and gas exploration and development activities. Reasonably foreseeable development of mineral resources would likely not affect the surface geology. Hydraulic fracturing activities, if any, should not impact the subsurface geology except for opening existing fractures and/or creating new fractures to allow hydrocarbons to more readily flow into the wellbore. Induced seismicity from the Proposed Action is of low probability, particularly because any wastewater injection sites would be located outside of any proposed lease parcels.

Subsequent exploration and oil and gas development could impact the production horizons and reservoir pressures. If production wells are established, the resources allotted to the wells would eventually be depleted. There could also be impacts to other mineral resources 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 subject lease parcel. The extent of the impacts to geology and mineral resources, if any, would be further determined once site-specific development information is available at the APD stage.

#### **4.4.1 Possible Future Best Management Practices, Standard Operating Procedures, and/or Mitigation Measures**

The BLM has reviewed existing information and planning documents and, except as noted in other attached stipulations, knows of no reason why normal development—subject to the controls of applicable laws and regulations and the lease terms and conditions—cannot proceed on the leased lands. However, specific post lease issuance activities could not be identified prior to lease issuance since the nature and extent of oil and gas resources were not known and specific operations have not been proposed. The lessee is hereby made aware that all post lease operations will be subject to appropriate environmental review and may be limited or denied by no surface occupancy stipulations.

#### **4.5 Soils**

While the act of leasing federal minerals would not affect soils, subsequent exploration/development may produce short and long term impacts by physically disturbing the topsoil and exposing the substratum soil on subsequent Marietta Units. Direct impacts resulting from reasonably foreseeable 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 top soil productivity and susceptibility to wind and water erosion where construction of these facilities are necessary.

Indirect impacts from reasonably foreseeable development such as runoff, erosion and off-site sedimentation could result from construction and operation of well sites, access roads, gas pipelines and facilities. Contamination of soil from drilling/completion and production wastes mixed into soil or spilled on the soil surfaces could cause a long-term reduction in site productivity if not adequately identified and addressed. Some of these impacts can be reduced or avoided through proper design, construction and maintenance, and implementation of best management practices.

#### **4.5.1 Possible Future Best Management Practices, Standard Operating Procedures, and/or Mitigation Measures**

The 2006 Forest Plan directly addresses soil concerns and mitigations in many different sections including Watershed, Aquatic and Riparian Resources, Scenic Management, Minerals and Geology and Transportation. A notification and three stipulations notify potential lessees at the leasing stage to the presence of slopes and/or unstable soils that may result in limited surface occupancy on the lease parcels.

All State of Ohio Regulations related to mitigating soil impacts also apply at the site specific level for horizontal drilling and fracturing operations. Many of the stipulations are in the Ohio Revised Code, as well as the ODNR manual of “Best Management Practices for Oil and Gas Well Site Construction”. Provisions in the manual are incorporated into a state-issued permit as terms and conditions of the permit.

## 4.6. Water Resources and Water Quality

### 4.6.1. Surface water

#### 4.6.1.1. *Surface water quality*

While the act of leasing federal minerals would produce no impacts to surface water quality, subsequent exploration and development of the lease parcels have the potential to produce impacts. For example, road development poses a risk to surface water because of runoff due to soil compaction. Runoff that is not being absorbed by topsoil can carry toxic chemicals, sediment, or debris into nearby streams or lakes. Drilling does pose the potential for accidental spills of toxic chemicals and water that contains trace amounts of HF fluids. Areas with increased rates of water runoff may contain a steep slope; however, stipulation #8 set in place by the 2006 Forest Plan prevents development of slopes in excess of 55%. Stipulation #16 indicates that development on slopes between 35-55% will be analyzed on a case-by-case basis and road construction will be planned to have minimal surface disturbance.

#### 4.6.1.2. *Surface water quantity*

Drilling and completion operations use anywhere from 4,000,000-8,000,000 gallons per well. Because HF technology is continuously evolving it is difficult to isolate an exact quantity of water that would be needed. There is not enough surface water in the Marietta Unit for water to be withdrawn and used so HF water would either need to be brought into the area or potentially withdrawn from the Ohio River. Large withdrawals have to be registered with the state and the Forest Service. The BLM and Forest Service would not approve any APDs that would result in adverse impacts on aquatic life associated with water withdrawal.

### 4.6.2. Groundwater

#### 4.6.2.1. *Groundwater quantity*

Local aquifers do not yield sufficient water to support industrial activities; therefore, the proposed leasing action and potential future mineral development would likely not affect groundwater quantity.

#### 4.6.2.2. *Groundwater quality*

Future mineral development activities would pose some risk of accidental spills of drilling fluids, produced water, and other chemicals. This risk would be minimized in part by the requirement, described in the 2012 SIR, for operators to use tanks, instead of open pits, to hold all fluids other than fresh water. Since tanks are smaller than typical open pits, a spill from a tank would most likely produce less of a hazard than an accidental discharge from a pit.

The only areas where a spill would pose an unacceptable risk to groundwater quality are designated wellhead protection areas or certain locations within the Ohio River and Little Muskingum River floodplains (Thompson, 2012). Other locations throughout the Marietta Unit tend to have low groundwater pollution potential due to low hydraulic conductivity and greater depths to groundwater.

Drilling to a production zone that is below a potable water-bearing formation poses the risk of allowing brine and other chemicals to migrate up into a potable water zone. This risk is mitigated in federal wells by casing and cementing requirements in Onshore Oil and Gas Order Number 2. The Ohio DNR, Division of Oil and Gas Resources Management (DOGRM) also requires cementing and casing in all wells as well as sampling of all water wells within 1,500 of a proposed horizontal well prior to a permit being issued.

As detailed in the 2012 SIR, the BLM and DOGRM are required to be notified in advance of drilling and, in most cases, to have inspectors on-site at the time of drilling. Operators are required to submit cementing logs. If the DOGRM suspects that the cementing is insufficient, the inspector may require the operator to conduct cement tests, and well stimulation is not permitted to take place until cementing passes inspection tests.

The potential for fluids to migrate from the hydraulic fracture zone is considered very low, since the thousands of feet separating likely production formations consist of very-low-permeability rocks. Fractures at these depths have been filled in by pressure and mineral deposits.

When a new well is hydraulically fractured, the pressurized fluids seek existing fractures in or conduits through the bedrock. These could include orphaned wells or improperly sealed production wells that penetrate the fracture zone. The DOGRM addresses these types of situations in the permitting process, and federal lessees are liable to plug and abandon orphan wells on their leases.

#### **4.6.3. Riparian areas**

As detailed in the **Plant and Animal Habitat and Populations** section previously, stipulations #15 and #16 establish protections for riparian area and floodplain function. These same stipulations are designed to protect the functions of riparian areas and floodplains in regulating water flows, capturing sediment, and recharging aquifers. Therefore, adverse impacts to riparian areas are not anticipated as a result of reasonably foreseeable mineral development activities.

#### **4.7. Wastes, Hazardous or Solid**

Though the Proposed Action of leasing would not create or produce wastes, subsequent reasonably foreseeable actions related to oil and gas exploration and development would typically generate the following wastes, (1) discharge of drilling fluids and cuttings into the tanks on location; (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 (Ground Water Protection Council & ALL Consulting, 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, 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).

#### **4.7.1 Possible Future Best Management Practices, Standard Operating Procedures, and/or Mitigation Measures**

If federal minerals are proposed for development in the future, an APD would be required and the BLM would conduct additional site-specific analysis of potential impacts from wastes. Specific mitigation is deferred to the APD process. The following measures to reduce adverse impacts from wastes 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 mineral development activities 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 SPCC plans, if the applicable requirements of 40 C.F.R. §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.

The BLM would apply COAs in conjunction with the Forest Service at the APD stage regarding handling and disposing of wastes based on what the operator proposes at that time.

#### **4.8. Recreation and Noise**

There would be no direct impacts from leasing, since there would be no ground disturbance at this stage. Subsequent mineral development, such as well construction, operation, and, eventually, abandonment would create noise and change views in ways that could make the area less attractive to people who desire solitude and natural surroundings.

Reasonably foreseeable mineral development activities would also indirectly affect developed recreation sites and possibly increase travel time to such sites because of increased vehicle traffic during drilling. The noise from construction may 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 magnitude 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) (Bureau of Land Management, 1998), and a forest may damp noise by five to 20 dB per 100 feet. Using these figures, the affected radius with respect to hunting around construction sites 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 that would 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 would likely continue non-stop for 30 days for each well that is constructed. The time of year of construction has a critical effect on the magnitude of the potential 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 occurs 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).

Developed recreation areas and trails would be declared NSO and would not be affected by any ground disturbing activities; however, truck traffic, noise, and visual impacts can be expected. Vehicle traffic would increase during initial exploration activities, possibly resulting in longer drive times for forest visitors. Recreation sites within 0.28 miles of drilling activities would be temporarily affected by the noise. However, because of the dense forest in the general area, visual impacts from drilling are expected to be minimal. Most of the recreation sites within the Marietta Unit are either closed from December 15 through the winter or receive little visitation, meaning that the majority of effects to recreation would be limited primarily to late spring through early winter.

Future exploration activities would also result in visual effects on recreational users. Vehicle traffic during this period would create dust on dirt roads, hampering wildlife viewing and degrading scenic views. The length and duration of disruption would depend on the amount of exploration and drilling. After exploration and drilling, the vehicle traffic would decline but would still be subject to the occasional support vehicle for the wells.

Recreation on the WNF is expected to increase over the next few years. This is projected because of the increased retirement of the "Baby Boomer" generation and their increased leisure time, and because the population of southeastern Ohio has been increasing at a larger rate than the rest of the state (Arbogast, 2004). Recreation contributes to the local economy in the form of gas being bought by recreationists, lodging, camping fees, restaurants, outfitters, outdoor stores, OHV suppliers and other retail and service centers which cater to outdoor recreation. Vendors in the 12 counties of

southeastern Ohio also purchase a disproportionately high number of nonresident hunting licenses (Arbogast, 2004).

