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INTRODUCTION AND BACKGROUND

In 2006, an Environmental Impact Statement (EIS) and revised Land and Resource Management Plan (referred to here as the Forest Plan) were finalized for the Wayne National Forest (WNF). The Forest Plan decision made all federally-owned minerals administratively available to be leased (Record of Decision, p 14). This programmatic decision was based on projections for oil and gas activity finding that horizontal drilling was “still not yet economically feasible” (EIS, Appendix G reproduced here as Appendix B, p G-5), but could be used to access oil and gas in areas where surface use was not permitted by allowing for pad location outside of the restricted area (EIS, p 2-33 and 3-266).

A 2012 review of the projections for oil and gas activity found that 13 horizontal well sites could possibly be developed using high volume hydraulic fracturing (HVHF) technology through the remainder of the first ten years of Forest Plan implementation. This new information is presented in Appendix C and summarized in the New Information section of this report. In light of the new information the WNF conducted a programmatic review to determine the adequacy of the EIS, Forest Plan and associated planning documents.

The objective of the review was to determine whether the new information concerning the potential for HVHF presented a seriously different picture of the environmental effects of plan implementation, and thus requires a supplement or revision to the Forest Plan EIS (40 CFR 1502.9(c)). If a supplement or revision is required, the review will also inform a determination of whether amendment of the Forest Plan would be appropriate to avoid or minimize adverse effects. This report documents the interdisciplinary review of new information.

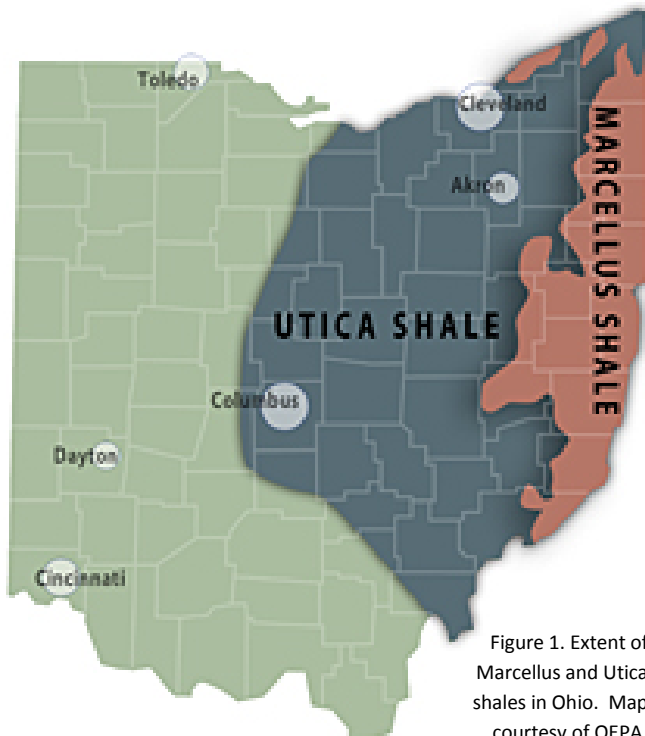
A Land and Resource Management Plan (Forest Plan) and the Environmental Impact Statement (EIS) and associated planning documents prepared for it are broad in nature (EIS, p 1-6). The Forest Plan provides a programmatic framework concerning future management of the WNF over a 10-15 year period. The Forest Plan does not authorize, fund or implement any site specific activities, nor does it consent to lease any particular parcel for potential oil and gas activity (EIS, p 1-6). The decisions made in the Forest Plan are whether or not to make Federal minerals available for leasing, where (management areas) and under what conditions (standards and guidelines)(EIS, p 3-263). Since the Forest Plan does not authorize, fund or implement any site-specific actions, the EIS is appropriately broad in nature and does not analyze site-specific effects (EIS, p 1-7). This type of analysis is termed “programmatic” and provides a framework for future, site-specific analysis to be conducted if or when a project proposal is developed (EIS, pp 1-6 and 1-7).

Background of Project Development

Within recent years there has been increased interest and activity in developing shale gas resources within the Appalachian region. This interest and development has mostly been focused on the Marcellus shale, which underlies parts of New York, Pennsylvania, Ohio, West Virginia, Maryland, Virginia and Tennessee. Southeast Ohio is on the margins of the Marcellus and so has not seen the amount of activity that is occurring in neighboring states. Portions of Ohio are underlain by the Utica shale. Until recently, the Utica shale was not a main target formation for oil and gas, and wells that were developed into that formation were traditional, vertical wells. In early 2011 reports started to reach the local news media that the Utica shale may have quantities of natural gas that could be tapped

in a profitable way via horizontal drilling methods here in southeast Ohio. These reports seemed to be substantiated by the soon following activity to acquire lease rights for exploration and development of oil and natural gas on private lands. In the Athens County area, reports were that some landowners were promised upwards of \$2,500 per acre in signing bonuses for their mineral rights.

Prior to this timeframe, Expressions of Interest were made to the Bureau of Land Management (BLM) on multiple parcels on the Wayne National Forest (July 2008 and February 2009), totaling to just over 3,300



acres. An Expression of Interest is a formalized request made to the BLM to lease federal minerals. Some of the parcels are located near the Hocking River. Groundwater contained in unconsolidated sand and gravel deposits along the Hocking River supply drinking water to many local communities. WNF specialists reviewed the parcels (late 2010 and early 2011) to make sure they were available to be leased, that NEPA analysis had been done (the Forest Plan EIS was used as the NEPA analysis) and determined and mapped certain areas where surface occupancy would not be allowed or would be limited if a well proposal was ever made. With these measures in place, the former Forest Supervisor gave consent for the leasing. BLM included the parcels in a competitive lease auction scheduled for December 7, 2011 and announced the auction 90 days in advance.

An outpouring of public concern related to the possible development of horizontal wells near the Hocking River on the WNF followed, which prompted WNF to review the EIS in regards to horizontal drilling. On November 14, 2011 the current Forest Supervisor requested the removal of the parcels from the competitive lease auction, pending a review of the perceived changed circumstances in relationship to the effects analysis in the programmatic EIS and associated planning documents. The Regional Forester approved this request and submitted it to the BLM. On November 17, 2011 the BLM issued an errata sheet to the competitive lease auction removing the WNF parcels. The Forest Supervisor requested that BLM to review the projections for oil and gas activity in light of the perceived changed circumstances.

Purpose and Need for Review

The Forest Plan and Environmental Impact Statement

The Forest Plan provides management direction for the WNF, including whether Federal minerals are available for leasing, and sets forth Forest-level mitigations and design criteria, called standards and guidelines, as constraints on development to protect resources from activities that may occur during the life of the Forest Plan (EIS, pp 1-6 and 1-7). The Forest Plan does not authorize, fund or implement any site specific activities, nor does it consent to lease any particular parcel (EIS, p 1-6). In conjunction with development of the Forest Plan, a programmatic EIS was prepared that analyzed the potential direct, indirect and cumulative effects on resources of the range of acres considered for various activities in the alternatives proposed. Since the Forest Plan does not authorize, fund or implement any site specific

actions, the EIS is appropriately broad in nature and does not analyze site specific effects. It is important to note that the acres considered for possible future oil and gas activities were the same across all alternatives considered in the EIS and were based on the Reasonably Foreseeable Development Scenario (EIS, Table 2-4, p 2-20 and RFDS, Appendix G to the EIS, reproduced here as Appendix B). The RFDS, prepared by the BLM with input from WNF staff, contains a projection of the types of activities (oil and gas-related) and level of activity likely on WNF surface-managed lands for the first 10 years of Forest Plan implementation. The RFDS considered horizontal drilling, noting that technology and associated practices were “still not yet economically feasible” (EIS, Appendix G, p G-5). The EIS went on to state that this technology could be used to develop oil and gas resources in areas with a No Surface Occupancy (NSO) stipulation by allowing for pad location outside of the restricted area (EIS 2-33 and 3-266). That is, it did not completely ignore the potential for horizontal drilling.

At the outset it is important to understand the nature of the analysis set forth in the Forest Plan EIS. This programmatic EIS was prepared in conjunction with revision of the Forest Plan. The Record of Decision (ROD) for the Forest Plan identified lands available for leasing (36 CFR 228.102(c) and (d)), anticipating that over the planning period the agency would receive Expressions of Interest to lease various parcels and would have a future opportunity to review those requests prior to consenting to leasing (36 CFR 228.102(e)). The Forest Plan EIS was designed to contain sufficient NEPA analysis for the Forest Supervisor to make that consent to leasing decision at the time when an Expression of Interest is made on specific parcels; however, the Forest Plan ROD did not contain the consent to lease any particular parcel or make any site specific decisions with regard to federal mineral leasing. The ROD defers those decisions to the time when Expressions of Interest are made and review of the specific parcels can determine if leasing those parcels is consistent with the Forest Plan and if the programmatic EIS analysis is sufficient for the consent (36 CFR 228.102(e)(1)).

This current programmatic review of the new information set forth below does not consider the consent to lease any particular parcel. Upon completion of this programmatic review, the Forest will, in the normal course of business, resume the processes set forth in Section 228 including the verification process for particular parcels as described in Section 228.102(e) and determine whether to consent to lease particular parcels.

New Information

In conjunction with the November of 2011 decision to review the Forest Plan, programmatic EIS and associated planning documents, the BLM reviewed the RFDS to determine if a changed condition existed. The BLM responded with a letter dated May 3, 2012 (Appendix C), indicating that based on advances in technology and high prices for oil, the development of oil and gas using horizontal technology is now economically feasible on the WNF. There is potential for 13 horizontal well sites (10 on the Marietta Unit and 3 on the Athens Unit) on the WNF through the remainder of the first decade of Forest Plan implementation. This projection includes well sites that may take place on federal minerals or private minerals underlying WNF surface lands. The projection does not include private surface lands located within the proclamation boundary.

The BLM provides reasoning for their projection,

“The two key factors in the development of the minerals below the WNF are the surface topography and the extent and continuity of the geologic formations. The well pad sites for horizontal drilling requires relatively flat surfaces that are at least 3.5 acres in size. The WNF

does not contain many locations that are this size or greater, and are relatively flat. Horizontal drilling into a formation requires that the formation in question be thick enough that the drill bit can penetrate the formation, be turned horizontally and remain in the formation during drilling and production. The driller must also have the right to access a continuous and large enough portion of the formation to make the wells economically viable.” (Appendix C)

The BLM letter summarized differences between conventional vertical wells and horizontal well sites (Table 1) so that the WNF could review the cumulative acres and the potential effects of 13 horizontal wells on the WNF.

Table 1: Comparison of Vertical and Horizontal Wells (From BLM letter dated 5/3/2012)

	<u>Vertical Well Pad Site</u>	<u>Horizontal Well Pad Site</u>
Total acres of surface disturbed by oil & gas drilling activity before reclamation	0.69 – 1.1	3 – 5.5
Total acres of surface needed to support drilled wells that are completed for production (excess disturbance reclaimed)	0.55 – 0.66	0.68 – 1.38
Number of wells per well pad	1	1 - 8
Access Road Width (feet)	12 -16	12 -16
Drilling time per well (days)	20 - 100	15 – 100
Water used for drilling & hydraulic fracturing per well (gallons)	44,000 – 85,000	3,500,000 – 4,000,000
Water that returns to the surface and is available for reuse	70% - 80%	70% - 80%
Water handling method	Tanks on Site, Sumps or Re-Injection	Tanks on Site, Sumps or Re-Injection
Compressor Sites (acres)	1 - 5	1 - 5

It is important to note that, even with the incorporation of horizontal well sites, the total surface disturbance acres of anticipated activity will not increase above those acres described within the RFDS prepared for the EIS (EIS Appendix G). That is, oil and gas well development surface disturbance that is analyzed and approved at the site specific level will not exceed 272 total acres and/or 121 acres, once the excess disturbance is reclaimed, through the first ten years of Forest Plan implementation (2016). Based on activity to-date, it is not likely that the disturbance limits of 272/121 acres will be reached; however, those acreages were analyzed, so disturbance could be that high.

Since 2006, the level of on-the-ground activity that has occurred is well below the level forecast in the RFDS. A total of 12 vertical wells have been developed with 20 acres of total disturbance during the development phase, reduced to 10 acres after reclamation for the production phase (approximately 8% of the projected levels). Table 2 displays a comparison of the projected activity versus actual to-date activity.

Table 2: Comparison of Activity Projected in 2006 RFDS versus Actual Activity to Date

	2006 RFDS Forecast	Completed To Date	Percent 2006 RFDS
Number of new wells drilled over next 10 years (as projected in 2006 RFDS)	234	12	5%
Miles of new access road needed	45	2	4%
Total acres of surface disturbed by oil & gas drilling activity before reclamation	272	20	7%
Total acres of surface needed to support drilled wells that are completed for production (excess disturbance reclaimed)	121	10	8%
Number of depleted wells plugged over next 10 years	108	7	6%
Total acres reclaimed by plugging depleted wells	59	5	8%

The BLM concluded, “while a change in technology has now made horizontal drilling in portions of the WNF economically viable, the level of on-the-ground activity that has occurred and is yet anticipated, including any horizontal drilling operations, is still within the levels forecast in the RFDS. Therefore the RFDS is still applicable and does not need to be revised” (Appendix C). The information provided by BLM in the May 3, 2012 letter will be referenced throughout this report.

Equally important in the review process conducted by the WNF, are the differences in nature and scale of potential effects between conventional and horizontal drilling operations. As indicated in Table 1, horizontal drilling requires a larger drilling pad and a larger volume of water for well developments.

Purpose of This Review

This review was conducted by a team of local WNF resource experts to determine if the programmatic EIS and associated planning documents must be supplemented or the Forest Plan amended in response to the new information. NEPA regulations (40 CFR 1502.9(c)(1)) set forth the standard concerning supplementation of an EIS:

Agencies shall prepare supplements to either draft or final environmental impact statements if:

- *The agency makes substantial changes in the proposed action that are relevant to environmental concerns; or*
- *There are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts.*

Forest Service internal directives found in the Forest Service Handbook (FSH 1909.15 Section 18.1) likewise set forth direction regarding review of new information or changed circumstances:

...the responsible official should review the information carefully to determine its importance. Consideration should be given to whether or not the new information or changed circumstances are within the scope and range of effects considered in the original analysis.

If, after an interdisciplinary review and consideration of new information within the context of the overall program or project, the responsible official determines that a correction, supplement, or revision to an environmental document is not necessary, implementation should continue.

Document the results of the interdisciplinary review in the appropriate program or project file. This documentation is sometimes called a supplemental information report (SIR) and should conclude with whether or not a correction, supplement, or revision is needed, and if not, the reasons why.

This programmatic review of new information was conducted in accordance with above mentioned framework. The potential development of 13 horizontal well sites using HVHF techniques represents a change from the original RFDS projections; this is new information that must be analyzed pursuant to NEPA regulations and the Forest Service Handbook. The purpose of this review is to determine whether this new information represents “significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts” relative to the analysis set forth in the EIS prepared for the Forest Plan. The interdisciplinary team considered whether the new information presents a seriously different picture of the environmental effects at the programmatic level.

Similar to the analysis prepared in the EIS, this review of new information does not specifically consider oil and gas development of any particular parcel. Further consideration of environmental effects occurs at subsequent levels of decision-making. The interdisciplinary analysis contained in this supplemental information report instead addressed broader questions to determine whether the new information requires supplementation of the programmatic EIS or amendment to the Forest Plan. This analysis considered the following questions:

1. At the programmatic level, do the potential environmental effects of developing 13 horizontal well sites using HVHF on the WNF present a seriously different picture of the environmental effects of oil and gas development, relative to the effects disclosed in the EIS prepared for the Forest Plan?
2. If the new information presents a seriously different picture of the environmental effects, do measures in the Forest Plan provide for the appropriate protection of the public and natural resources if horizontal drilling using HVHF were to take place on the WNF, or is there an opportunity to avoid or reduce adverse effects through amendment of the Forest Plan?

Based upon review of the best available scientific information, public input and this analysis, the determination will be made by the Forest Supervisor as to whether the programmatic EIS must be supplemented or revised, and if so, whether the Forest Plan should be amended to assure that Forest Plan objectives can still be met and adverse effects can be avoided or minimized. This SIR documents interdisciplinary review of new information. The SIR itself is not a NEPA analysis or approval, nor is it a discrete or circumscribed agency action. It is interlocutory in nature and does not mark the consummation of a decision-making process or determine any legal rights. It simply is a review of available information, akin to a memorandum to the file, documenting assessment of the significance of new information.

The interdisciplinary team took into account past, present or reasonably foreseeable natural gas exploration and development on the WNF and the potential effects of exploration and development in the Marcellus and Utica shales. The team also took into consideration information provided by resource specialists from the Bureau of Land Management (BLM), US Army Corps of Engineers (USACE), US Fish and Wildlife Service (USFWS), Ohio Department of Natural Resources Division of Oil and Gas Resources Management (DOGRM) and the Ohio Environmental Protection Agency (OEPA). This report documents that the WNF took a hard look at the potential programmatic effects associated with the new

information, given the information known to the WNF at this time regarding horizontal well development levels and environmental effects. The Forest's review of all relevant factors concerning whether or not to supplement or revise the EIS is documented in the record for this report.

OIL AND GAS ON THE WAYNE NATIONAL FOREST

Ownership

The programmatic EIS notes that minerals ownership patterns on WNF will change over time (EIS Appendix G, p G-3). The following paragraphs regarding acreages and percentages of ownership reflect the current situation and are presented as background information.

Subsurface ownership, also known as mineral rights, is highly unconsolidated and very complex across the WNF. The proclamation boundary for the Wayne National Forest includes a total of approximately 833,990 acres, of which, approximately 241,000 acres are owned by the United States of America (USA)/WNF. This is approximately 28% of the total land acreage within the proclamation boundary. Of that 28%, approximately 41% (98,858 acres) are underlain by federally-owned minerals. Privately owned minerals underlie approximately 59% or 142,258 acres of WNF land. This means that out of the approximately 833,990 acres within the proclamation boundary, 12% has both federally-owned surface and subsurface. The majority of subsurface acreage is privately owned.

When the minerals and the surface are owned by the USA and the minerals are not encumbered by a pre-existing lease, the minerals are deemed federal minerals and can be leased through a lease auction administered by the BLM. The Forest Service then has the authority to control the surface activities in order to protect resources. Below are scenarios whereby the surface may be owned federally, but the minerals are owned/leased by another party and the Forest Service has less discretion over the surface activities.

- Outstanding Mineral Rights are privately held rights retained by a third party prior to transfer of the surface. That is, when the surface land was sold to the USA the minerals were already owned by a third party and that third party retained ownership (EIS, p 3-250).
- Reserved Mineral Rights are privately held rights reserved by the seller when the surface is sold to the Federal Government. Mineral reservations can be for any length of time into perpetuity. A reserved mineral estate contains the Secretary of Agriculture Rules and Regulations that are made a part of the deed rights. These rules provide certain protections for the surface estate. (EIS, p 3-250)
- Acquired Leases are leases made to a third party that were in existence prior to the transfer of the property to the USA. Or, the lease was made while the USA owned the surface and the minerals were reserved. Once the minerals reservation expires, the rights revert to the USA; however, the existing lease is still in place. The USA owns both the surface and the subsurface; however, the subsurface has an active lease, which is subject to the terms and conditions that were in place when the lease was made. (EIS, p 3-251)

For the sake of simplicity, this report will lump outstanding and reserved minerals and acquired leases into one category, termed "private minerals". While acquired leases are not privately-owned

minerals, they are minerals where the Forest Service has less ability to control surface activities, thus the decision to include them, for the purposes of this report only, in the category of private minerals.

Beneath approximately 41% or 98,858 acres of National Forest System land that comprises the WNF (of the 241,000 acres), oil and natural gas are federally owned.

Process for Considering Oil and Gas Activities

The consideration of oil and gas activities differs based on the ownership of the minerals (federally-owned versus privately-owned).

Federal Minerals

Environmental analysis in accordance with the National Environmental Policy Act (NEPA) is required for federal minerals on the Wayne National Forest. During Forest Plan revision, WNF staff considered the surface activities associated with oil and gas operations and how they fit into the land management strategy. The determination was made that for some Management Areas, disturbance was not consistent with the goals and objectives. These areas have a No Surface Occupancy stipulation – Future Old Forest, Research Natural Areas, Special Interest Areas, Developed Recreation and Timbre Ridge Lake. The Forest Plan recognizes existing activity on federal leases in these areas already occurs and further states that future proposed activity on leases that pre-date the Forest Plan must be allowed. All leases that have been and will be issued since the finalization of the Forest Plan stipulate no surface occupancy in these areas (Forest Plan, pp 2-42, 3-28, 3-40, 3-44, 3-47, 3-54 and Forest Plan Appendix H, pp 4-6 (Appendix H is reproduced here as Appendix A)).

In addition, surface occupancy was found to be inappropriate in some areas of sensitivity. Some areas have the No Surface Occupancy stipulation based on presence of cultural heritage sites with known significance, instable soils, slopes in excess of 55 percent, proximity to known Indiana bat hibernacula, administrative sites, developed recreation areas, trails and associated trailheads (Forest Plan, p 2-42 and Forest Plan Appendix H, p 7). A Controlled Surface Use stipulation is applied when portions of a parcel contain sensitive features that must be avoided or have impacts mitigated in some way. The Controlled Surface Use stipulation is applied to areas with moderate or high scenic value, known locations of federally threatened or endangered species or Regional Forester sensitive species, managed wildlife openings, riparian areas (including the River Corridor Management Area), portions of floodplains outside of riparian areas and slopes between 35 and 55 percent (Forest Plan Appendix H, pp 7-8).

With surface occupancy controlled in certain areas as outlined above, it was determined that all federal minerals would be made administratively available for leasing (ROD, p 14). Protections are included for special resources that are unknown at the time of leasing and are provided for by notifications attached to parcels at the time of leasing. These notifications inform bidders that surveys and analysis will be conducted when a proposal for development is received. Additional restrictions or limitations to surface occupancy may result from the surveys and analysis. Notifications also inform bidders that all public laws, federal regulations and standards and guidelines from the Forest Plan apply (Forest Plan Appendix H, pp 2-3).

Once an Expression of Interest for particular parcels is received by the BLM, it is forwarded on to the Regional Forester, who in turn sends it to the Forest Supervisor. WNF staff research the parcels to ensure they are available to lease (not already leased, minerals are indeed owned by the USA, leasing is

consistent with the Forest Plan) and determine if any of the stipulations apply to certain parcels. Stipulations are attached to the parcels as applicable (all notifications are attached to every parcel). In accordance with 36 CFR 228.102(e)(1), when considering whether or not to consent to lease specific parcels, the WNF also verifies that the oil and gas leasing of the specific parcels has been adequately addressed by the programmatic EIS and is consistent with the Forest Plan. If NEPA has not been adequately addressed, or if there is significant new information or circumstances as defined in 40 CFR 1502.9 requiring further environmental analysis, WNF would conduct additional NEPA analysis prior to consenting to lease the parcels. The package returned back to the BLM indicates whether or not the parcels are available for leasing, which stipulations apply to which parcels and references the Forest Plan EIS and ROD as the NEPA analysis and documents authorizing the leasing. The mineral parcels then go on to be leased at a BLM auction.

Additional NEPA analysis is prepared after a lessee submits an Application for Permit to Drill (APD) to the BLM (EIS , pp 1-6 and 1-7). This stage is termed the “site-specific level” (EIS, p-1-7). It is the APD that notes what type of well and associated activities are proposed for development. A component of the APD is a Surface Use Plan of Operation, which must be reviewed by the WNF when use of National Forest land is proposed. Most often, the owner/operator has already contacted the WNF for guidance on appropriate standards and guidelines as they prepared their plans for surface use. At this time, the lessee would have already obtained a permit to drill from ODNR Division of Oil and Gas Resources Management. The lessee can “correct” or update their ODNR-issued permit if the site-specific NEPA conducted by the WNF results in different or additional site specifications (USDA FS 2012e).

In reviewing the Surface Use Plan of Operations, the WNF conducts the appropriate level of NEPA, based on the effects of surface activities proposed. This could be a categorical exclusion, environmental assessment or environmental impact statement. Public involvement and input is sought and taken into consideration during this time in all scenarios. Analysis is conducted by Forest staff and considers aspects such as wildlife, botany, archaeology and cultural resources, forestry, hydrology and soils, engineering and scenery management and considers direct, indirect and cumulative impacts as appropriate. Other agencies are consulted during the process, including the US Fish and Wildlife Service and the State Historic Preservation Office when appropriate. During this site-specific NEPA analysis specialists apply standards and guidelines from the Forest Plan and develop additional site-specific mitigations to address unique circumstances posed by the individual site (ROD, p15).

The Forest Supervisor or District Ranger will then make a decision to approve the Surface Use Plan of Operation as proposed or with changes, or to deny the plan. Denial would likely only be done in rare circumstances usually related to non-avoidable impacts to federally-threatened or endangered species. In the case of denial, the lessee can resubmit the APD to BLM with a revised Surface Use Plan of Operations that now may meet with WNF approval. BLM is the agency that approves the APD and actually issues the permit (ROD, p 14).

Private Minerals

When owners intend to develop their minerals, they provide the Forest Service with an operating plan. Forest Service staff and specialists review this operating plan for consistency with the Forest Plan and conduct an environmental review of the proposed operation. The results of the environmental review are used to work with the operator in negotiating measures or practices they could adopt to allow the operation to be consistent with the Forest Plan, or otherwise avoid or lessen environmental effects of their operation on WNF resources (EIS, pp 3-247 and 3-248).

Private mineral owners or operators must obtain all necessary State issued permits that are required for their operation. The Forest Service works with State of Ohio agencies issuing permits to ensure that the proposed operation meets State requirements and WNF resources are reasonably protected (EIS, p 3-264).