According to a socioeconomic review created by the Forest Service in preparation for the 2006 Forest Plan in 2004, after hunting, OHV use and mountain biking tend to be the recreational uses which contribute most to the local economy. However, day use such as sightseeing or nature watching, hiking, boating, and fishing tend to be the most common recreational activities on the WNF. Noise and visual effects caused by future exploration are expected to have temporary effects on all of these activities, and it can be expected that money contributed to the local economy through recreation would decline during the initial exploration and drilling phase, but how much, and the duration, would depend on the amount of time and the amount of exploration being conducted. However, long term impacts to recreation and tourist dollars should be nonexistent to minimal since future construction associated with mineral development would be located outside of developed recreation areas.

This analysis does not consider the recreational values of private lands that may be located within the boundary of the WNF. Private lands indeed provide recreational opportunities, and sometimes these opportunities may be available to the public, since some state-sponsored land management programs require participants to permit public use of their lands. Recreational values of private lands would be considered in future NEPA analysis evaluating an APD, since it would be more reasonable to assess such values on a site-specific basis.

#### **4.8.1 Possible Future Best Management Practices, Standard Operating Procedures, and/or Mitigation Measures**

As APDs are received and processed, the BLM, in consultation with the Ohio DNR, WNF, operators, and other parties, will seek to minimize auditory or visual impacts on recreational resources through simple, reasonable measures, such as restricting construction to certain times of year or requiring the preservation of plants that provide visual screening.

#### **4.9. Cultural Resources/Paleontology**

There would be no direct impacts to cultural resources/paleontology as a result of leasing as there would be no surface disturbance at this stage. Direct and indirect impacts from reasonably foreseeable future oil and gas development may occur to cultural resources if there is ground disturbance. Any known archeological sites within the leasing area, however, would be avoided and declared NSO to the extent possible in accordance with BLM and Forest Service policy. If development is proposed, the Forest Service, as the surface land manager, would conduct site-specific Section 106 compliance measures including surveys, records search, and the appropriate Tribal and SHPO consultation prior to any ground disturbing activities.

#### **4.10. Native American Religious Concerns**

There would be no direct impacts to Native American Religious interests as a result of leasing as there would be no surface disturbance at this stage. As discussed above under Section 4.8, the Forest Service

would conduct the appropriate consultations and site-specific surveys, as needed, prior to any ground disturbing activities.

#### **4.11. Visual Resources/Scenic Quality**

There would be no direct impacts on visual resources or scenic quality as a result of leasing as there would be no surface disturbance at this stage; however, subsequent mineral development could result in impacts. Should a lease result from this action a lessee would have to submit an APD and any pertinent rights-of-way (ROW) requests and receive approval. Should mineral development occur, land may be cleared for roads, pipelines, and well pads that could create visual impacts to surrounding private land owners, passersby, recreational, and cultural/historic users. Upon receiving an APD/ROW, more site-specific NEPA would be required to analyze the impacts of the scenic quality in accordance with the most recent version of the 2006 Forest Plan. This analysis would determine any site-specific mitigation measures to be placed on the application which could include moving the proposed location, low profile tanks, paint color, 3D modeling or various other measures to meet the SIO objectives where development is allowed. Upon completion of drilling and completion operations the well pad, pipeline and any areas not necessary for production would be placed into interim reclamation further reducing the footprint and visual impacts of the location. See Chapter 5 of this EA for a more detailed list of potential stipulations that would be applied upon receipt of an EOI.

##### **4.11.1 Possible Future Best Management Practices, Standard Operating Procedures, and/or Mitigation Measures**

As discussed above, further site-specific NEPA analysis will be conducted at the APD stage. The Forest Service will evaluate each parcel proposed and apply the appropriate lease stipulations depending on the SIO rating and resources, including the viewshed, of the area. More site specific mitigation measures, if needed, will be developed at the APD level.

#### **4.12. Socioeconomics**

##### **4.12.1. Economic stimulation from potential future construction and drilling activity**

The direct effect of leasing would be the payments received, if any, from the leasing of the proposed parcels in the WNF. There would also be various effects from potential future mineral development activities. This analysis draws from studies on economic stimulus from development of the Utica Shale because most current drilling activity is in the Utica Shale and because economic studies on shale development are readily available. Impacts to economic activity from future mineral development may be divided into the following three principal types of impact (Thomas, et al., 2012):

1. Additional drilling stimulates oil and gas businesses to do more business, including hiring additional people and contractors and purchasing more equipment. This is a *direct* effect.
2. Additional contractors hire suppliers, and heightened business activity may stimulate new entrants into an industry or new companies moving into a local market from another area. This is an *indirect* effect.

3. Laborers who have moved into a community demand housing, food, haircuts, entertainment, etc., and laborers who have just gotten a promotion or a new job have additional income on hand to spend on all of these things. This effect is a kind of indirect effect that economists call *induced* effects.

These effects can be quantified by measuring additional business revenues and profits, numbers of jobs created, workers' incomes, and taxes collected (Thomas, et al., 2012). All of these effects and variables are difficult to collect, process, and interpret over a complex regional economy. For example, if the number of jobs created by oil and gas activities were known, it cannot be assumed that all of those jobs were truly added to the economy because some of those employees likely transferred into those jobs from others, while some of the laborers are likely transient employees who will leave the area at the end of the project.

The total value added to Ohio's economy, in terms of the effects and variables described, of oil and gas development in Ohio through 2014 was estimated at \$162 million for 2011 and projected to be \$4.8 billion in 2014. Thirty-three horizontal wells were drilled in Ohio in 2011, and the report projected 1,075 wells being drilled in 2014. A comparable study that makes similar projections into the next decade or beyond was not available for inclusion in this EA.

A workforce analysis has been completed to project the numbers, types, and incomes of the jobs that oil and gas development will demand in Ohio (Lendel, Thomas, Townley, Murphy, & Kalynchuk, 2015). One important difference in labor demand between horizontal drilling and vertical drilling is that the need for labor declines precipitously after one well has been drilled on a pad. The next well to be drilled on the same pad does not require pad, roadway, or pipeline construction that was required for the first well.

The authors of the workforce analysis described above predict that it will take several years for the industry to provide many jobs that can employ local laborers. The pre-drilling phase of oil and gas development primarily requires highly technical professions, such as geologists, GIS specialists, attorneys, and engineers. In the early phase of an oil and gas play, these professionals are usually brought in by the companies. As a play matures, companies may open local offices, providing local employment opportunities, and local people may complete education and training that would qualify them to work in those types of jobs. One-third of all jobs generated by projected Utica Formation development and 58% of those in the pre-drilling phase require post-secondary education, certification, or specialized experience, which will limit the number of jobs that are available to local residents. In time, area universities and technical schools implement or augment training programs targeted at the growing industry's needs, more workers from Ohio may be able to get jobs in Utica shale development.

The workforce analysis predicts that Utica shale development will generate 7,558 jobs in Ohio in 2015 and 10,505 in 2019. In all of Ohio, 700 wells were drilled in the Utica formation in 2015, and 879 wells are predicted to be drilled in 2019. The RFDS for the WNF projects the drilling of 110 wells on the

Marietta Unit over a period of 10 years. If we assume a linear year-to-year increase through 2019 and that drilling on the Marietta Unit follows the same pattern, then the number of wells drilled per year on the Marietta Unit is about 3.5% of the statewide development. This percentage of the projected number of jobs is about 320 jobs. Only a small proportion of these jobs would go toward reducing unemployment in the five counties for the reasons discussed above, notably the abundant use of transient workers and the lack of technical qualifications among the workforce in southeastern Ohio and northwestern West Virginia.

#### **4.12.2. Payments from the federal government**

Federal lands are exempt from property taxes, and the federal government compensates communities for lost property taxes in several ways (Arbogast, 2004). The federal government supports counties with federal land through reimbursements for highway construction, law enforcement, and fire protection and through rural development grants, but the three primary sources of compensation to the states and counties are the 25 Percent Fund, payments in lieu of taxes (PILT), and mineral royalties.

Through the 25 Percent Fund, the federal government pays to the states 25% of the fees collected from timber harvests, camping, grazing, and special use permits. These funds are transferred to the counties based on their proportions of federal land ownership. These payments peaked in the mid-1980s and declined precipitously after that due to a nationwide decline in timber harvesting and a litigation-related stop to timber harvests on the WNF. Payments in lieu of taxes are made by the federal government to counties based on each county's proportion of federal lands that were acquired from private owners and several other indicators. The method for calculating PILT payments has changed through the years, and counties have had options for how they collect the funds, making simple statements of PILT payments less meaningful than they would be if the calculations were simple and consistent. These payments increased in the mid-1990s due to legislation that changed the method for calculating PILT. Finally, mineral royalties have been paid at the rate of 25%. These funds were, until 1992, paid through the 25 Percent Fund and earmarked for schools and roads. Since then royalty payments have been shifted into a separate fund for counties. Each county receives a proportion of mineral royalties based on its proportion of federal lands, regardless of which county's federal lands generated the royalties. That is to say, a county that had no mineral extraction in a given year could receive a share of royalties, and a county that had high mineral extraction could have a disproportionately low share of royalties.

Federal oil and gas leases generate revenue through initial bids as well as annual rents. The minimum competitive lease bid is \$2.00 per acre. Lease rental costs \$1.50 per acre per year for the first five years and \$2.00 per acre per year thereafter. Oil and gas leases expire after 10 years unless they are producing, under which circumstance they last for the duration of production. Annual lease rents continue until production begins, at which point rents are replaced by royalties, which are set at 12.5% of production revenue. The average expected production of a Utica well is 3.5 billion cubic feet (Lendel et al., 2015), but natural gas prices have fluctuated too wildly for a meaningful price projection.