Regulatory Structure and Process

Several different agencies, each with their own processes, are responsible for the regulation of oil and gas wells on the WNF. These regulatory responsibilities are further broken down depending upon subsurface rights. Over 59 percent (142,258 acres) of WNF subsurface is privately owned. The figures below depict how different agencies interact depending on the type of subsurface rights. Figure 2 shows the major agencies involved with the lease of federal subsurface under federal surface. Figure 3 shows privately owned subsurface minerals and Federal surface. The following discussion outlines the specific responsibilities of each agency.

Federal Leases are regulated by several different agencies throughout leasing, drilling and production stages of the process. These agencies include Wayne National Forest, Ohio Department of Natural Resources Division of Oil and Gas Resources Management (DOGRM), Bureau of Land Management (BLM) and Ohio Environmental Protection Agency (OEPA). Development of private minerals is mainly regulated by the DOGRM and OEPA. Laws such as the Endangered Species Act and the Historical Preservation Act are applicable to private minerals and all surface activities on the WNF. As stated in the previous section, the WNF works with operators by recommending mitigations and practices to protect the federal surface. It is important to note that subsurface owners have the legal right to access their minerals.

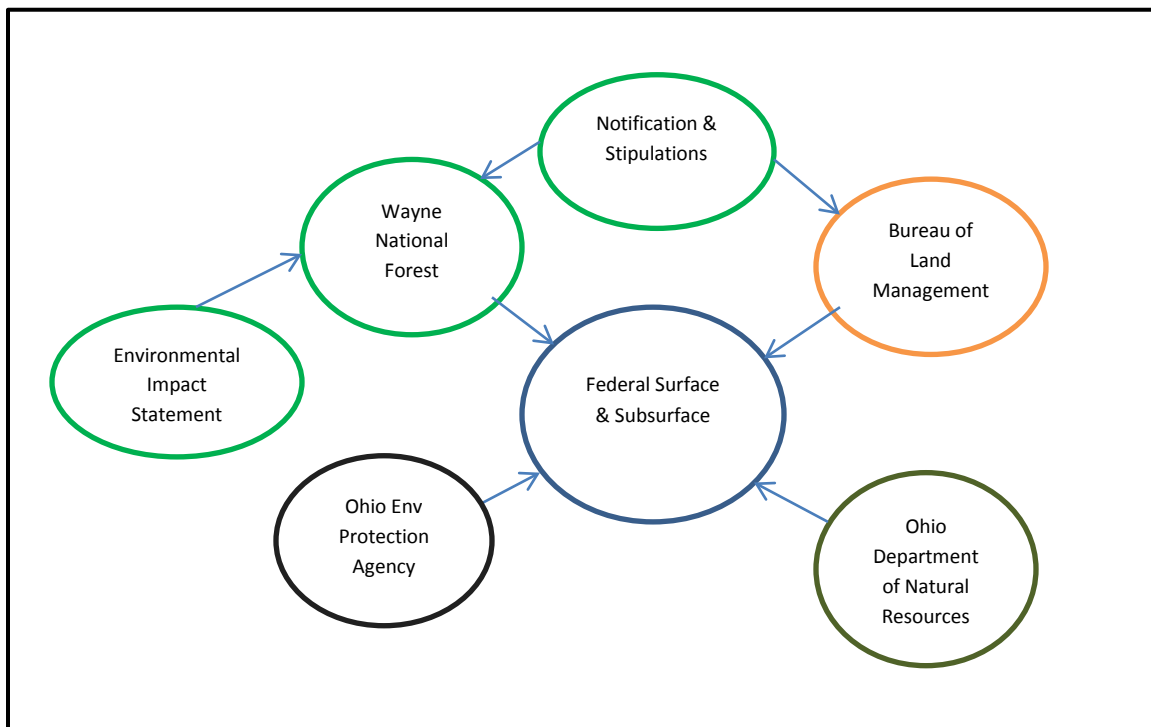


Figure 2. Diagram of Regulatory Framework for Developing a Well of a Federal Lease

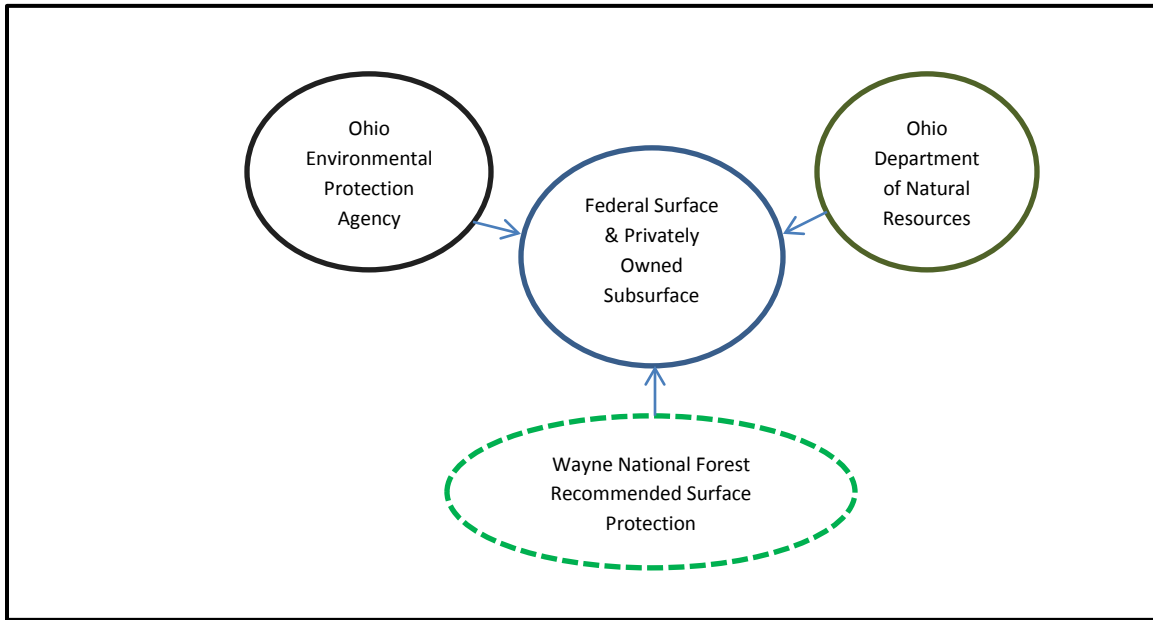


Figure 3. Diagram of Regulatory Framework for Developing a Well on Private Minerals

United States Forest Service - Wayne National Forest

The EIS and ROD for the WNF Forest Plan decided which federal minerals are available for leasing. As described on page 8 in the 2006 ROD “federally owned oil and gas rights within the Forest are administratively available for oil and gas leasing. Subsequent to this decision, the Forest Supervisor will make the leasing determinations for specific lands [36 CFR 228.102(e)] and authorize the Bureau of Land Management (BLM) to offer these lands for lease.” At the time when BLM leases federal minerals the Forest Plan and associated documents become part of the federal lease with the lessee.

Any lease operations are also subject to environmental protection requirements in Forest Service regulations, including the regulations found at 36 CFR 228.102(e) that implement the Federal Onshore Oil and Gas Leasing Act of 1987. For example, Forest Service oil and gas regulation surface use requirements (36 CFR 228.108) require environmental protections relating to access, facilities, cultural and historical resources, fire prevention and control, fisheries, wildlife and plant habitat, soil erosion and sedimentation, safety, management of wastes, watershed protection and reclamation.

In addition to the environmental analysis conducted prior to leasing, a site-specific environmental analysis under NEPA is required for approval of the proposed Surface Use Plan of Operations (see previous section for details).

Because the role of the Forest Service in oil and gas administration is inextricably tied to roles played by the State of Ohio and BLM, a discussion of the adequacy of the Forest Plan, EIS and associated planning documents would not be complete without considering the roles played by those other entities. The EIS

and Forest Plan recognize this partnership in various ways, including acknowledging the Ohio law and implementing regulations found in the Ohio Revised Code and Ohio Administrative Code as being applicable to mineral activities on the WNF (EIS, p 3-248), recognizing the intertwined roles of the USFS and BLM in managing federal minerals (EIS, p 3-245) and directing that the OEPA be notified and efforts be coordinated by OEPA to contain and mitigate any spill that may occur (Forest Plan, p 2-41). In recognition of these intertwined roles, the reviews contained within this report do consider how activities and potential effects are controlled by the state and the BLM, when applicable.

Bureau of Land Management

Any lease operations are subject to environmental protection requirements in BLM regulations, including Onshore Oil and Gas Orders. BLM regulation Onshore Oil and Gas Order No. 1 contains environmental protection requirements for the Drilling Plan and Surface Use Plan of Operations in the APD. For example, drilling plan requirements state "the drilling plans must be in sufficient detail to permit a complete appraisal of the technical adequacy of, and environmental effects associated with, the proposed project" (USDOI BLM and USDA FS 2007, Section III.D.3). BLM regulation Onshore Oil and Gas Order No. 2 contains environmental protection requirements for drilling operations: "the proposed casing and cementing programs shall be conducted as approved to protect and/or isolate all usable water zones, abnormally pressured zones, and any prospectively valuable deposits of minerals" (USDOI BLM 1988, Section III.B)

The USFS and the BLM signed an interagency agreement in 1984 that set forth policy and procedure for the administration of federal minerals (USDOI BLM and USDA FS 1984, p 1). This agreement was updated and clarified in 2006, with the signing of a Memorandum of Understanding (MOU, contained in Appendix E) which delineates each agency's responsibilities in relationship to oil and gas activities when federally-owned minerals are overlain by National Forest lands (USDOI BLM and USDA FS 2006, p 1). This MOU outlines the agencies roles, detailing the BLM as being responsible for regulating all "down-hole operations and directly related surface activities", and the USFS as being responsible for "regulating all surface-disturbing activities associated with oil and gas exploration and development through analysis and approval of the Surface Use Plan of Operations" (USDOI BLM and USDA FS 2006, p 3). This MOU is attached to this report as Appendix E.

State of Ohio

The following table from the OEPA website provides a summary of ODNR & Ohio EPA authority over oil and gas operations (<http://www.epa.state.oh.us/shale.aspx>). These authorities apply to all oil and gas activities, regardless of the minerals ownership.

Who Regulates	Ohio Department of Natural Resources	Ohio Environmental Protection Agency
Drilling in shale deposits	<ul style="list-style-type: none"> ▪ Issues permits for drilling oil/gas wells in Ohio. ▪ Sets requirements for proper location, design and construction requirements for wells. ▪ Inspects and oversees drilling activity. ▪ Requires controls and procedures to prevent discharges and releases. ▪ Requires that wells no longer used for 	<ul style="list-style-type: none"> ▪ Requires drillers obtain authorization for construction activity where there is an impact to a wetland, stream, river or other water of the state. ▪ Requires drillers obtain an air permit-to-install and operate (PTIO) for units or activities that have emissions of air pollutants.

	<ul style="list-style-type: none"> production are properly plugged. Requires registration for facility owners with the capacity to withdraw water at a quantity greater than 100,000 gallons per day. 	
Wastewater and drill cutting management at drill sites	<ul style="list-style-type: none"> Sets design requirements for on-site pits/lagoons used to store drill cuttings and brine/flowback water. Requires proper closure of on-site pits/lagoons after drilling is completed. Sets standards for managing drill cuttings and sediments left on-site. 	<ul style="list-style-type: none"> Requires proper management of solid wastes shipped off-site for disposal.
Brine/flowback water disposal	<ul style="list-style-type: none"> Regulates the disposal of brine and oversees operation of Class II wells used to inject oil/gas-related waste fluids. Reviews specifications and issues permits for Class II wells. Sets design/construction requirements for Class II underground injection wells. Responds to questions/concerns from citizens regarding safety of drinking water from private wells from oil/natural gas drilling. 	
Brine/flowback water hauling	<ul style="list-style-type: none"> Registers transporters hauling brine and oil/gas drilling-related wastewater in Ohio. 	
Pumping water to the drill site from a public water supply system		Requires proper containment devices at the point of connection to protect the public water system.

ODNR Division of Oil and Gas Resources Management

The ODNR Division of Oil and Gas Resources Management (DOGRM) is the primary regulator of oil and gas activities in the State of Ohio. DOGRM responsibilities include regulating oil and gas drilling and production operations, brine disposal operations and underground injection operations. The DOGRM webpage can be found at <http://www.ohiodnr.com/oil/oilgashome/tabid/10371/Default.aspx>.

Ohio Revised Code (ORC) contains Ohio’s oil and gas laws and is available at <http://codes.ohio.gov/orc/1509>. ORC was recently updated by Substitute Senate Bill 165, which became law in June of 2010. The weblink provided above does incorporate revisions to the law that were made by Substitute Senate Bill 165. Provisions within this bill address enhanced permitting authority in urban areas, strengthened funding for operations and orphan well plugging, added additional notification requirements by the industry and expanded enforcement provisions. Amended Substitute Senate Bill 315 passed both houses of the Ohio legislature in May of 2012 and was signed into law by the Governor on June 11, 2012. Ohio Administrative Code (OAC) contains regulations that have

been developed in order to implement the Revised Code and can be found at <http://codes.ohio.gov/oac/1501%3A9>. Revisions were recently made final to the OAC, with the biggest additions being the creation of well construction rules. These revisions become effective August 1, 2012.