There have been many changes through the years to the payment programs described above, and a major increase in Forest Service ownership in the WNF in the late 1990s reduced the average per-acre payments to counties. From the mid-1980s through the late-1990s, average per-acre payments to counties declined by 64%. Table 4.2, below, summarizes payments made by the federal government to Noble, Monroe, and Washington Counties (U.S. Forest Service, 2016c). *These figures are not adjusted for inflation and are not directly comparable across years.*

**Table 4.2. Federal government payments to counties.**

	<b>Monroe, total</b>	<b>Monroe, royalties</b>	<b>Noble, total</b>	<b>Noble, royalties</b>	<b>Washington, total</b>	<b>Washington, royalties</b>
2001	\$28,441	\$2,432	\$998	\$63	\$72,924	\$3,895
2002	\$31,750	\$1,142	\$1,048	\$33	\$73,695	\$1,828
2003	\$48,525	\$1,565	\$1,038	\$44	\$62,668	\$2,486
2004	\$50,171	\$4,581	\$1,142	\$126	\$70,091	\$7,123
2005	\$41,276	\$4,411	\$1,148	\$125	\$70,368	\$7,113
2006	\$45,370	\$7,262	\$1,208	\$207	\$74,344	\$11,772
2007	\$41,588	\$3,620	\$1,176	\$177	\$69,210	\$6,417
2008	\$97,154	\$9,690	\$3,882	\$277	\$131,624	\$15,706
2009	\$92,083	\$4,693	\$3,766	\$134	\$127,651	\$7,606
2010	\$58,214	\$9,423	\$2,602	\$269	\$81,482	\$15,273
2011	\$49,203	\$5,912	\$2,322	\$169	\$83,347	\$9,583
2012	\$51,149	\$6,812	\$2,289	\$195	\$86,103	\$11,041
2013	\$58,581	\$5,336	\$2,107	\$152	\$92,598	\$8,649
2014	\$61,356	\$6,265	\$1,665	\$179	\$95,673	\$10,155

#### **4.12.3. Environmental justice**

As described in previous sections, certain impacts from reasonably foreseeable oil and gas development may be localized and have more of an effect on certain people and places than on others. Air pollution, noise, loss of road access during construction, and other factors may more intensively affect a household that is close to the development than others that are farther away.

As detailed in Chapter 3, the private lands surrounding the Forest Service lands are owned by people of a variety of income and education levels. Someone who is living in poverty may be more prone than a wealthy person to grant an operator access without carefully considering potential impacts to his or her household, such as noise, loss of vegetation, soil erosion, and air pollution. The same could be said of a landowner with little education, who does not understand a landowner's legal rights, and it is possible that a landman might target such low-income, uneducated landowners when choosing between multiple suitable locations for a pad or other infrastructure.

If an operator wishes to drill on federal surface the Forest Service would ensure that proposed activities are not causing undue inconvenience or harm to neighboring landowners. If an operator wishes to drill on private surface, then it is the operator's responsibility to make a good-faith effort to come to an agreement with the surface owner, and the BLM would arrange an on-site meeting with the surface owner, the operator, and other relevant parties. The BLM would use this opportunity to ensure that the surface owner knows his or her rights by providing a copy of the BLM pamphlet entitled *Split Estate: Rights, Responsibilities, and Opportunities* (Bureau of Land Management, 2007), thereby minimizing the potential for environmental justice concerns.

#### 4.13. Cumulative Effects

CEQ regulations direct proponents to consider the potential environmental impacts resulting from "the incremental impacts of the action when added to past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions" (40 CFR 1508.7). Recent CEQ guidance in considering cumulative effects involves defining the scope of the other actions and their interrelationship with the Proposed Action. The scope must consider geographical and temporal overlaps among the Proposed Actions and other actions. It must also evaluate the nature of interactions among these actions.

Cumulative effects are most likely to arise when a relationship or synergism exists between the Proposed Action and other actions expected to occur in a similar location or during a similar time period. Actions overlapping with or in proximity to the Proposed Action would be expected to have more potential for a relationship than those more geographically separated.

To identify cumulative effects, three fundamental questions need to be addressed:

- Does a relationship exist such that affected resource areas of the Proposed Action might interact with the affected resource areas of past, present, or reasonably foreseeable actions?
- If one or more of the affected resource areas of the Proposed Action and another action could be expected to interact, would the Proposed Action affect or be affected by impacts of the other action?
- If such a relationship exists, then does an assessment reveal any potentially significant impacts not identified when the Proposed Action is considered alone?

The scope of the cumulative effects analysis involves both the geographic extent of the effects and the time frame in which the effects could be expected to occur. For this EA, the affected area includes the proposed lease area and surrounding vicinity.

#### 4.13.1. Context for Cumulative Effects Analysis

Several specific, planned and completed projects on the Marietta Unit have had or will have effects on plant and animal habitat and populations:

- approval of an electric line that crosses 600 feet of NFS lands, 2009
- habitat improvement for yellow-fringed orchid on 38.5 acres using a variety of mechanical and chemical treatments and minor construction activities, 2010
- approval of three oil and gas wells, 2010
- renewal of two miles of electric pipeline permits, ranging in width from 15 to 80 feet, 2010
- renewal of 61 acres of hay and row-crop cultivation and 114 acres of grazing, most of which is in river corridor management area, 2010
- renewal of permits for 3,300 feet of road access, 2010
- approval of laying approximately 2,500 feet of 1½-inch plastic pipeline on surface
- mechanical treatments on managed openings, 2011
- habitat management, including 564 acres of early successional habitat creation, 432 acres of all-aged stands using single-tree and group selection, and 870 acres of prescribed burning, 2011
- approval of an Application for Permit to drill a vertical oil and gas well on a 0.74-acre pad with a 250-foot access road, 2013
- plugging and abandonment of six orphaned wells, 2014
- 4.4-mile expansion of Kinderhook equestrian trail, 2015
- approval of a 150-foot-by-10-foot ATV trail to serve an oil and gas well, 2015

The ability to accurately assess potential cumulative impacts in this EA is limited due to the lack of site-specific information for potential future oil and gas development activities. Upon receipt of an APD, which would identify specific parcel(s) for development, a site-specific analysis would be conducted. The RFDS can be used to generalize cumulative impacts that could occur associated with the proposed leasing action. In addition to considering the potential future effects associated with the RFDS, other activities occurring in the WNF (as documented in the 2006 Forest Plan and 2012 SIR), were taken into account. The cumulative effects analysis does not consider potential leasing in other areas of the WNF, such as the Athens Unit or Ironton District. This is because any impacts associated with leasing in these areas would be separated sufficiently in time and location from the Proposed Action that cumulative impacts would not be expected.

The majority of the federal surface is over private mineral interests. Leasing and development of federal minerals under federal surface is subject to more stringent government regulation than non-federal minerals. Therefore, one result of this leasing action would be more federal oversight of the

development in the Marietta Unit. There would be very little federal oversight in the development of private minerals under federal surface.

The cumulative effects analysis presented in the following sections includes information from and refers to Chapter 3 of the 2006 Forest Plan Final EIS.

#### 4.13.2. Cumulative Effects Analysis

##### 4.13.2.1. Cumulative Effects on Air Resources

It would be impossible to develop reliable projections of GHG emissions resulting from oil and gas leases, but it is likely that leasing minerals may lead to the installation and production of new wells, which may consequently produce an increase in GHG emissions. 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 CH<sub>4</sub> – CH<sub>4</sub> that escapes from wells (both gas and oil), oil storage, and various types of processing equipment. This is a major source of global CH<sub>4</sub> emissions. These emissions have been estimated for various aspects of the energy sector, and starting in 2011, producers are required under 40 C.F.R. §98, to estimate and report their CH<sub>4</sub> emissions to the EPA.
- Combustion of produced oil and gas – it is expected that operations will produce marketable quantities of oil and/or gas. 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>.

The assessment of GHG emissions, their relationship to global climatic patterns, and the resulting impacts, is an ongoing scientific process. It is not known 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. Inconsistencies in the 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 but an assessment of impacts on climate change from the release of GHGs is outside the scope of this document because it is a global phenomenon.

In recent years, many states, tribes, and other organizations have initiated GHG inventories, tallying GHG emissions by economic sector. The EPA provides links to statewide GHG emissions inventories

(U.S. Environmental Protection Agency, 2015c). Guidelines for estimating project-specific GHG emissions are available (URS Corporation, 2010), but some additional data, including the volume of oil produced and the number of wells, are not available for the Proposed Action. Uncertainties regarding the numbers of wells and other factors make it impractical to project amounts of GHG that the Proposed Action would emit. At the APD stage, more site-specific information on oil and gas activities resulting in GHG impacts would be described in detail. Also at the APD stage, the BLM would evaluate operations, require mitigation measures, and encourage operators to participate in the voluntary STAR program.

#### ***4.13.2.2. Cumulative Effects on Plant and Animal Habitat and Populations***

The most important actions contributing to cumulative effects in the Marietta Unit are the intensive resource extraction – especially timber removal – that dominated much of the Twentieth Century, which greatly simplified vegetative structure and wildlife habitat, and the development of the Wayne National Forest, which has restored healthy forests throughout the Marietta Unit. Timber extraction focused on clearcutting, removing whole stands and leaving denuded areas to regenerate as single-aged stands of just a few, shade-intolerant species. A related effect of intensive settlement of the area was the suppression of wildfire, which is a natural force that is important to the propagation of oak forests.

The development of the WNF has resulted in the active reforestation of cleared sites and the development of long-term goals, objectives, and targeted management areas. This long-term process has coincided with the passive and active reforestation of tens of thousands of additional acres throughout the Marietta Unit, as farming has declined as a land use and less-destructive methods for mineral extraction have been employed over the last several decades.

The broader actions that are described in the 2006 Forest Plan are expected, over the coming decades, to result in a decline in oak-dominated stands, which depend on periodic disturbance, and to produce an increase in acres forested in shade-tolerant, fire-intolerant species like maples. The Forest Service will continue to promote early-successional habitats and will use site-specific stipulations and guidelines to manage known locations and suitable habitats for threatened and endangered species. The Ohio DNR's hunting regulations are the primary tool for managing the state's deer herd at a level that ensures recreational hunting opportunities while mitigating crop damage, and the WNF's restrictions on ginseng harvesting are expected to ensure the viability of that species for collection.

#### ***4.13.2.3. Cumulative Effects on Water Resources and Water Quality***

The impacts to water resources and water quality would occur within the context of several decades of activities that have had various types of impacts on water resources. The most prominent actions whose effects are visible on the landscape are the intensive resource extraction in the last century and the formation of the WNF.

Intensive mining, timber extraction, and farming through much of the Twentieth Century had broad impacts on surface water resources. Surface mining has included rerouting waterways, and acid mine drainage has polluted many waterways and extirpated much of the aquatic life in them. Timber

extraction has left many steep slopes denuded of vegetation and cleared vegetation from riparian areas, leading to mass wasting and severe soil erosion into waterways. Riparian areas serve a critical role in watershed and local hydrology health and any disturbance to its function could be harmful to habitat in surrounding areas (U.S. Department of Agriculture, 1996).

The formation of the WNF has initiated and continued the restoration and management of the watersheds in the Marietta Unit. The Forest Service has conducted many acid mine drainage and abandoned mine lands restoration projects, reducing sedimentation and acidification in many waterways. By reestablishing vegetation and managing healthy forests, especially on steep slopes and other erosion-prone areas, the Forest Service has reduced sediment loads in streams. At the same time, forests on private lands throughout the Marietta Unit have been reforested in recent decades, further reducing erosion and improving surface water quality.

#### *4.13.2.4. Cumulative Effects on Soils*

Increases in mineral development, construction activities, and the conversion of land to developed landscapes collectively result in the removal of vegetation, long-term reduction in vegetation cover, and disturbance of soils. This would expose soils to the erosive forces of wind and water, destabilize soils, and increase overland flow, which in turn could result in accelerated erosion. Accelerated erosion could mobilize soils and remove nutrient-rich topsoil, and thereby reduce soil productivity and vegetation growth rates. However, the use of best management practices such as those discussed in Section 4.5 would minimize cumulative effects on soils.

#### *4.13.2.5. Cumulative Effects on Mineral Resources*

There would be no cumulative impacts to minerals from the administrative action of leasing, but the potential reasonably foreseeable development projected under the RFDS in combination with other mineral development activities in the Marietta Unit would result in a minor incremental effect from development on BLM federal mineral estate. At this stage it is uncertain how productive the wells accessing the federal mineral estate would be, should development occur in the future. If developed, the mineral resources would be drained and depleted over time.

#### *4.13.2.6. Cumulative Effects from Wastes*

As noted in the Proposed Action description, impacts from waste storage, handling, and disposal would be minimized through the use of BMPs, SOPs, and COAs at the APD stage, should federal minerals be proposed for development. Other mineral development, agriculture, and timber management activities in the area would need to comply with all required laws and regulations with regard to wastes. Therefore, cumulative effects from wastes are not anticipated.

#### *4.13.2.7. Cumulative Effects on Recreation and Land Use*

There would be no cumulative impacts to recreation and land use as a result of leasing; however, there are potential effects to both if future development activities occur on or near the leased parcels. As discussed in 4.8, noise caused by exploration activities would result in wildlife temporarily vacating the

area, reducing hunting and wildlife viewing opportunities for that time. Reasonably foreseeable development of minerals would also affect other recreational activities, particularly those located at developed recreation sites, and noise may cause forest visitors to look for recreational activities elsewhere until exploration is complete. Under the no action alternative, there would be affect to recreational activities.

#### ***4.13.2.8. Cumulative Effects on Cultural Resources and Native American Concerns***

There would be no cumulative impacts to cultural resources as a result of leasing; however, potential cumulative effects to cultural resources could occur if future development activities on or near the lease parcels are conducted without proper surveys and consultations under the NHPA or state requirements. 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, however, should be slight as inventory, assessment, protection, and mitigation measures would be implemented at the APD stage if federal minerals are accessed. Under the No Action Alternative, operators in the vicinity would be required to comply with all required laws and regulations with regard to protection of cultural resources and Native American Concerns.

#### ***4.13.2.9. Cumulative Effects on Visual Resources and Scenic Quality***

The act of leasing would have no cumulative effects on visual resources and/or scenic quality of the Marietta Unit. Should development occur on leased parcels, there could be cumulative effects based on the number of well pads, roads and any other associated development which could include pipelines and power. Upon receipt of an APD, further site-specific analysis would be completed and cumulative effects on visual resources and scenic quality analyzed in relation to other projects or potential projects.

#### ***4.13.2.10. Cumulative Effects on Socioeconomics***

The economic conditions of southeastern Ohio have been changing over the past years and decades as a result of many factors and decisions. As described above, timber production was once a much larger generator of wages and downstream economic activity than it is at present. Mineral production, including coal, limestone, dolomite, sand, and gravel, decreased in economic value of production as well as in employment between 1970 and 2000. More recently, oil and gas production in the region has caused an increase in wages, employment, and downstream economic activity.

The primary action that affects the economic conditions of southeastern Ohio is the ownership of the Wayne National Forest. The Forest Service's Social and Economic Assessment (Arbogast, 2004) states that federal ownership of lands comprising the WNF is beneficial to local, rural economies for several reasons. First, the federal government supports the counties through various types of payments and cost-share programs. Second, the federal government maintains the roads and other infrastructure on NFS lands. Finally, the presence of the National Forest stimulates local economies as visitors to the national forest contribute money that they spend for outdoor gear, lodging, food, and other expenses.

#### **4.14. Irreversible and Irretrievable Commitments of Resources**

NEPA Section 102(2)C requires a discussion of any irreversible or irretrievable commitments of resources that would be involved in the proposal should it be implemented. An irreversible commitment of a resource is one that cannot be reversed (e.g., the extinction of a species or disturbance to protected cultural resources). An irretrievable commitment of a resource is one in which the resource or its use is lost for a period of time (e.g., extraction of any solid mineral ore or fluid mineral).

Reasonably foreseeable future oil and gas development associated with the Proposed Action would result in surface disturbing activities that would result in irreversible or irretrievable commitments of resources. These surface disturbing activities would result in alterations to soil, removal of vegetation cover and wildlife habitat, and possible damage to cultural resources if proper surveys and consultations are not conducted under the NHPA. Increases in sediment and nonpoint source pollution that result from these activities could result in degradation of water quality within the watershed and habitat for aquatic-dependent species, although no major surface waters are located adjacent to the parcel. Use of BMPs, SOPs, COAs and stipulations as described in the EA are designed to reduce the magnitude of these impacts by preventing habitat degradation.

Development of oil and gas wells would represent an irretrievable commitment of nonrenewable fossil fuels.

#### **4.15. Relationship between Local Short-term Uses and Long-term Productivity**

NEPA requires an analysis of the relationship between a project's short-term impacts on the environment and of the effects that these impacts may have on the maintenance and enhancement of the long-term productivity of the affected environment. Impacts that narrow the range of beneficial uses of the environment are of particular concern. This refers to the possibility that choosing one development option reduces future flexibility in pursuing other options, or that giving over a parcel of land or other resource to a certain use eliminates the possibility of other uses being performed at the site.

The Proposed Action would take place within a national forest. While vegetation loss from future development would occur, no unique habitat or ecosystems would be lost due to this action. Implementation of the Proposed Action or No Action Alternative may result in future oil and gas development, which results in surface-disturbing and other disruptive activities that remove vegetation, increase soil erosion and compaction, create visual intrusions and landscape alterations, increase noise, and degrade wildlife habitat. Although management actions, BMPs, surface use restrictions, and lease stipulations are intended to minimize the effect of short-term uses, some impact on long-term productivity of resources would occur.

#### 4.16. No action alternative for all resources

The no action alternative would preclude leasing of federal minerals under the Marietta Unit of the WNF. The direct and indirect effects described above would, for the most part, not occur. If the BLM does not sell mineral leases, then the revenues that would be produced by leasing and, potentially, by mineral production may not be made available to the counties. Failure to lease would result in private mineral development and drainage of the federal minerals without any benefit to the government.

## 5 LEASE-SPECIFIC OIL AND GAS NOTIFICATIONS AND STIPULATIONS

### Introduction

The text of this section is taken directly from Appendix H to the Forest Plan.

The following notifications and stipulations implement the standards and guidelines of the Wayne National Forest's 2006 Land and Resource Management Plan (Forest Plan). These are in addition to the standard lease terms for oil and gas leases (BLM Form 3100-11). Not all of these notifications and stipulations are applied to every lease, rather, only those that are relevant based on site conditions. These notifications and stipulations are necessary to protect specific resource values on the lease area. They may be made less restrictive or modified for site-specific situations if such change is found to be in the public interest. These notifications and stipulations may be made less restrictive or modified only after a formal analysis has been completed and specifically approved in writing by a Forest Service line officer.

### Notifications

#### Special Notification #1

Operations under this lease will be consistent with all the standards and guidelines found in the Wayne National Forest's 2006 Land and Resource Management Plan and are hereby incorporated into this lease in its entirety. Forest Plan standards and guidelines may restrict location, timing, and methodology of oil and gas lease operations. Special surveys for protection of National Forest System land and resources will be required. A copy of the WNF's 2006 Land and Resource Management Plan is available from the following website <http://www.fs.fed.us/r9/wayne/> or by writing to:

Forest Supervisor  
Wayne National Forest  
13700 US HWY 33  
Nelsonville, OH 45764

#### Notification #1 - Cultural Resources

The Forest Service is responsible for assuring the area to be disturbed is examined for cultural resources prior to allowing surface disturbing activities on lands covered by this lease. Important cultural resource

values may be present on portions of a lease. Surface disturbing activities must avoid these areas unless the authorized officer agrees to the mitigation measures. The lessee/operators may, at their discretion and cost, conduct the examination on the lands to be disturbed. This examination must be done by or under the supervision of a qualified resource specialist approved by the Forest Service. An acceptable report must be provided to the Forest Service identifying the anticipated effects of the Proposed Action on cultural resource values. If items of substantial archaeological or paleontological values are discovered during operations, or a known deposit of such items is disturbed, the lessee (or operator) will cease work in the affected area. The lessee (or operator) will then notify the Forest Service and will not resume excavation until the Forest Supervisor gives written approval.

#### **Notification #2 - Floodplains**

Any activities proposed in, or likely to affect a floodplain will be subject to:

- Analysis and identification of alternate sites
- Public notification and comment period
- Provisions of any other federal, State or local laws and regulations as required under presidential Executive Order 11988, Protection of Floodplains.

#### **Notification #3 - Protection of Federally Listed Endangered and Threatened and Regional Sensitive Species and their Habitats**

The Forest Service is responsible for assuring that the area to be disturbed is examined prior to allowing any surface disturbing activities on lands covered by this lease. The examination is to determine effects upon any plant or animal species listed, or proposed for listing, as federal endangered or threatened, regional sensitive, and their habitats. If the findings of this examination determine that the operation(s) may have a detrimental effect on a species covered by the federal Endangered Species Act, the operator's plans may be denied or restrictions added. The presence of regional sensitive species may also require some restrictions of the operation(s).