Ohio Environmental Protection Agency

The Ohio Environmental Protection Agency (OEPA) is the primary regulator of air quality and emissions in the State of Ohio. This authority is delegated to the OEPA by the United States Environmental Protection Agency. The OEPA issued the final Model General Permit for air pollution permitting at shale oil & gas well sites in February 2012. This general permit covers all operations involved in an oil and gas well site during the production phase of the well. This includes glycol dehydration units, natural gas and diesel engines, storage tanks, flares and ancillary equipment. Operators will also need to apply for and obtain a separate permit for any unpaved roadways. Detailed information related to the Model General Permit for shale oil & gas well sites including a press release, questions and answers concerning air pollution permitting, and a fact sheet for oil gas air permitting can be found at http://www.epa.state.oh.us/dapc/genpermit/genpermits.aspx#gp_issues.

The bulleted items below are taken from the OEPA website (<http://www.epa.state.oh.us/shale.aspx>) under the Industry Resources heading. Each of the items links to a document or webpage containing useful information related to that topic. The website also has headings for Updates, Basics, Who Regulates, Issued Permits, Archives and Links.

Industry Resources

- Ohio's Regulations: A Guide for Operators Drilling in the Marcellus and Utica Shales
- Drilling for Natural Gas in the Marcellus and Utica Shales: Environmental Regulatory Basics

Water

- Sources of Water for Hydraulic Fracturing Fluids
- Water Withdrawal Regulations for Oil and Gas Drilling (ODNR)
- Ohio EPA Section 401 Certification for the U.S. Army Corps of Engineers Nationwide Permit 39 for Commercial and Institutional Developments (including oil/gas well sites)
- U.S. Army Corps of Engineers, Nationwide Permit Information
- U.S. Army Corps of Engineers Regulatory Role in Activities Associated with Oil and Natural Gas Production and Distribution
- U.S. Army Corps of Engineers – District Office websites
- U.S. Army Corps of Engineers – District Boundary Map
- U.S. Army Corps of Engineers, Letter to Industry from the Buffalo District Office

Air

- Air general permit for production operations at shale gas well sites

Waste Management

- Drill Cuttings from Oil and Gas Exploration in the Marcellus and Utica Shale Regions

At the outset it is important to have a proper frame of reference of how the regulatory environment has changed at the state level. The DOGRM compiled information on documented groundwater impacts from oil and gas activities in Ohio over a recent 25 year period (1983-2007). This information is presented in a report issued by the Ground Water Protection Council (Kell 2011) and shows a correlating reduction in contamination incidents as regulatory reforms were instituted. The following summary of the key information in that report provides a basis for understanding the relative risks posed to groundwater by oil and gas activities under State of Ohio regulations, and a context for better understanding the risks of the activities considered in the Forest Plan and associated EIS.

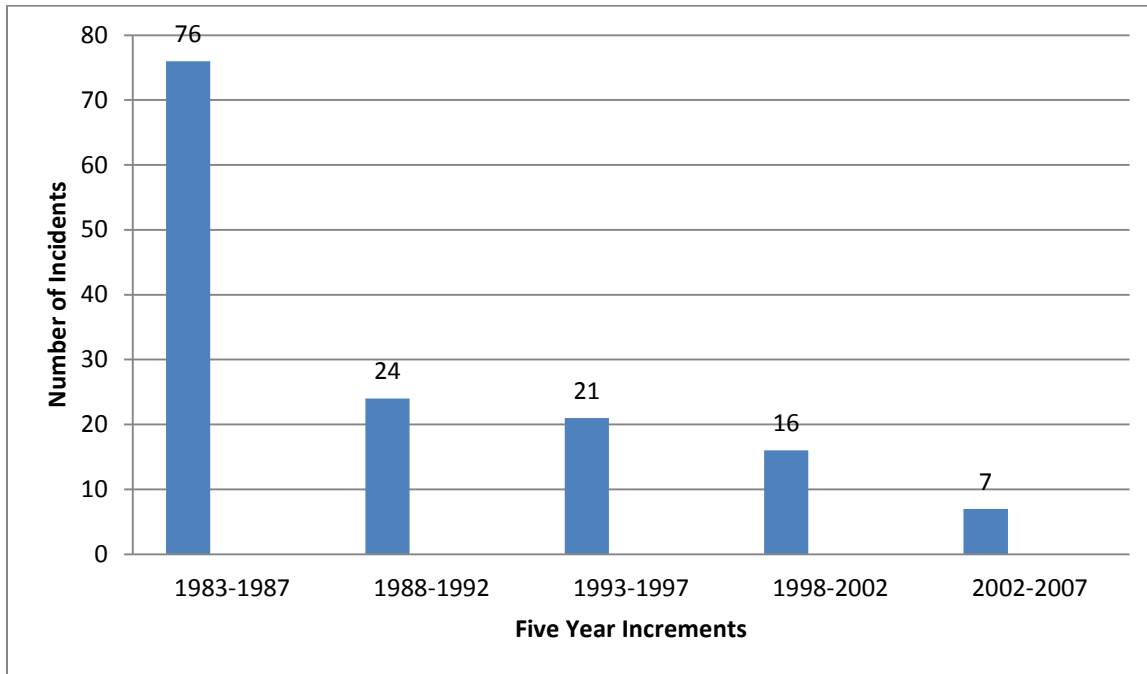
During the 25 year study period (1983-2007), Ohio documented 185 groundwater contamination incidents caused by historic or regulated oil field activities. Of those, 144 groundwater contamination incidents were caused by regulated activities, and 41 incidents resulted from orphaned well leakage (Kell 2011, p 37). Seventy-six of the incidents caused by regulated activities (52.7percent) occurred during the first five years of the study (1983-1987)(Kell 2011, p 38). Seventy eight percent (113) of all documented regulated activity incidents were caused by drilling or production phase activities. Improper construction or maintenance of reserve pits was the primary source of groundwater contamination, which accounted for 43.8 percent of all regulated activity incidents (63) in Ohio (Kell 2011, pp 43-44). It is important to note that during the study period there was only one horizontal shale gas well completed in Ohio (Kell 2011, p 41). Also, none of these incidents occurred on WNF lands.

Table 3. Confirmed Incidents of Groundwater Contamination in Ohio by Phase of Activity (Period 1983 – 2007)

<u>Phase</u>	<u>Number of Incidents</u>	<u>Number Well Sites</u>	<u>Percent Well Sites with Incidents</u>
Site Preparation	0	33,304	0.00%
Drilling and Completion	74	33,304	0.22%
Well Stimulation	0	27,969	0.00%
Production, On-lease Transport and Storage	39	64,830	0.06%
Waste Management and Disposal	26	83,646	0.03%
Plugging and Site Reclamation	5	20,374	0.02%
Total	144	83,646	0.17%

As displayed in Figure 4, the number of incidents caused by regulated activities declined significantly (90.1 percent) during the study period (Kell 2011, p 38). This drastic decline corresponds to regulatory reforms including produced water tracking, establishment of deep injection of produced water as preferred disposal method, closure of produced water in earthen pits and reserve pit construction standards (Kell 2010, p 39).

Figure 4. Regulated Activity Incident Trends (reproduced from Kell 2010, p 38)



ISSUE AREAS/RESOURCE REVIEWS

This section will document the reviews conducted for specific issue areas or resources. Each issue area or resource was determined to be of importance in relationship to the activities associated with horizontal drilling using HVHF. Reviews are organized in the following order:

- [Water](#)
- [Wildlife](#)
- [Forest Fragmentation](#)
- [Botany](#)
- [Waste Disposal](#)
- [Noise and Light Pollution](#)
- [Air Quality](#)
- [Infrastructure](#)
- [Public Safety](#)
- [Heritage](#)
- [Soils](#)

The core team working on this project determined that the review of how water, wildlife and fragmentation issue areas/resources are addressed required an in-depth exploration. For the remaining issue areas/resources considered in this report the team determined a more concise review was sufficient (USDA FS 2012d). During the reviews, specialists determined how existing laws, rules and regulations and the Forest Plan, EIS and associated planning documents addressed each issue area or resource.

WATER RESOURCE REVIEW

The information presented in the water resource review will apply to the application of high volume hydraulic fracturing (HVHF) to all low permeability or “tight” formations (including the Marcellus and Utica shales) as there are no meaningful differences in how the general technique is used in one formation versus another.

Hydraulic fracturing of conventional vertical wells has been occurring in Ohio for many years, albeit involving smaller volumes of fluids. Differences between conventional oil and gas sites and the HVHF oil and gas well sites being evaluated include a larger footprint and greater fluid volumes. The magnitude of risk increases in scale as the volume of fluid potentially subject to accidental release increases. The Forest Hydrologist and Regional Hydrogeologist considered pertinent information about oil and gas activities in the State of Ohio and within the region in order to evaluate the sufficiency of the Forest Plan, programmatic EIS and associated planning documents in regards to HVHF effects on the water resource.

The EIS and Forest Plan address oil and gas exploration and development in various places (excerpted below and in many places throughout the SIR).

Direction from the Forest Plan, EIS and Appendices

The following information is taken directly from the Forest Plan, EIS and associated appendices.

Environmental Impact Statement (EIS)

Protection of Streams and Riparian Areas

“Although no specific issues regarding impacts to soils or watershed health were identified during public scoping for this Forest Plan revision, the following activities will be discussed in general terms because they can impact riparian areas and streams. These discussions will be more qualitative than quantitative and will focus more on roads since erosion and sedimentation are principal concerns during reclamation: roads/trails, vegetation management, mineral exploration and fire management” (EIS, p 3-17 – for the purposed of this review, the mineral exploration section will be explored).

Mineral Exploration

“Mineral exploration and development can affect soil and water by increasing erosion and sedimentation, soil compaction, and water yield. In many cases soil productivity is reduced and turbidity and/or sedimentation may increase. The potential seepage or spillage of toxic substances from mining facilities or disposal areas may also pose a threat to water quality” (EIS, p 3-18).

“Statutes, regulations, and executive orders guide Forest Service policy for the exploration and development of mineral resources on NFS land” (EIS, p 3-245).

“Authority to manage the exploration and development of mineral and energy resources on NFS land is shared by the Secretaries of Agriculture and the Interior. The U.S. Dept. of the Interior (USDI) has primary responsibility for administration of general mining laws and mineral leasing, but certain leasing acts require the Secretary of Agriculture's consent” (EIS, p 3-245).

“Leases may also be subject to conditions designed to ensure adequate utilization of lands for the purposes for which they were acquired or are being administered” (EIS, p 3-245).

“The Forest Service has entered into interagency agreements with USDI agencies to establish cooperation and coordination in the management of federally-owned minerals within national forests. The Forest Service is responsible for managing surface occupancy and use by those conducting mineral activities and to manage the disposal of certain mineral materials” (EIS, p 3-245).

“Mineral and energy resource management laws and regulations and associated authorities can be divided into two categories:

- Surface management authorities

- Mineral management authorities” (EIS, p 3-245).

Mineral Development and Exploration of the Wayne National Forest

Oil and Gas Development

“Most wells within the WNF are classified as ‘stripper’ wells, which produce small volumes of oil, gas, or both, with equally small volumes of brine as a waste product. The average stripper gas well in Ohio produces 7.4 thousands of cubic feet per well each day, while the average stripper oil well produces less than one barrel of oil per day” (EIS, p 3-256).

“Activity on federal leases on the WNF since 1993 has been minimal. Only four new wells were drilled and six depleted producers were plugged. Oil and gas activities on outstanding and reserved mineral rights have averaged five wells drilled per year on the WNF. Over the last decade, oil and gas production in Ohio has declined steadily, from 8.3 million barrels of oil in 1993 to 5.65 million barrels in 2003 and from 136 thousands of cubic feet of gas to 94 thousands of cubic feet over the same period” (EIS, p 3-258).

“The low number of new wells can be attributed to energy prices in the mid-1990s, which were some of the lowest experienced by industry in 35 years. However, current energy prices are strong and have elicited increased interest in drilling new wells on federal leases on the WNF. Ten new Applications for Permit to Drill (APD) were submitted in 2003/2004” (EIS, p 3-265).

Reasonably Foreseeable Development Scenario for Oil and Gas

“The area within the WNF proclamation boundary constitutes the area of analysis for the environmental effects relating to minerals issues. This look at the direct and indirect effects of implementing the 2006 Forest Plan will be limited to impacts affecting only National Forest System (NFS) land. The cumulative effects analysis, however, will include impacts off NFS land” (EIS, p 3-265).