The Forest Service has the responsibility to conduct the required examination. In cases where the Forest Service time frames cannot meet the needs of the lessee/operator, the lessee/operator may, at his discretion and cost, conduct the examination on the lands to be disturbed. This examination must be done by or under the supervision of a qualified resource specialist approved by the Forest Service. An acceptable report must be provided to the Forest Service identifying the anticipated effects of the Proposed Action on federal endangered or threatened species, regional sensitive species, or their habitats.

#### **Notification #4 - Compliance with Public Laws and Federal Regulations**

Operators are required to comply with all public laws and federal regulations that apply to National Forest System lands and the Wayne National Forest's 2006 Land and Resource Management Plan.

**Notification #5 - Steep Slopes and/or Unstable Soils**

The area of this lease contains a considerable amount of land with steep slopes and/or unstable soils. Accordingly, the opportunity to locate access roads, drilling sites, pipelines, storage tanks and other improvements may be extremely limited.

**Management Areas Requiring Special Stipulations****Stipulation #1 - No Surface Occupancy - Future Old Forest**

No surface occupancy allowed on the entire lease or on designated areas of the lease (see lease map) for the protection of the Future Old Forest resources.

On National Forest System land in Future Old Forest Management Areas, the Forest Service will issue leases for federal oil and gas only with a No Surface Occupancy (NSO) stipulation. In the case of federal leases issued pursuant to the Comprehensive National Energy Policy Act of 1992, the Forest Service will recommend to the Bureau of Land Management that operations be allowed to continue provided that all activities comply with Forest guidance. When the existing well (or wells) is depleted, all facilities must be removed and the site rehabilitated to Forest Service standards. No new wells will be allowed, nor will existing wells be allowed to be drilled to deeper formations. The NSO stipulation does not apply to reserved or outstanding mineral rights.

**Stipulation #2 - No Surface Occupancy - Research Natural Areas**

No surface occupancy within designated areas of the lease (see lease map) for the protection of natural processes or research, historical, or educational values.

On National Forest System land in Research Natural Area Management Areas, the Forest Service will issue leases for federal oil and gas only with a No Surface Occupancy (NSO) stipulation. In the case of federal leases issued pursuant to the Comprehensive National Energy Policy Act of 1992, the Forest Service will recommend to the Bureau of Land Management that operations be allowed to continue provided that all activities comply with Forest guidance. When the existing well (or wells) is depleted, all facilities must be removed and the site rehabilitated to Forest Service standards. No new wells will be allowed, nor will existing wells be allowed to be drilled to deeper formations. The NSO stipulation does not apply to reserved or outstanding mineral rights.

**Stipulation #3 - No Surface Occupancy - Special Areas**

No surface occupancy within designated areas of the lease (see lease map) to protect natural processes or research, historical or educational values.

On National Forest System land in Special Interest Management Areas, the Forest Service will issue federal oil and gas leases only with a No Surface Occupancy (NSO) stipulation. In the case of federal leases issued pursuant to the Comprehensive National Energy Policy Act of 1992, the Forest Service will recommend to Bureau of Land Management that operations be allowed to continue provided that all activities comply with Forest guidance. When the existing well (or wells) is depleted, all facilities must be

removed and the site rehabilitated to Forest Service standards. No new wells will be allowed, nor will existing wells be allowed to be drilled to deeper formations. The NSO stipulation does not apply to reserved or outstanding mineral rights.

**Stipulation #4 - No Surface Occupancy - Candidate Areas**

No surface occupancy within designated areas of the lease (see lease map) for the protection of natural processes or research, historical or educational values.

On National Forest System lands in Candidate Research Natural Management Areas, the Forest Service will only issue federal oil and gas leases that have a No Surface Occupancy (NSO) stipulation. In the case of federal leases issued pursuant to the Comprehensive National Energy Policy Act of 1992, the Forest Service will recommend to Bureau of Land Management that operations be allowed to continue provided that all activities comply with Forest guidance. When the existing well (or wells) is depleted, all facilities must be removed and the site rehabilitated to Forest Service standards. No new wells will be allowed, nor will existing wells be allowed to be drilled to deeper formations. The NSO stipulation does not apply to reserved or outstanding mineral rights.

**Stipulation #5 - No Surface Occupancy - Administrative Sites, Developed Recreation Areas, Trails, and Associated Trailheads**

No surface occupancy within designated areas of the lease (see lease map) to protect special management units such as developed recreation areas, trails and associated trailheads, water supply facilities, administrative site, etc.

On National Forest System land within administrative sites, developed recreation areas, trails and associated trailheads, the Forest Service will issue leases for federal oil and gas only with a No Surface Occupancy (NSO) stipulation. The NSO designation will include a buffer zone, which will be determined in accordance with the Implementation Guide for Scenery Management. In the case of federal leases issued pursuant to the Comprehensive National Energy Policy Act of 1992, the Forest Service will recommend to the Bureau of Land Management that operations be allowed to continue provided that all activities comply with Forest guidance. When the existing well (or wells) is depleted, all facilities must be removed and the site rehabilitated to Forest Service standards. No new wells will be allowed, nor will existing wells be allowed to be drilled to deeper formations. The NSO stipulation does not apply to reserved or outstanding mineral rights.

**Resources Requiring Special Stipulations**

**Stipulation #7 - No Surface Occupancy - Cultural Resources of Known Significance**

No surface occupancy is allowed within archaeological or historical sites of known significance (see lease map). At the time of any new proposed lease developments, a Forest Service archeologist shall determine the need for any setbacks or restrictions for the protection of objects of historic or scientific interest.

**Stipulation #8 - No Surface Occupancy - Slopes in Excess of 55 Percent**

No surface occupancy is allowed on slopes in excess of 55 percent (see lease map) to protect soil and water from erosion and mass failure hazards because of steep slopes.

**Stipulation #9 - No Surface Occupancy - Areas of Mass Instability**

No surface occupancy is allowed for the exploration and development of energy minerals on areas with mass soil instability, as defined by the USDA County Soil Surveys (see lease map).

**Stipulation #10 - No Surface Occupancy - Hibernacula**

No surface occupancy within ¼ mile of all known Indiana bat hibernacula.

**Stipulation #11 - Controlled Surface Use - Areas of Land with a Scenic Integrity Objective of 'High' or 'Moderate'**

At the time of any new proposed lease developments, the responsible line officer shall determine the need for any visual quality mitigation. Some examples of mitigation may include special design and reclamation measures, transplanting trees and shrubs, fertilization, mulching, special erosion control structures, irrigation, site recontouring to match the original land contour, low profile equipment and painting to minimize contrast. Surface occupancy may also be limited or denied in sensitive areas, such as unique geologic features and rock formations, visually prominent areas such as designated trails and developed recreation sites.

**Stipulation #12 - Controlled Surface Use - Known Locations of Federally Listed Species**

No cutting of snags (trees with less than 10% live canopy), shagbark or shellbark hickories, or trees that are hollow and/or have major splits or broken tops, except during the bat hibernation season (September 15 through April 15). If such trees are a safety hazard, they may be cut anytime they pose an imminent threat to human safety, but if cut in the nonhibernation season the Forest Service biologist must be notified in advance. This stipulation applies only to trees over six inches in diameter.

Protect all supercanopy trees or other identified congregation roost trees for bald eagles along major river corridors and lakes. Protect known nests and roosts as described in the Bald Eagle Recovery Plan, or as directed by the U.S. Fish and Wildlife Service.

Prior to any surface disturbing activities a Forest Service biologist will conduct an assessment for potential American burying beetle habitat and occurrence. Occupancy restrictions will be determined at the time of the evaluation.

**Stipulation #13 - Controlled Surface Use - Known Locations of Regional Forester Sensitive Species**

Controlled surface use may include setbacks or restrictions from portions of the lease to ensure protection of habitat for regional sensitive species. At the time of any new proposed lease developments, the responsible line officer shall determine the need for any setbacks or restrictions, or the need for timing-related stipulation in accordance with the aquatic and terrestrial wildlife and botanical resources standards and guidelines.

The leaseholder and Forest Service inspector shall work together to identify locations for development and production facilities in order to protect the structural integrity of large old trees found on a portion of the tract.

**Stipulation #14 - Controlled Surface Use - Managed Wildlife Openings**

At the time of any new proposed lease developments, the responsible line officer shall determine the extent of the surface use restrictions necessary to maintain habitat integrity for plant and animal species dependent on such habitats.

**Stipulation #15 - Controlled Surface Use - Riparian Areas**

At the time of any new proposed lease developments, the responsible line officer shall determine the appropriate surface use restrictions necessary to maintain the structural and ecological integrity of riparian areas, and aquatic and riparian-dependent species viability.

**Stipulation #16 - Controlled Surface Use - Portions of Floodplains Outside Riparian Areas**

Oil and gas activities may be allowed within that portion of a floodplain outside riparian areas. Mineral activities will be evaluated on a case-by-case basis, and appropriate mitigation measures will be applied. The leaseholder and Forest Service inspector shall work together to identify locations for roads, pipelines, well pads and production facilities.

**Stipulation #17 - Controlled Surface Use - Slopes Between 35 and 55 Percent**

Oil and gas activities will be allowed on slopes from 35 to 55 percent on a case-by-case basis with appropriate mitigation. New road construction and maintenance shall be planned to disturb the least amount of ground. The leaseholder and Forest Service inspector shall work together to identify locations for roads, pipelines, well pads, and production facilities.