Environmental Consequences (from the Watershed Section of the EIS)

Direct and Indirect Effects Common to all Alternatives

“Effects on watershed and riparian resources should generally vary by the degree to which management activities are projected to occur under each alternative. Forest-wide objectives set the tone for managing specific resources, and management area direction further defines how resources will be managed. Even with these over-arching principles and with the application of standards and guidelines, unavoidable effects to water, soil, and riparian resources may occur as a result of project implementation. By and large, these effects should be short-term. However, operation and maintenance may entail a long-term commitment of resources.” (EIS, p 3-16)

Appendix G to the EIS - Oil and Gas Management (reproduced here as Appendix B)

Typical Oil and Gas Operations

Drilling Operations

“A large ‘reserve’ pit is dug on the well pad” (EIS Appendix G, p G-6).

“Rotary rigs use a toothed, tricone cutting bit mounted on successive lengths of rotating drill pipe to drill the hole. Either a water-based mud (with additional conditioning agents as needed) or compressed air is used as the circulating agent” (EIS Appendix G, p G-6).

“As the well is deepened, using one of the above methods, steel pipe called casing will be periodically cemented into the hole along its length to seal the rock formations and their native fluids from the drilling (and later producing) environment. Federal regulations require casing to be installed in a manner that will protect fresh water zones and isolate other zones which contain oil, gas, and water” (EIS Appendix G, p G-7).

“Federal regulations require that the rigs be equipped with blow-out preventers which are capable of preventing the hole from an uncontrolled flow in case a high pressure zone is encountered” (EIS Appendix G, p G-7).

“In the event of a commercial discovery, the drill rig is moved off the site and a smaller truck mounted rig and two to three 400-barrel tanks are moved onto the site to begin the completion phase. Specialized trucks pump water or nitrogen mixed with sand or a mild acid into the well to fracture the producing formation to increase its flow rate. A large amount of the fluid volume that is pumped into the well is “flowed back” into the tanks that were brought on site. The tanks may remain for a longer period until the well is “cleaned up”, that is, most of the injected fluid is recovered” (EIS Appendix G, p G-7).

Production Operations

“The typical producing oil well and its associated production facility consists of one or two 100-barrel steel oil/water storage tanks surrounded by an earthen dike, a pump-jack and motor to bring the oil to the surface, an electric line to run the motor, a separator (a vessel that separates the raw well stream into oil, gas, and water), and if gas is being produced with the oil, a gas meter. If an electric source isn’t readily available, pumpjack motors can be run by natural gas drawn off the well. A typical producing gas well and its facility typically consist of an assortment of valves on the wellhead, a 100-barrel tank for produced water, a separator, and a gas meter” (EIS Appendix G, p G-8).

“Hydrocarbons are transported from the wellbore to the production equipment by means of varying lengths of 2-inch diameter pipe. Where feasible, pipelines are buried at least 24 inches below the ground surface. There may be a permanent flare to dispose of small quantities of natural gas that are not economic to sell. When natural gas can be marketed, gathering pipelines transmit the gas from the production facility to secondary collector lines and on to main transmission lines. Given the long history of gas production in the WNF, there is already a well-developed pipeline infrastructure in place which should minimize the need for lengthy gathering lines to service new wells” (EIS Appendix G, p G-8).

“Water produced along with the oil and gas is generally salty and sometimes sulphurous. Federal and State regulations require this saltwater, or brine, to be properly disposed of. The

most common method of disposal in Ohio is for the brine to be trucked to a State-licensed disposal well where it is injected into underground formations already containing brine. A less common disposal method allowed in certain townships is road spreading of brine for the purpose of dust and ice control. Producing wells in the WNF typically produce only small amounts of brine” (EIS Appendix G, p G-8).

“Tanker trucks will pick up oil and/or salt water from the production tanks on a schedule determined by the volumes produced” (EIS Appendix G, p G-9).

“Occasionally, producing oil and gas wells experience mechanical problems in the wellbore that require a process called a ‘workover’. A workover involves bringing a smaller service rig to the location to perform any needed service on the well. Workovers take place on the existing well pad and sometimes may require a small pit to contain any fluids circulated from the wellbore. After the workover is complete, any fluids remaining in the pit are vacuumed out and disposed of in accordance with State requirements. The pit is then backfilled and revegetated as appropriate” (EIS Appendix G, p G-9).

“Lease Notifications provide more detailed information concerning limitations that already exist in law, lease terms, regulations, or operational orders and address special items the lessee should consider when planning operations” (EIS, p 3-25).

Appendix H to the Forest Plan -Lease-specific Oil and Gas Notifications/Stipulations (reproduced here as Appendix A)

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.” (Forest Plan Appendix H, p 2)

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 WNF Land and Resource Management Plan.” (Forest Plan Appendix H, p 3)

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.” (Forest Plan Appendix H, p 9)

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.” (Forest Plan Appendix H, p 9)

Forest Plan Standards Pertaining Directly to Minerals Development

The following standards from the Forest Plan are specific to mineral activities and provide notice to the operator of their responsibilities. Standards and guidelines for the protection of water resources are discussed later within the water resources review.

Federally Owned Minerals

SFW-MIN-11: Within management areas where surface occupancy is generally permitted, apply the Controlled Surface Use stipulation for new Federal leases where the following conditions occur:

- Riparian areas and wetlands
- Managed wildlife openings
- Developed recreation sites (located outside the Developed Recreation Management Area)
- Areas of land with a Scenic Integrity Objective of ‘High’ or ‘Moderate’
- Known locations of Federally listed species
- Known locations of Regional Forester sensitive species
- Portions of floodplains outside riparian areas
- Slopes between 35 and 55 percent.

SFW-MIN-12: Consider approval of plans of operation based on applicable regulations and analysis of:

- Surface/subsurface resources
- Any restrictions and mitigations determined by an environmental analysis
- Road construction standards
- Standard BLM lease stipulations
- Appropriate lease-specific oil and gas notifications and stipulations (See Appendix H – Lease Specific Oil and Gas Notifications/Stipulations).

Privately Owned Minerals

SFW-MIN-20: The exercise of all reserved and outstanding mineral rights are subject to applicable State and Federal laws and regulations pertaining to mining, real property, and environmental protection, including the Surface Mining Control and Reclamation Act with regard to coal.

Federally and Privately Owned Minerals

SFW-MIN-1: Prevent or eliminate occupancy that is not reasonably incident to, or required for, legitimate mineral operations.

SFW-MIN-2: Require that all proposed surface-disturbing mineral activities have an approved operation and reclamation plan before the activity begins.

SFW-MIN-3: Require that operators conduct activities and maintain equipment to prevent the discharge of oil or brine onto the ground or into surface waters.

SFW-MIN-4: Upon discovery or notification of an accidental spill of crude oil or brine that discharges, or threatens to discharge, into surface waters, notify the Ohio Environmental Protection Agency Emergency Response and Special Investigations unit in Columbus. 1-800-282-9378

SFW-MIN-5: The operator, as directed by Ohio EPA, is responsible for remedial action for cleanup of soil and water resources and timely repair of damaged wells, pipelines, or tanks.

SFW-MIN-8: Require owners and lessees to plug oil and gas wells when production ceases. Work with cooperating agencies to plug abandoned non-producing wells without identified owners.

All of the information, standards and guidelines, notifications and stipulations are still applicable to HVHF of oil and gas on the WNF because they are designed to minimize and/or mitigate surface impacts. The same activities described above, taken from the Forest Plan planning documents related to oil and gas drilling/production, would occur on a horizontal well. Yet, the scale would be larger.

Additional Considerations

As stated in the Regulatory Structure section, because the role of the Forest Service in oil and gas administration is inextricably tied to roles played by the State of Ohio and BLM, a discussion of the adequacy of the Forest Plan, EIS and associated planning documents would not be complete without considering the roles played by those other entities. The EIS and Forest Plan acknowledge roles played by other agencies. In recognition of these intertwined roles, the water resource review does discuss how activities and potential effects are controlled by the state and the BLM.

Since technology has evolved, giving industry the expertise to extract oil and gas from these deep, low permeability formations, the roles, responsibilities and regulations of the various agencies have become unclear to the general public. The recently released OEPA-ODNR "Guide for Operators Drilling in the Marcellus and Utica Shales" (referred to here as the Operator's Guide, ODNR 2012) explains the various agencies and their authorities over activities associated with HVHF drilling in the State of Ohio. Ohio has recently revised oil and gas laws and regulations in order to keep up with the new technologies being used. Substitute Senate Bill 165 was signed in 2010 and was the first major overhaul of Ohio oil and gas law in many years. Amended Substitute Senate Bill 315 was signed into law on June 11, 2012 and provides for additional measures. An understanding of these new measures will help in evaluating the potential impacts and determining the appropriate measures to be implemented for the protection of water resources on a case-by-case basis if a proposal is made to drill on WNF lands. The following discussion within this resource review considers the effects to water resources.

Effects

The following sections are focused on federal minerals. When activity is proposed on federal minerals the BLM is heavily involved; WNF Forest Plan, notifications, stipulations, standards and guidelines apply; and site specific mitigations can be developed and added as appropriate to account for unique situations presented by individual sites. For private minerals the WNF would work with the owner/operator in regards to the Forest Plan and other site specific measures for the protection of resources. The discussion dealing with how state agencies regulate oil and gas activities applies to both federally-owned and privately-owned minerals.

Effects to Groundwater

Forest Service policy related to groundwater

During the review process comments were received from members of the public referencing the official Forest Service policy on groundwater. There currently is no official policy dealing with groundwater. Draft policy has been developed; however, it has not been finalized or adopted.

Forest Service Manual (FSM) 2880 contains direction on inventorying groundwater resources on National Forest lands, and FSM 1920 instructs the agency to develop guidance for the protection of surface water resources that are associated with groundwater sources. There are guidance documents dealing with groundwater available, namely the Technical Guide to Managing Groundwater Resources. The Technical Guide recognizes that the USFS is one of several agencies that are involved in managing oil and gas operations: "The Forest Service only has responsibility for surface activities and surface impact evaluation" (USDA FS 2007c, p 57). The recently released Gen. Tech Report WO-86a (Groundwater-Dependent Ecosystems: Level I Inventory Field Guide) and Gen. Tech Report WO-86b (Groundwater-Dependent Ecosystems: Level II Inventory Field Guide) provide guidance on the identification and inventorying of groundwater-dependent ecosystems. They do not provide any guidance related to the management of these ecosystems or the groundwater systems on which they depend. The USFS and the BLM signed an interagency agreement in 1984 that set forth policy and procedure for the administration of federal minerals (USDOI BLM and USDA FS 1984, p 1). This agreement was updated and clarified in 2006, with the signing of a Memorandum of Understanding (MOU, contained in Appendix E) which delineates each agency's responsibilities in relationship to oil and gas activities when federally-owned minerals are overlain by National Forest lands (USDOI BLM and USDA FS 2006, p 1). In addition to other responsibilities, the USFS is responsible for identifying and notifying the BLM of groundwater resources that may require protection (USDOI BLM and USDA FS 2006, p 12).

Potential Groundwater Contamination

Potential effects to groundwater from contamination due to horizontal drilling using HVHF techniques can be grouped into three main areas; inadequate cementing or defective casing of the well, accidental releases at the surface and upward migration of fluids from the hydraulic fracturing zone. Each is considered below.

Inadequate cementing or defective casing of the well

Contaminants can potentially leak from defective casing and inadequate cement seals and possibly migrate into underground sources of drinking water. This risk exists regardless of the scale of operation because all oil and natural gas wells, whether vertical or horizontal, are constructed in a manner that requires protection of the deepest underground sources of drinking water. Lengths of steel pipe, called

casing, are set in the wellbore and cemented into place. The steel casing and cement seal are designed to keep fluids and gases from contaminating underground sources of drinking water and from migrating out of the oil and gas producing zone. If the steel casing is defective, or the cement is not properly placed or is inadequate, this may allow fluids to leak from the well and potentially cause groundwater contamination. EIS Appendix G, page G-7 states:

“...steel pipe called casing will be periodically cemented into the hole along its length to seal the rock formations and their native fluids from the drilling (and later producing) environment. Federal regulations require casing to be installed in a manner that will protect fresh water zones and isolate other zones which contain oil, gas, and water. Casing is also used to seal off potentially valuable minerals, such as coal seams, and other underground features, such as caves, vugs, or large fractures.”