## 6 MAPS

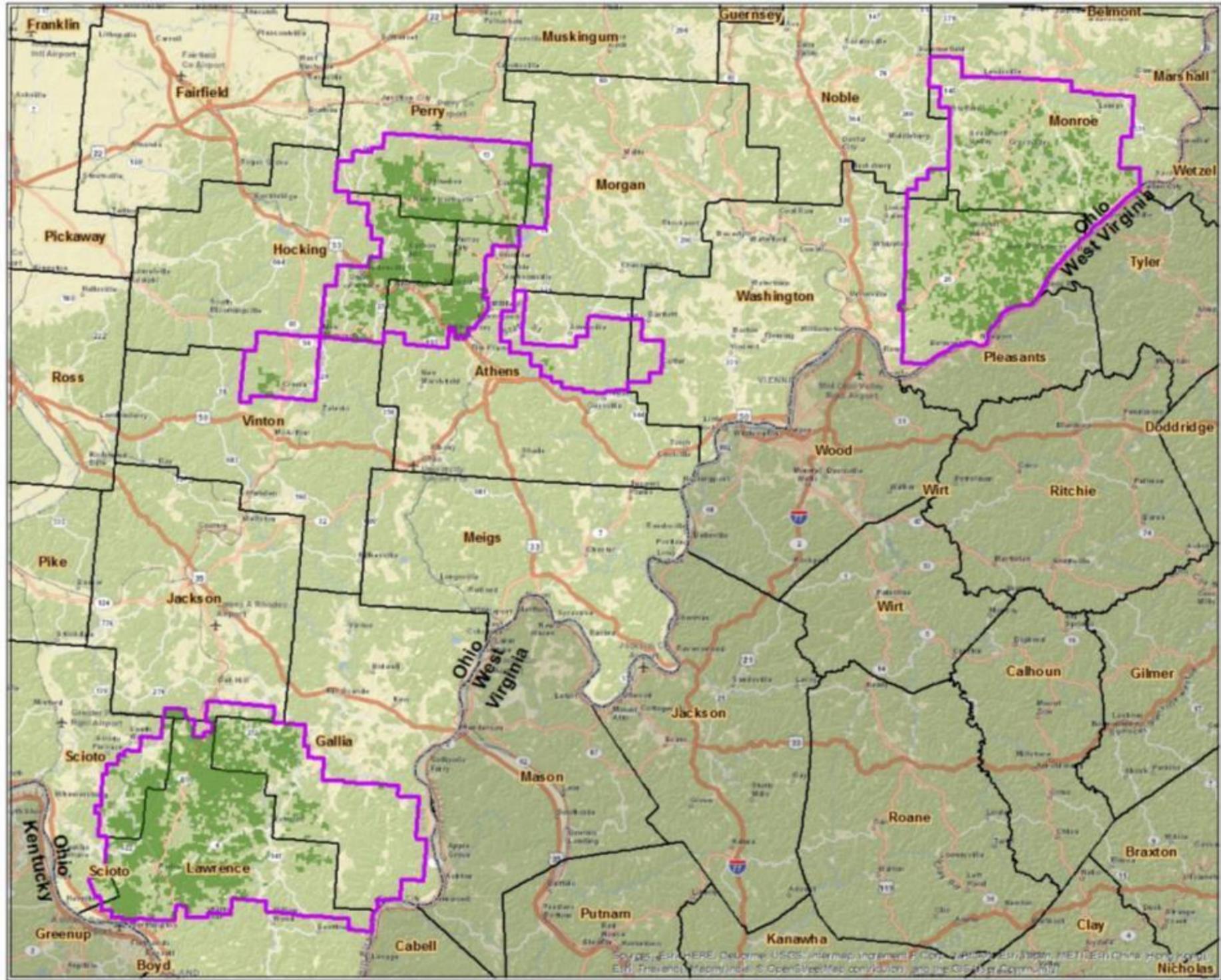
**Wayne National Forest Leasing EA**  
**Map 1:**  
**Forest Overview**

U.S. DEPARTMENT OF THE INTERIOR  
 Bureau of Land Management  
 Eastern States  
 Northeastern States District  
 Milwaukee, WI  
 February 2016





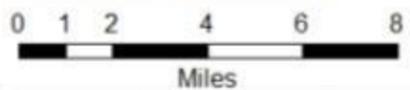

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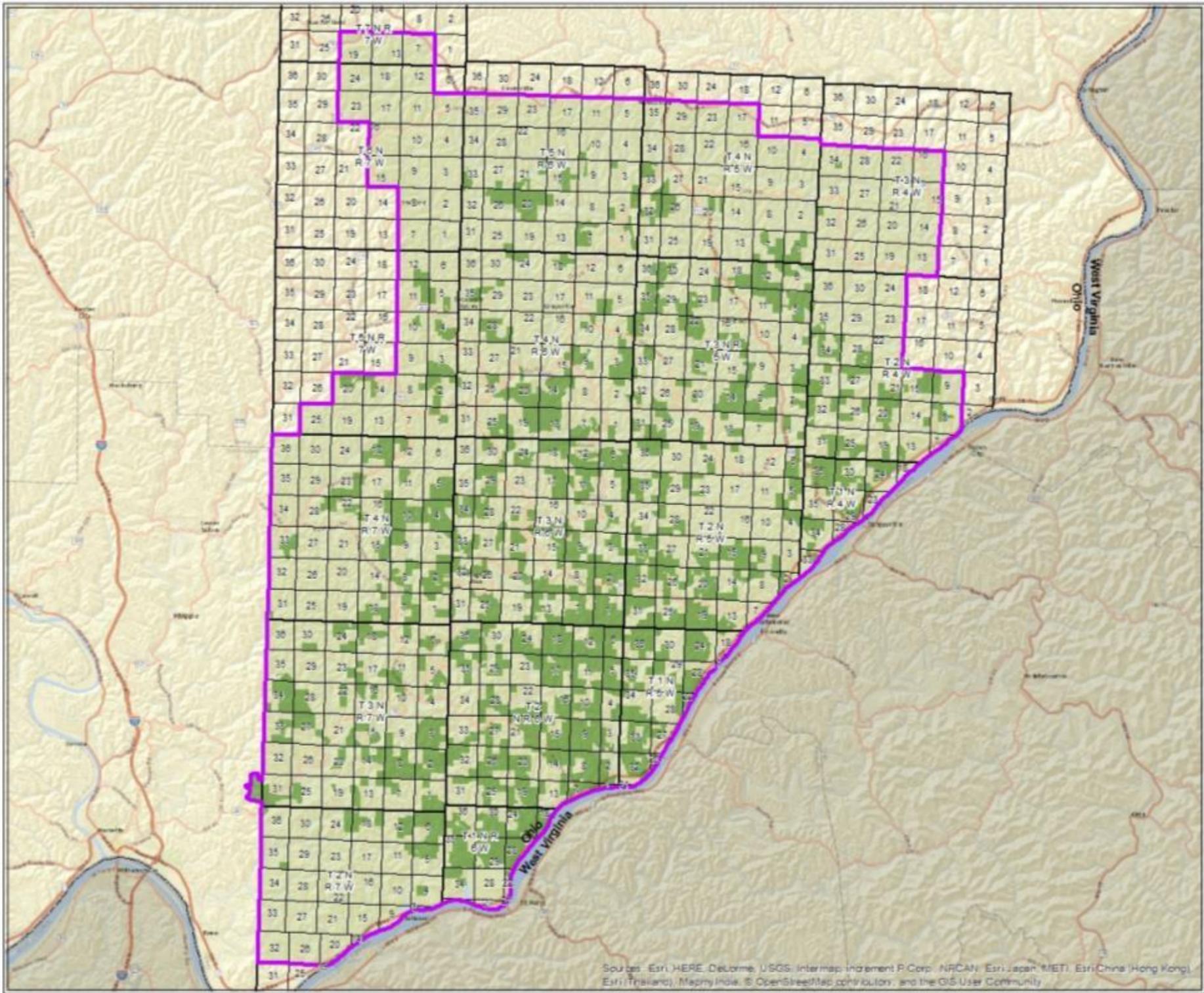
**Wayne National Forest  
Leasing EA  
Map 2: Marietta Unit  
Overview**

U.S. DEPARTMENT OF THE INTERIOR  
Bureau of Land Management  
Eastern States  
Northeastern States District  
Milwaukee, WI  
February 2016

-  WNF Proclamation Boundary
-  Survey Township Boundary
-  Survey Section Boundary
-  USFS Surface Ownership



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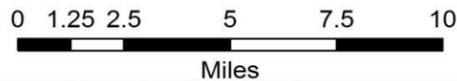
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri, Japan, METI, Esri, China (Hong Kong), Esri, (Ireland), Mapbox, © OpenStreetMap contributors, and the GIS User Community

**Wayne National Forest  
Leasing EA  
Map 3: Marietta Unit  
EOIs To Date**

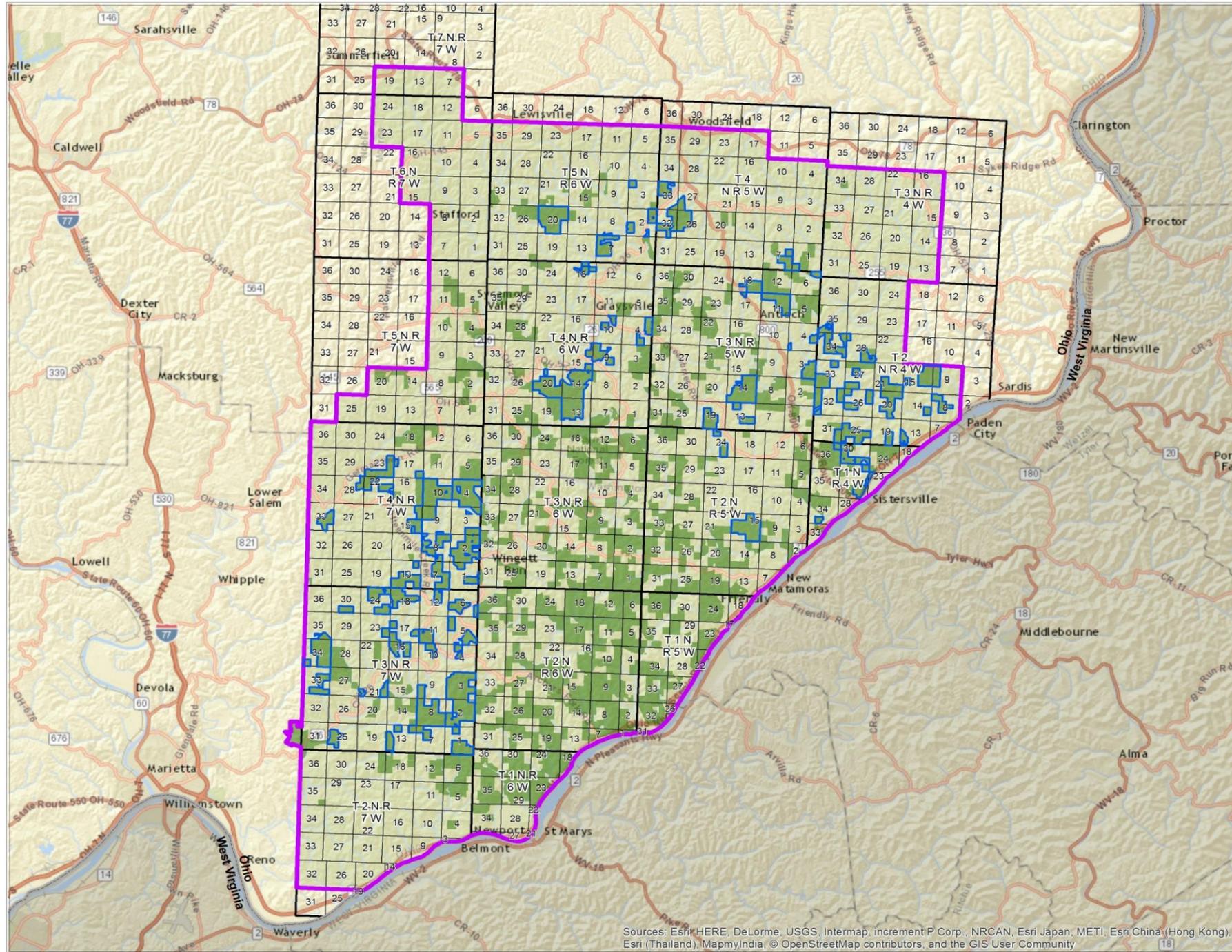
U.S. DEPARTMENT OF THE INTERIOR  
Bureau of Land Management  
Eastern States  
Northeastern States District  
Milwaukee, WI