Appendix G to the EIS was used as the basis for analysis conducted to determine the effects of oil and gas activities on other resources. As stated above, federal regulations require casing to protect fresh water zones (USDOI BLM 1988). Cementing and casing of the well is regulated by the BLM through the Onshore Oil and Gas Order Number 2, and by DOGRM through the Ohio Revised Code and Ohio Administrative Code. When state regulations are more strict than federal regulations, the BLM defers to the state. In Ohio, the BLM defers to the DOGRM in many scenarios for the regulation of casing and cementing. Standards and guidelines related to casing and cementing were not developed for the Forest Plan, since “laws, regulations, and directives that apply to the entire National Forest System are not reiterated in standards or guideline” (Forest Plan, p 1-6). Furthermore, for the state of Ohio the exclusive authority for permitting oil and gas wells and production operations within the state (except those provisions delegated to the Environmental Protection Agency in federal law) is delegated to the DOGRM (ORC 1509.02). The EIS recognizes the authority the WNF has in decision making related to oil and gas operations: “The Forest Service is responsible for managing surface occupancy and use by those conducting mineral activities” (EIS, p 3-246). In short, the situation is such that the WNF has no decision making authority dealing with casing and cementing of wells. In accordance with the interagency MOU between the Forest Service and BLM, if a specific proposal to develop a well were made, Forest Service groundwater specialists would review each proposed drilling and hydraulic fracturing site within the context of local hydrogeology and groundwater-dependent receptors and provide site specific recommendations to the BLM and DOGRM for mitigation or monitoring. Those agencies have the ultimate authority to implement the recommendations.

The Forest Scale Roads Analysis completed in 2002 for the Forest Plan revision considered effects to water resources due to oil and gas activities and disclosed “the potential direct effects to ground water include transfer of drilling fluids and saline production water to fresh water aquifers if wells are not properly constructed” (Forest Scale Roads Analysis, p 22).

At the federal level, the BLM is responsible for overseeing and ensuring the drilling activities and well construction are completed in such a manner as to be protective of groundwater. According to the USFS/BLM MOU (USDOI BLM and USDA FS 2006, p 12), the BLM is primarily responsible for providing expertise in groundwater protection related to oil and gas operations. Onshore Oil and Gas Order Number 2 contains the implementing regulations administered by the BLM for federal leases and directs the BLM to conduct the casing and cementing program “to protect and/or isolate all usable water zones, abnormally pressured zones, and any prospectively valuable deposits of minerals” (USDOI BLM 1988, Section III.B). As stated above, when state regulations meet or are more strict than federal, the BLM defers to the state agency responsible for oversight, in this case the DOGRM.

The DOGRM administers oil and gas regulations in relationship to casing and cementing wells as follows.

Amended Substitute Senate Bill 315 passed both houses of the Ohio legislature in May of 2012 and was signed into law on June 11. This bill amended Ohio Revised Code to provide for the mandatory sampling of all water wells located within 1500 feet of a proposed horizontal well prior to a permit being issued (ORC 1509.06(A)(8)(c)).

The application for a state permit must include information regarding the casing plan, including the type of casing proposed, cement volumes proposed and whether stimulation of the well is proposed (OAC 1501.9-1-02(A)(6)). The casing and cementing program are the most critical part of developing a well. The DOGRM reviews the casing program, and if deficiencies are found, orders changes be made (Glascock 2012). The well owner must notify the DOGRM inspector in advance of cementing the surface casing, conductor casing, production casing and hydraulic fracturing of the well. The owner must also submit a well completion record detailing the cementing of casing strings, all of the logs that were used on the well, and the information regarding the hydraulic fracturing job (ORC 1509.17(C)). Well cementing records are normally submitted by the oil and gas operators to DOGRM. If there is reason to believe an inadequate cement job has occurred, DOGRM will require the oil and gas operator to run a cement bond log to further evaluate the cement job and its integrity. If there is a problem with the cement, DOGRM will require the oil and gas operator to perform corrective action to the well, which may include remedial cementing. First generation cement bond logs measure the travel time of sound waves through the casing and cement to the formation, and the cement bond log shows the quality of bonding between the casing and the cement. Second generation cement bond logging tools use a padded device that generates a 360 degree map of the cement sheath around the casing and are now the preferred tool for cement bond logging operations (Tomastik 2012a). DOGRM and BLM inspectors are required to be notified by the operator in advance and are on site during the cementing and casing process for the majority of oil and gas wells (Tomastik 2012e and Storzer 2012b). Additional inspectors are being hired in anticipation of the heavier workload (USDA FS 2012e). Operators are not allowed to proceed with the well drilling or stimulation until the cement passes inspection tests (Glascock 2012). Pressure testing is required for casing strings longer than 200 feet (OAC 1501.9-1-08(D)(3)).

Well construction and cementing must be done according to what is required on the drilling permit. Casing must be put in place to support unconsolidated sediment, to isolate and protect all underground sources of drinking water (as defined in the Safe Drinking Water Act) up to 10,000 mg/L total dissolved solids, and to provide a base for a blowout preventer or other well control technologies in order to control pressure and fluids during the drilling process. Operators must use steel production casing with sufficient cement in order to isolate the geologic formation producing the oil and gas during well stimulation and the operational life of the well. Other formations that contain gas and have the potential to cause over-pressurization must also be encased and cemented in order to seal the well off and prevent migration into the well bore (ORC 1509.17(A)).

New well construction and cementing rules were recently finalized by the state. These rules specifically address drilling, casing, cementing, notification and record-keeping standards/requirements for oil and gas wells in Ohio. These rules are indexed at Ohio Administrative Code 1501.9-1-08 and became effective August 1, 2012 (Tugend 2012b). These rules adopt standards from the American Petroleum Institute and ASTM (formerly known as the American Society for Testing and Materials) in many cases, which are considered the gold star for industry practices.

When underground mine voids are encountered during the drilling of an oil and gas well, a mine string is required. The mine string is a string of casing that isolates the mine from the drilling activity. A larger diameter wellbore is drilled from the surface through the underground mine void and casing is set and is cemented in place (Tomastik 2012b). It is cemented both above and below the void (ORC 1509.18), in order to prevent formation water from moving into the void. Drilling continues to 50 feet below the lowermost underground source of drinking water and then casing is set at this point (surface casing) back to the surface and cement is pumped down inside the surface and casing and circulated around the backside of the casing into the annular space between the two strings of casing. The mine string seals water out of the mine void and prohibits any water in the mine (such as acid mine drainage) from moving into the wellbore. With properly constructed mine and surface casing strings, it is highly unlikely that acid mine drainage would corrode through the multiple layers of steel casing and cement and lead to a release of fluids from the well (Tomastik 2012b).

Well construction or the placement of defective casing that causes the leaking of fluids or gases, causing damage to other permeable rock, underground sources of drinking water or the land surface or threatens public health and safety or the environment is prohibited. In the case where there is a defect in casing or well construction, the owner must immediately notify DOGRM and must immediately take action to correct the situation – plugging the well when other measures will not effectively remedy the situation (ORC 1509.12(A)).

A well owner or operator must notify an inspector at least 24 hours prior to well stimulation (ORC 1509.19). Well owners and operators are required to file reports detailing the types and volumes of fluids that were used to stimulate the well (when applicable), the method used for containing the fluids that returned to the surface and the name of the person/company that performed the stimulation. In addition to this information, the owner and/or operator must include a copy of the log from the well stimulation and graphs showing the pumping pressure and rate that were achieved during the stimulation (ORC 1509.12(A)(9)). If damage to the casing or cement occurs during well stimulation and allows circulation of fluids from the annulus of the surface production casing, the well owner must immediately terminate stimulation and notify DOGRM. If the casing and cement can be repaired in a way that isolates oil and gas zones, completion of the well may be allowed. If the well cannot be repaired, it must be plugged and abandoned (ORC 1509.19). In order to evaluate the effectiveness of the remedial cementing, DOGRM may require cement evaluation logs, temperature surveys, pressure tests or a combination of all be submitted for review (ORC 1509.19).

The owner holding a permit and the operator of a well are liable for a violation of Ohio law, rule or regulation or terms and conditions of a permit (ORC 1509.22(E)). When surface or ground water that are supplies for domestic, agricultural, industrial or other legitimate use have been “substantially disrupted by contamination, diminution or interruption” because of an oil and gas operation, a well owner is responsible to replace that water supply or compensate that water user for the difference in value before and after the damage occurred (ORC 1509.22(F)).

Conclusion

The existing framework is such that the Forest Service has no authority to make decisions on the cementing and casing of a well. As per the MOU between the Forest Service and the BLM, the WNF will provide site specific recommendations concerning local hydrogeology and groundwater-dependent receptors to the BLM and DOGRM for mitigation or monitoring.

No additional analysis or protections are needed at the Forest Plan level at this time since Ohio has updated regulations in order to keep pace with technology. Because of these regulatory updates, the effects on WNF water resources are not anticipated to change.

Accidental releases at the surface

Surface spills or subsurface releases of contaminants can result from the following surface activities associated with hydraulic fracturing at a level of risk that will scale with the increase in the incidence of the activity or the volume of fluids involved.

- Spills or leaks of drilling muds and associated chemicals contained in on-site storage tanks, trucks, or surface pits.
- Spills of chemicals, fluids and wastes being transported to and from the drill site for use in drilling, hydraulic fracturing, or some other well site activity.

Discussion on effects to water resources from accidental releases at the surface is found in the surface water contamination section.

Upward migration of fluids from hydraulic fracturing zone

The migration of fluids from the hydraulically fractured zone upward into zones containing potential drinking water sources is considered to be low-risk because of the presence of a thick sequence of low permeability layers between the fractured zone and potable groundwater zones. Contamination of groundwater has never been definitively linked to migration from the hydraulically fractured zone outside the borehole at any of the tens of thousands of sites in Ohio that have undergone either low or high volume hydraulic fracturing. It has been suggested that hydraulic fracturing could force hydraulic fracturing fluids or subsurface formation waters into permeable fault or fracture zones that connect the fractured zone with overlying underground sources of drinking water. However, no instance of this has been identified in Ohio. The potential for such pathways to exist allowing migration of fluids over the several thousand feet separating the Utica shale and the underground sources of drinking water is low, given that fault and fracture zones are frequently sealed by pressure and/or mineralized infilling materials; particularly with depth. Another risk arises from the hydraulically fractured zone intercepting an improperly abandoned oil or gas well. Orphan oil and gas wells that were drilled to or through the Marcellus or Utica could act as a conduit for the upward migration of hydraulic fracturing fluids if they are located within the fracturing zone of the proposed horizontal well. These types of wells are rare and are addressed by DOGRM during the permit application review process of a new Marcellus or Utica Shale application. If a new application is in close proximity to an improperly plugged and abandoned or an improperly sealed production well that penetrates into or through the Marcellus or Utica proposed producing zone, then the operator of the new application will either need to propose a new location or re-open and replug the older oil and gas well. This prevents the potential for cross-communication during the hydraulic fracturing operations (Tomastik 2012a).

The BLM further spoke to the low risk by indicating that a significant amount of head pressure would be needed in order to push hydraulic fracturing fluids from thousands of feet underground to areas of potential drinking water. The hydrostatic pressure needed to move fluids up a hole is immense (Bodus 2012c)

Conclusion

While the Forest Plan does not address the upward movement of fluids, existing information indicates that the potential for upward movement is remote. As noted above, there are no documented instances of contamination due to migration in Ohio. Meaningful analysis would require knowledge of geologic conditions at the locality of a proposed lease or well (see Appendix F for more information on this topic).

Groundwater Depletion

HVHF operations require anywhere from 3.5 – 4 million gallons of water per well, whereas conventional hydraulic fracturing operations use approximately 44,000-85,000 gallons of water (Appendix C). Generally, it is expected that operators will obtain water from the nearest available surface water or groundwater source that can provide the volumes needed. Groundwater production within the WNF outside the major rivers tends to be highly limited (2 to 3 gallons per minute) and is not always sufficient for domestic purposes. These production rates would not be reasonable for obtaining the 3.5 - 4 million gallons of water required for the typical hydraulically fractured well. On the WNF, within larger river corridors groundwater production may be sufficient for HVHF needs.

The Forest Scale Roads Analysis conducted in 2002 for the Forest Plan revision considered effects to water from oil and gas activities: “The potential indirect effects to ground water include water consumption for road watering and drilling fluids during the early development of a field could have a short term adverse effect on local groundwater levels” (Forest Scale Roads Analysis, p 22). Because of the low production rates of groundwater, it is not likely that a proposal would ever be made to utilize groundwater from the WNF for HVHF. Nevertheless, a Forest-wide guideline directs the WNF to control the withdrawal of water:

GFW-WSH-1: Water should not be diverted from streams, lakes, or springs when in-stream flow needs or water-level assessments indicate that diversion would adversely affect stream processes, aquatic and riparian habitats and communities, or recreation and aesthetic values.

There is no agency (federal or state) that regulates water withdrawals from streams and rivers in the State of Ohio. ORC section 1521.16 requires that the owner/operator of any facility that is capable of withdrawing 100,000 gallons/day or more must register with ODNR’s Division of Soil and Water Resources. Amended Substitute Senate Bill 315 was signed into law by the Governor on June 11, 2012. This bill amends Ohio Revised Code to provide for the disclosure on a permit application of the sources of ground and surface water to be used in the development of the well. Applicants must disclose if the water is from the Lake Erie or Ohio River watershed and must provide the estimated rate and volume of withdrawal (Amended ORC 1509.06(A)(8)(a)).