April 2016

-  Lease Requests
-  WNF Proclamation Boundary
-  Survey Township Boundary
-  Survey Section Boundary
-  USFS Surface Ownership



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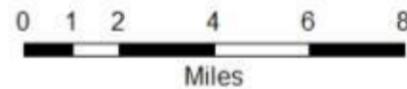
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

**Wayne National Forest  
Leasing EA  
Map 4: Marietta Unit  
USFS Management Areas**

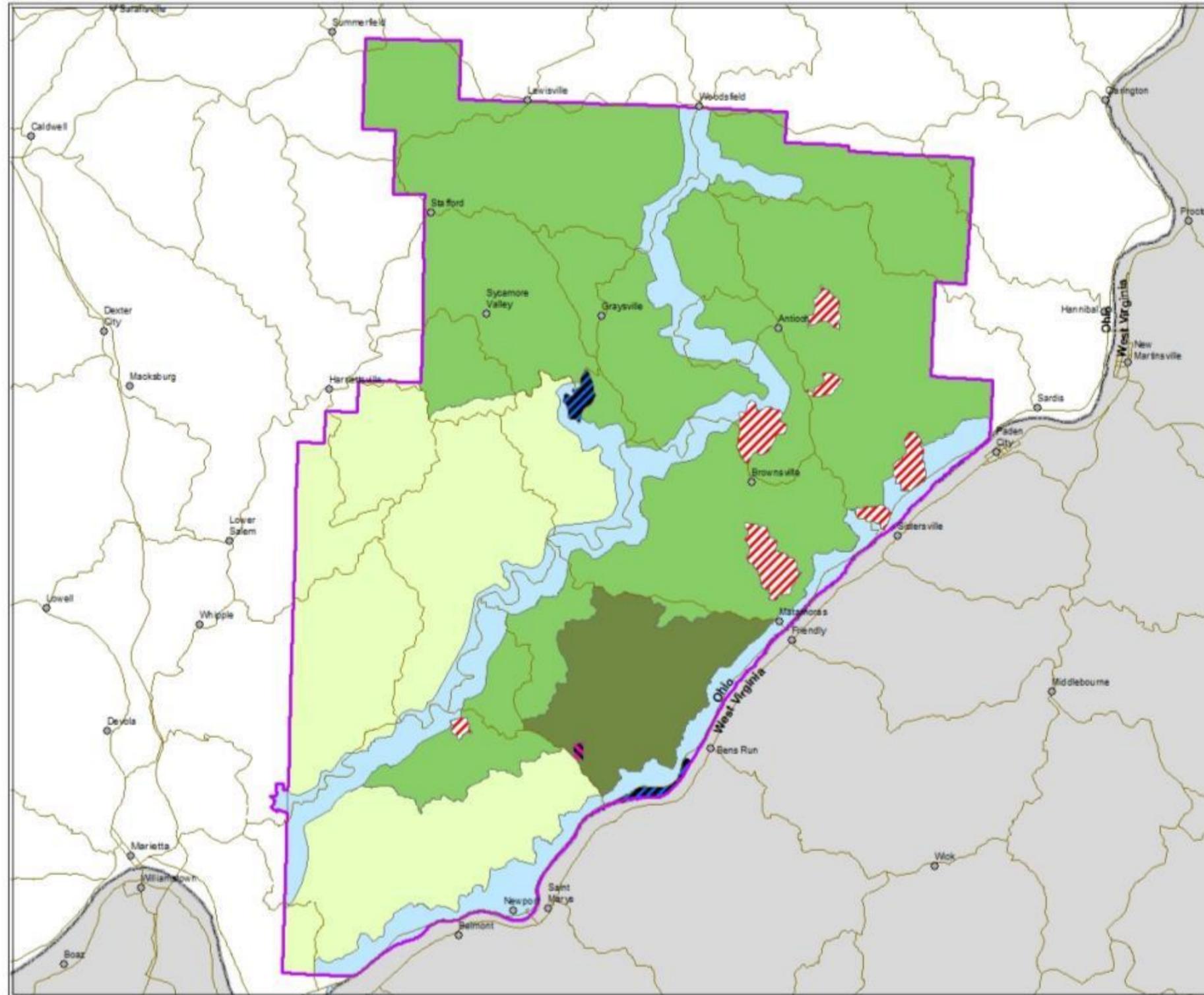
U.S. DEPARTMENT OF THE INTERIOR  
Bureau of Land Management  
Eastern States  
Northeastern States District  
Milwaukee, WI

February 2016

- Cities
- Highways
- ▭ WNF Proclamation Boundary
- Management Areas**
- Diverse Continuous Forest
- Forest and Shrubland Mosaic
- Future Old Forest w/ Mineral Activity
- River Corridor
- Developed Recreation
- Research Natural Area
- Special Area



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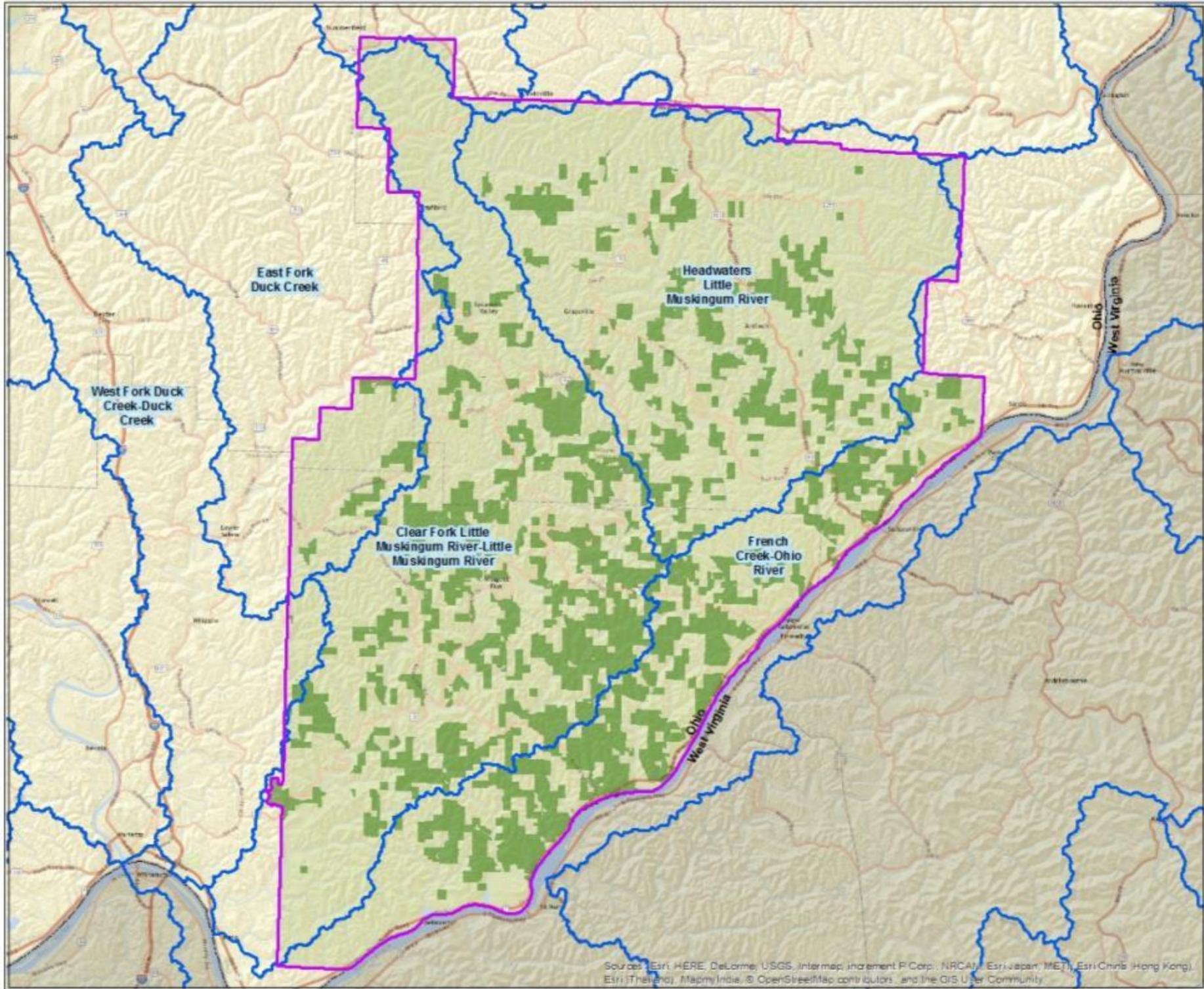
**Wayne National Forest  
Leasing EA  
Map 5: Marietta Unit  
Watershed Boundaries**

U.S. DEPARTMENT OF THE INTERIOR  
Bureau of Land Management  
Eastern States  
Northeastern States District  
Milwaukee, WI  
February 2016

-  WNF Proclamation Boundary
-  Watershed Boundary
-  USFS Surface Ownership



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**Wayne National Forest  
Leasing EA  
Map 6: Marietta Unit  
Scenic Integrity Level**

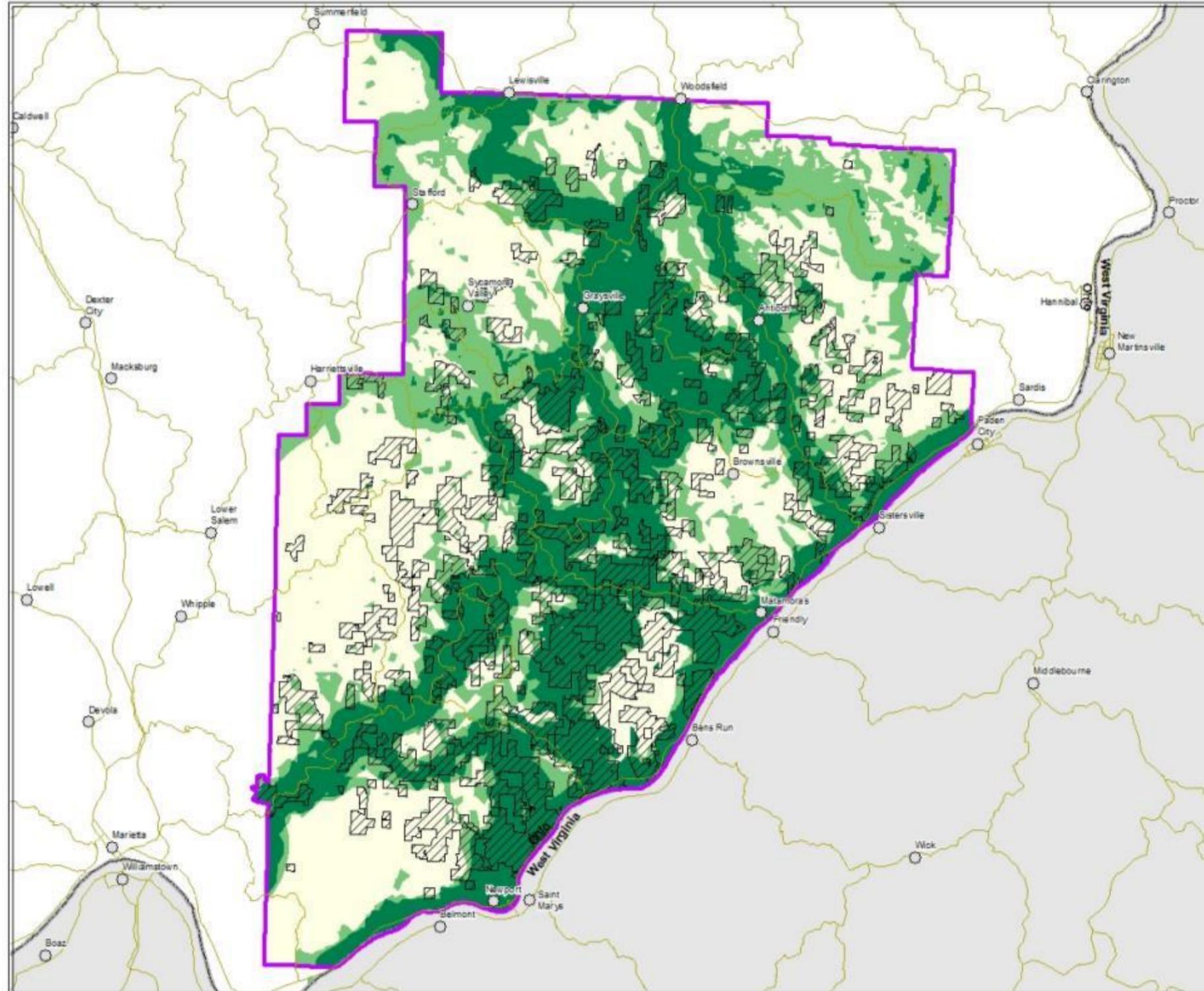
U.S. DEPARTMENT OF THE INTERIOR  
Bureau of Land Management  
Eastern States  
Northeastern States District  
Milwaukee, WI  
February 2016

○ Cities  
 — Highways  
 □ WNF Proclamation Boundary  
 ▨ USFS Surface Tracts  
**Scenic Integrity Level**  
 ■ High  
 ■ Medium  
 ■ Low



0 1 2 4 6 8  
Miles

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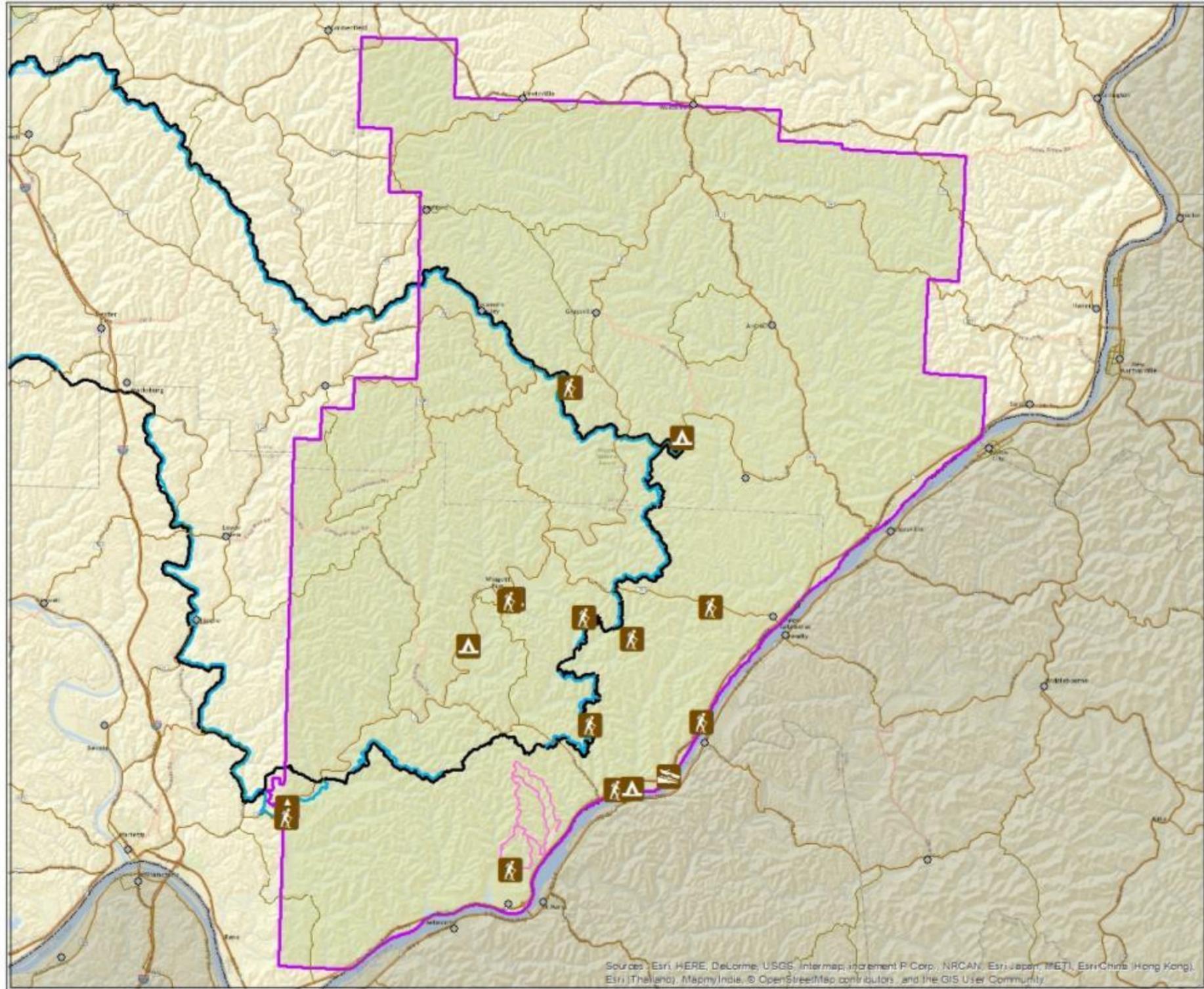
**Wayne National Forest  
Leasing EA  
Map 7: Marietta Unit  
Recreation Sites**

U.S. DEPARTMENT OF THE INTERIOR  
Bureau of Land Management  
Eastern States  
Northeastern States District  
Milwaukee, WI  
February 2016

-  Boat Launch
-  Campground
-  Trailhead
-  Cities
-  Highways
-  WNF Proclamation Boundary
-  Buckeye Trail
-  North Country Trail
-  Horse Trails



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## 7 PERSONS, GROUPS, AND AGENCIES CONSULTED

### Consultation and Coordination

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

U.S. Forest Service, Wayne National Forest

U.S. Forest Service, Eastern Region 9

U.S. Fish and Wildlife Service

The Delaware Tribe of Indians

The Delaware Nation

The Shawnee Tribe

The Eastern Shawnee Tribe of Oklahoma

The Absentee Shawnee Tribe of Indians

The Wyandotte Nation

Peoria Tribe of Indians of Oklahoma

#### 7.2 List of Preparers

##### BLM Preparers

Name	Title	Responsible for the Following Section(s) of this Document
Derek Strohl	Natural Resources Specialist	Plant and Animal Habitat and Populations; Environmental Justice, Socioeconomics
Jarrold Kellogg	Archaeologist	Cultural Resources, Paleontology, Native American Religious Concerns, Recreation
Katie Kassander	Natural Resources Specialist	Water Resources
Kurt Wadzinski	Planning and Environmental Coordinator	Editor
Carolyn Helm	Geologist	Geology/Mineral Resources/Energy
Kyle Schumacher	Natural Resources Specialist	Soils
Carol Zurawski	Planning and Environmental Coordinator	Cumulative Effects

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