Ohio is a state governed by the reasonable use doctrine (ORC 1521.17), which allows a landowner the “reasonable use” of water resources contained on/in his/her land. Conversations with ODNR staff revealed that the “reasonable use” of water is not extended to owners of minerals. This means that the mineral owner or lessee must come to an agreement with a landowner in order to use water contained within or passing through that property (Glascock 2012). When surface or ground water that are supplies for domestic, agricultural, industrial or other legitimate use have been “substantially disrupted by contamination, diminution or interruption” because of an oil and gas operation, a well owner is responsible to replace that water supply or compensate that water user for the difference in value

before and after the damage occurred (ORC 1509.22(F)). Often times conflict between users are resolved in civil court.

Conclusion

Because of the reasonable use water law in Ohio, the WNF would need to agree to any groundwater pumping associated with oil and gas activities, if the pumping were proposed on National Forest lands. Forest-wide guideline, GFW-WSH-1 (listed above), will be used to limit the pumping of groundwater when the loss of the water could have effects on other resources. This is an appropriate usage of the guideline since adequate levels of groundwater are necessary in order to maintain sufficient surface flow for stream processes, aquatic and riparian habitats and communities and recreation and aesthetic values. Furthermore, it is unlikely that groundwater from the WNF would supply HVHF operations, since supply is limited on much of the National Forest.

No additional analysis or protections are needed at the Forest Plan level. While the 3.5 – 4 million gallons required for horizontal operations represent a change from the conventional well operations, the level of effect is not anticipated to increase. By using the existing measures in the Forest Plan, supported by Ohio reasonable use doctrine, there is no increased effect to groundwater due to depletion, since at the site specific level the WNF will be able to control withdrawals and limit them to periods when water is plentiful.

Effects to Surface Water

Surface Water Contamination

Potential effects to surface water from contamination due to horizontal drilling using HVHF techniques can be grouped into three main areas; accidental releases, disposal of wastes and erosion and sedimentation. Each is considered below.

Accidental Releases

Accidental releases could occur on or near the pad from a loss of control during the drilling process such as blowouts, spills on the drilling pad of fluids used during the drilling process and leaks from tanks containing hydraulic fracturing fluids. Accidental releases can also occur when chemicals and fluids are in transport to and from the well pad site. Accidental releases are a possibility for oil and gas operations regardless of techniques and scale of operation. As stated previously, risk increases as the scale of operations increases due primarily to the higher volumes of fluids associated with high volume fracturing of the Marcellus and Utica shale formations for the extraction of oil and gas. Risks of potential surface contamination at these unconventional shale play drilling sites are nevertheless low due to the secondary containment barriers that are in place on these drilling pad locations.

For water resources, the Forest Plan EIS considered oil and gas activities together with mining activities (EIS, p 3-17). The Forest Plan EIS disclosed the potential for the spillage or seepage of toxic materials associated with mining facilities or disposal areas (EIS, p 3-18). The Forest Scale Roads Analysis conducted in 2002 for the Forest Plan revision considered potential effects to water from oil and gas activities: “The potential direct effects to surface water include introduction of pollutants via spills and releases to surface water from oil/produced water treatment, storage tanks and handling facilities, sanitary facilities, and oil/produced water transportation facilities (trucks, pipelines)” (Forest Scale Roads Analysis, p 22).

Forest-wide standards were developed to require the timely reporting of spills to the responsible authorities and to notify operators that remediation of areas damaged by spills is their responsibility (SFW-MIN-3, SFW-MIN-4 and SFW-MIN-5, listed earlier in this review).

Forest-wide standards and guidelines were also developed to protect water bodies by establishing the following filterstrips guidance.

- **GFW-ARR-5:** Where earth-disturbing activities expose mineral soil, establish filterstrips along waterbodies.
 - Filterstrip width along perennial water bodies should be a minimum of 100 feet, measured horizontally from the edge of the aquatic ecosystem.
 - Filterstrip width along intermittent water bodies should be a minimum of 75 feet, measured horizontally from the edge of the aquatic ecosystem.
 - Filterstrip width along ephemeral water bodies should be a minimum of 50 feet, measured horizontally from the edge of the aquatic ecosystem.
- **GFW-ARR-6:** Earth-disturbing activities that expose mineral soil may occur within the filterstrip only if effective sediment control measures that minimize and/or mitigate any detrimental effects are employed.

These filterstrips provide a second line of defense in the case of an accidental spill by providing a buffer between the area a spill could occur in, and surface water courses that could be contaminated. The standards refer to “water bodies.” Water bodies are streams, ponds, lakes, wetlands and waterholes as well. These are minimum distances that could be increased on a site by site basis if appropriate based on the specific site conditions.

The following Forest-wide guidelines provide protection to water resources by limiting the activities that can occur near sensitive areas.

Wetlands

GFW-ARR-23: Avoid adverse impacts to ephemeral wetlands during ground-disturbing activities.

Springs

GFW-ARR-29: Prohibit vegetation management or ground disturbing activities within 100 feet of perennial springs, unless the activity is designed to protect water quality of the spring or integrity of the surrounding area.

Riparian Corridors

GFW-ARR-4: Where possible, do not construct new facilities (such as roads, trails, campsites, and buildings) within riparian areas. Where such facilities must be located in riparian areas, construct and maintain them to minimize adverse impacts to ecological function.

Notifications 2 and 4 and Stipulations 15 and 16 (stated earlier in this review and in Appendix A) provide further protection to the water resources by limiting activities in close proximity to surface water bodies. In particular, Notification 2 and Stipulations 15 and 16 give the WNF the authority to restrict oil and gas activities and prohibit surface occupancy on parcels within or near wellhead protection areas

and areas of high-yielding aquifer (see maps, Appendix D). Areas of high-yielding aquifer are those recognized by the Ohio Department of Natural Resources to produce 25 gallons or more per minute.

The larger volume of hydraulic fracturing fluids and resultant flowback water are of concern because the scale of accidental release that could occur is larger than what might occur due to conventional oil and gas activities. Handling of these fluids was described in the RFDS (EIS Appendix G, pp G-7 & G-8) in the following way:

“Specialized trucks pump water or nitrogen mixed with sand or a mild acid into the well to fracture the producing formation to increase its flow rate. A large amount of the fluid volume that is pumped into the well is ‘flowed back’ into the tanks that were brought on site. Completing a well usually begins shortly after the hole is drilled, but may be delayed for several weeks pending availability of equipment. The truck mounted completion equipment is typically removed from the site in one to three days. The tanks may remain for a longer period until the well is ‘cleaned up’, that is, most of the injected fluid is recovered.”

This language describing a closed system appears in Appendix G to the EIS, which was used as the basis for the effects analysis conducted in the programmatic EIS and associated planning documents. The following standards allow the WNF to require the handling of hydraulic fracturing fluids and flowback in closed systems:

SFW-MIN-2: Require that all proposed surface-disturbing mineral activities have an approved operation and reclamation plan before the activity begins.

SFW-MIN-3: Require that operators conduct activities and maintain equipment to prevent the discharge of oil or brine onto the ground or into surface waters.

The storage of hydraulic fracturing fluids in a closed system would likely require the use of many tanks. The use of many tanks reduces the risk of catastrophic spills by limiting the quantity of fluid that might be released because it is highly unlikely there would be a failure in more than one tank, and because much smaller volumes of fluids are stored in tanks as compared to retention ponds. That is, if there were a breach in a tank holding fluids, even if the entire tank were emptied, the volume of fluid released would be far less than what might be released if all of the fluids were stored in a temporary pit or pond. This measure lessens the risk to be on par with what might occur at a conventional oil and gas well.

Additional discussion related to handling hydraulic fluids and flowback water in closed systems is found in the Wildlife Resource section.

Related to accidental releases during transportation of substances, the Forest Scale Roads Analysis considered how the roads system creates potential opportunities for pollutants, such as chemicals or oils, to cause impacts to waterways.

“Road-stream crossings provide the greatest potential for pollutants to enter stream systems. Roads that parallel streams also represent a potential route for contaminants to enter surface waters. Cross-drained ditches may transport spilled pollutants to standing or flowing water bodies. The Forest Road System is not generally used for transport of bulk materials of potential pollutants like petroleum products. The vehicles using the roads do carry sufficient fuel and oil to cause localized water quality problems should an accident occur but do not necessarily pose a significant threat to the Wayne’s waterways.” (Forest Scale Roads Analysis, p 21)

“Oil and Gas exploration and development activities are surface-disturbing in nature and require excavation and removal of surface vegetation and soils for drilling operations.” (Forest Scale Roads Analysis, p 21)

“The potential direct effects to surface water include:

- sediment loading of stream channels due to the earthwork associated with site construction;
- introduction of pollutants via spills and releases to surface water from:
 - oil/produced water treatment, storage tanks and handling facilities,
 - sanitary facilities; and
 - oil/produced water transportation facilities (trucks, pipelines).” (Forest Scale Roads Analysis, p 22)

“The potential direct effects to ground water include:

- transfer of drilling fluids and saline production water to fresh water aquifers if wells are not properly constructed;
- introduction of pollutants from spills and releases via exposed ground surfaces to subsurface aquifers from:
 - oil/produced water treatment, storage tanks and handling facilities,
 - sanitary facilities, and
 - oil/produced water transportation facilities (trucks, pipelines);” (Forest Scale Roads Analysis, p 22)

The Forest Scale Roads Analysis goes on to state that determinations of how and where roads may be “hydrologically connected” to waterways is best made through “project level and subwatershed (6th level watershed and smaller) scale analysis (Forest Scale Roads Analysis, p 23). Another pertinent issue discussed is how other beneficial uses of water may be affected by road derived pollutants (including chemicals and oils). “At the Forest-scale it is not feasible to determine expected water quality and quantity effectment from road features. This is more appropriately done at the project-level or subwatershed-scale (6th level watershed or smaller)” (Forest Scale Roads Analysis, p 23). SFW-MIN-3, SFW-MIN-4 and SFW-MIN-5 (listed earlier in this report) are broad enough to include any accidental release that may occur during transport. More information related to roads can be found in the Infrastructure/Transportation section of this report.

The BLM requires blow-out preventers on all Federal wells. Rarely, exceptions are made to this requirement (Storzer 2012b). Rigs that drill horizontal wells do have blow-out preventing equipment (Bodus 2012b). BLM inspectors are present for the casing/cementing and for the blow-out preventing equipment pressure testing. The BLM tests all of the equipment to the pressure approved in the APD. The BLM inspector is also present for anything the operator’s petroleum engineer identifies as a high priority in the APD. The BLM inspector is not normally present for stimulation operations unless it is identified as a priority by the petroleum engineer (Storzer 2012b).

Within “urbanized areas” (see definition, Appendix H) or when operations take place within 200 feet of an inhabited dwelling, state regulations require blowout preventers when drilling with rotary tools (rotary tools would be used in any horizontal drilling)(OAC 1501:9-9-03(D) and (E)).

State law prohibits putting brine, crude oil, natural gas or other fluids associated with oil and gas operations in surface or groundwater or in or on the land in quantities that do or could cause water used for human or domestic animal consumption to exceed standards of the Safe Drinking Water Act; or do or could cause damage, or injury to public health and safety or the environment (ORC 1509.22(A)). This regulation does not differentiate between the purposeful or accidental placement of substances in water or the land and so is applicable to both scenarios.

The DOGRM has developed setbacks of 50 feet from rivers, lakes, water wells, streams, ponds and other bodies of water. Setback can be increased if the specific site warrants (ORC 1509.23(A) and Tomastik 2012e). Amended Substitute Senate Bill 315 was signed into law by the Governor on June 11, 2012. This bill amends Ohio Revised Code to provide for mandatory review of the application to determine any needed terms and conditions when the proposed well is within a one-hundred year floodplain or the 5-year time-of-travel associated with a public drinking water supply (Amended ORC 1509.06(H)(2)).

DOGRM has the additional authority to make rules related to equipment to prevent and contain releases of oil and brine consistent with the Federal Water Pollution Control Act Amendments of 1972 and surface and subsurface releases of fluids, condensates and gases (ORC 1509.23(A)(4)). The Ohio Administrative Code (OAC 1501:9-9-05(A)(8)) states: "all surface equipment must be pressure rated to withstand operating pressures to which it is subjected". Pits or steel tanks maybe used for the temporary storage of fluids associated with oil and gas activities (ORC 1509.22(C)(3)). Any pits used for the storage of fluids or solids must be lined (Tomastik 2012e) and usually the entire pad area is lined as well (Glascock 2012). Pits and tanks used for temporary storage must be maintained in order to prevent the accidental release of substances (ORC 1509.22(C)(3)). These storage devices are temporary in nature and must be appropriately emptied and restored within 2 months of the end of drilling (this timeframe is 14 days if the well is within an urbanized area)(ORC 1509.072). Dikes or pits are allowed for the secondary containment of any potential spills. When used for this purpose dikes and pits must be constructed and maintained to prevent the escape of fluids and must be kept reasonably free of waste substances (ORC 1509.22(C)(4)).

An electronic database is maintained by the DOGRM and contains information needed in the case of an emergency situation that poses a threat to public health, safety or the environment. Minimum information required is that which is also required for the Emergency Planning and Community Right-To-Know Act regulations (ORC 1509.23(B)). Amended Substitute Senate Bill 315 was signed into law by the Governor on June 11, 2012. This bill amends Ohio Revised Code to require the owner of a well to provide emergency responders with the exact chemical composition of all fluids used in the drilling and stimulating of a well. Exact composition of each proprietary component will be made available upon request from emergency responders (Amended ORC 1509.10(H)).

The owner and the operator of the well are liable for any violation of Ohio's laws, rules or regulations or the terms and conditions of the permit (ORC 1509.22(E)). When surface or ground water that are supply for domestic, agricultural, industrial or other legitimate use have been "substantially disrupted by contamination, diminution or interruption" because of an oil and gas operation, a well owner is responsible to replace that water supply or compensate that water user for the difference in value before and after the damage occurred (ORC 1509.22(F)).

With respect to a spill plan, the State of Ohio Operator's Guide states that, "if an operator plans on storing oil products at the drill site, they could be subject to the Spill Prevention Control and Countermeasure (SPCC) regulations under 40 CFR Part 112 if they have the capacity to store 1320

gallons or more". SPCC requirements are federal regulations, administered by U.S. EPA. Ohio EPA does provide limited support to the SPCC program, but there are no state regulations administered specifically by Ohio EPA for the SPCC program. The Operator's Guide provides more details regarding this issue and offers websites for detailed information.

The above regulations are designed to prevent and contain any accidental spills from both infiltration and/or runoff onto the surface. If there is a spill, once contained, the OEPA must be notified and is responsible to direct the cleanup (for further information: See Reporting Requirements in the Operator's Guide).

Information related to Ohio's regulations for transportation of oilfield wastes can be found in Disposal of Wastes section that directly follows.

Conclusion

No additional analysis or protection is needed at the Forest Plan level. The EIS analyzed the risk of effects to water resources and disclosed that spills may occur. This analysis is equally relevant to conventional and HVHF wells. The analysis was in part based on State of Ohio regulations for oil and gas activities and water quality. State of Ohio regulations have kept pace with the advances in technology and methods of extracting oil and gas resources. Measures already existing in the Forest Plan limit surface occupancy in sensitive areas and require the handling of fluids in a manner that minimizes the potential occurrence and size of a spill back to what might occur at a conventional oil and gas operation. Therefore, the level of effect is not anticipated to increase.

The Forest Scale Roads Analysis determined that effects to water resources due to road derived pollutants were best identified at the project level. This remains the best approach.

Disposal of Wastes

Contamination of surface water could occur from the improper disposal of solids such as drilling muds and the improper disposal of fluids, mainly brine water.

Solids

Solid wastes produced in oil and gas operations are drilling muds and well cuttings. Drilling muds are the materials used by the operator to lubricate and cool the drill bit during the drilling process. In conventional operations the muds may be largely made up of clays. In horizontal operations a portion of the muds are synthetic materials. Well cuttings are the pieces of underground rock that are pulverized by the drill bit and then moved up the wellbore to the surface. The disposal of these solids is regulated by the DOGRM. Drilling muds and well cuttings are not considered hazardous waste.

For water resources, the Forest Plan EIS considered oil and gas activities together with mining activities (EIS, p 3-17). The Forest Plan EIS disclosed the potential for the spillage or seepage of toxic materials associated with mining facilities or disposal areas (EIS, p 3-18).

A Forest-wide standard, SFW-MIN-2, requires that an approved surface operation and reclamation plan be in place prior to earth disturbing activities. This standard will be used to restrict the burial of drilling wastes from horizontal drilling operations.

The disposal of solids must be consistent with the Ohio Revised Code Chapter 1509, which states that the disposal of solids cannot violate any rule of the Division (ORC 1509.22(C)(2)). On site burial of solids has long been the preferred method of disposal on conventional wells. In this method fluids are siphoned off the top of the pit and the muds and cuttings are solidified. The top edges of the pit liner are folded over the now-solid materials and the pit is filled in with dirt. This is still the preferred method on conventional vertical wells (Tugend 2012a). DOGRM staff have indicated that for horizontal wells, this type of disposal is not permitted, due to the use of synthetic drilling muds in horizontal wells and the total volume of material involved in horizontal wells (Tugend 2012a). Instead the drilling muds are normally separated out and reused in subsequent wells and the cuttings are trucked off-site where they may be used beneficially (state termed) as daily cover at a landfill (USDA FS 2012e).

Fluids

There is public concern regarding the disposal of fluids used or created in oil and gas operations. The fluids to be disposed of include hydraulic fracturing fluids, produced water and flowback water. Produced water is the saline water that naturally occurs in underground sediment and rock and is a by-product of oil and gas operations. When an oil and gas well is drilled on fluid those fluids are circulated back to the surface. Often times this drilling fluid will pick up formation brines from different geologic formations that are highly saline and can contain dissolved minerals and some level of naturally-occurring radioactive materials. Flowback fluid is the water that returns to the surface after a well has been hydraulically fractured. This water is a mixture of hydraulic fracturing fluids and produced water.

The RFDS described handling of waste water from oil and gas operations:

“Water produced along with the oil and gas is generally salty and sometimes sulphurous. Federal and State regulations require this saltwater, or brine, to be properly disposed of. The most common method of disposal in Ohio is for the brine to be trucked to a State-licensed disposal well where it is injected into underground formations already containing brine. A less common disposal method allowed in certain townships is road spreading of brine for the purpose of dust and ice control. Producing wells in the WNF typically produce only small amounts of brine.” (EIS Appendix G, p G-8)

For water resources, the Forest Plan EIS considered oil and gas activities together with mining activities (EIS, p 3-17). The Forest Plan EIS disclosed the potential for the spillage or seepage of toxic materials associated with mining facilities or disposal areas (EIS, p 3-18).

The following Forest-wide standard can be used as described below.

SFW-SAFE-19: Prohibit disposal of non-Federal wastewater on Federal lands.

While Ohio state regulations allow for the disposal of brine through road application (see discussion regarding state regulation that follows), wastewater associated with oil and gas operations is considered non-federal so disposal by road application would not be allowed on roads under the jurisdiction of Wayne National Forest. This standard can also be used to prohibit the siting of injection wells on the WNF.

The disposal of fluids used or created in the drilling, stimulation and production of oil and gas is regulated by DOGRM. All oilfield fluid wastes in Ohio must be tracked cradle to grave and any person hauling oilfield waste fluids must be registered, bonded and insured with DOGRM (Tomastik 2012a).

The law specifically states that no one is allowed to place fluids associated with oil and gas operations in surface or groundwater or in or on the land in amounts that cause or could cause pollution of water used for human consumption (or consumption by domestic animals) or damage/injury to public health and safety or the environment (ORC 1509.22).

The Ohio Revised Code includes flowback water and produced water into the generic term “brine”. Brine water is only permitted to be disposed of via the following methods:

- Deep well injection at a Class II Injection Well,
- Enhanced recovery,
- Spreading on roads for dust and/or ice control, or
- Other methods in order to test new technologies (ORC 1509.22(C)(1)).

The overwhelming majority of brine is injected into Class II injection wells. Smaller proportions of brine are disposed of through enhanced recovery operations, whereby the fluid is injected into a permitted Class II enhanced recovery injection well under pressure in order to move oil and gas towards other production wells; spreading on roads for the control of ice and dust; or other methods as approved by the DOGRM for the testing of new technologies (ORC 1509.22(C)(1)). “Other methods” include those efforts being made by industry to recondition and reuse fluids in subsequent fracturing jobs (Glascock 2012, and Tomastik 2012e).

Brine may not be disposed of through municipal sewage treatment plants (Nally 2011), through direct discharge to waterways (Nally 2011), through injection into the ground via infiltration from a pit (ORC 1509.22(C)(7)), or through the evaporation of fluids from a pit (ORC 1509.22(C)(7)).

Before brine can be spread on roads, streets, highways and other such surfaces for dust and ice control, the governing agency body with jurisdiction over the roadway must vote to approve a resolution for the application. At least one public meeting must precede the vote. For county roads this would be the County Commissioners (ORC 1509.226(A)). For roads, streets, highways and other such surfaces that are under the jurisdiction of a division of the state or an agency of the Federal Government, no resolution is needed (ORC 1509.226(B)). When road application is approved by either a governing body or a division of the state or federal agency, guidelines must be submitted and must conform to the following:

- “Brine shall not be applied:
 - (a) To a water-saturated surface;
 - (b) Directly to vegetation near or adjacent to surfaces being treated;
 - (c) Within twelve feet of structures crossing bodies of water or crossing drainage ditches;
 - (d) Between sundown and sunrise, except for ice control” (ORC 1509.226(B)(1)).
- “Only brine that is produced from a well shall be allowed to be spread on a road. Fluids from the drilling of a well, flowback from the stimulation of a well, and other fluids used to treat a well shall not be spread on a road” (ORC 1509.226(B)(10)).

This last bullet point means that only the brine that naturally occurs underground and is produced in conjunction with oil and gas is allowed to be spread on roadways for dust and ice control. The transport of brine typically requires the business doing the hauling be registered with the DOGRM; however,

township, county or state vehicles that are spreading brine in accordance with the methodology just described are not required to be registered (ORC 1509.222(A)(1)).

Ohio Revised Code outlines a number of requirements for companies that haul brine including:

- Requirements for payment of surety bonds prior to a registration certificate being issued to a business that transports brine (ORC 1509.225(A));
- Requirements that businesses that transport brine obtain registration from the DOGRM (ORC 1509.222(A)(1));
- Requirements that annual reports from such businesses are submitted to DOGRM and disclose quantities moved, sources and delivery points (ORC 1509.223(B)); and,
- Requirements for keeping a daily log on each vehicle involved in transporting brine, which includes information such as the name and location of the well where the brine originated, the amount of brine loaded at each collection point, the disposal location and the amount of brine disposed of at each location, and making it available upon request (ORC 1509.223(C)).

The Chief of the DOGRM may suspend or revoke a transporter's registration if a pattern of violations can be shown, and the violations are caused by the transporter's careless or willful actions (ORC 1509.224(A)).

The owner of a well holding a permit and the operator are liable for a violation of Ohio law, rule or regulation or terms and conditions of a permit (ORC 1509.22(E)). When surface or ground water that are supply for domestic, agricultural, industrial or other legitimate use have been "substantially disrupted by contamination, diminution or interruption" because of an oil and gas operation, a well owner is responsible to replace that water supply or compensate that water user for the difference in value before and after the damage occurred (ORC 1509.22(F)).

More information regarding the disposal of wastes can be found in the Operator's Guide under the sections *Managing Drill Cuttings*, *Spill Containment*, *Control and Release Reporting Requirements*, and *Spill/Release Reporting*.

Conclusion

No additional analysis or protection measures at the Forest Plan level are needed. The EIS considered handling of wastes and disclosed that spillage or seepage could occur and that this would threaten water resources. As stated in the RFDS, volumes of brine to be disposed of were anticipated to be small. At sites using HVHF there may be more fluid to be disposed of than what would be present for a conventional well. State of Ohio regulations have kept pace with the advances in technology and methods of extracting oil and gas resources. Measures already existing in the Forest Plan prevent brine application to roadways and the locating of injection wells on the WNF. These measures are in place and mitigate effects, regardless of the volume of fluids involved. Therefore, the level of effect is not anticipated to increase.

Erosion and Sedimentation

The Forest Plan EIS discloses that oil and gas development can cause effects to water resources related to erosion and sedimentation (EIS, p 3-18), and that the related activity of road building increases sedimentation and concentrates runoff (EIS, p 3-17). The EIS, page 3-20, states:

“Surface mining and oil and gas well development are management activities that could occur, but are dependent on proposals by private minerals owners or Federal minerals lease holders. In order to accomplish short-term and long-term land management activities, soil erosion and sediment transport may be an unavoidable consequence. However, Forest-wide standards and guidelines integrated into all alternatives minimize effects to soil stability and downslope and downstream areas. These Forest-wide standards and guidelines not only reduce the threat of short-term impacts, but minimize the likelihood for long-term adverse effects to soil and water resources.”

The Forest Scale Roads Analysis conducted in 2002 for the Forest Plan revision considered effects to water due to oil and gas activities: “The potential direct effects to surface water include sediment loading of stream channels due to the earthwork associated with site construction” (Forest Scale Roads Analysis, p 22).

The following standards and guidelines were developed to avoid and mitigate erosion and sedimentation effects to water resources from all activities that take place on the WNF. They are general in nature, but provide the operator with guidance that will be applicable to various activities associated with land disturbance during drilling operations.

GFW-ARR-6

Earth-disturbing activities that expose mineral soil may occur within the filterstrip only if effective sediment control measures that minimize and/or mitigate any detrimental effects are employed.

GFW-WSH-8: When stabilizing disturbed areas, give priority to stabilizing areas that are discharging soil into watercourses, especially in municipal and recreational impoundment watersheds. Techniques may include:

- Placing straw bales in ditch lines and small drainages
- Leaving berms in road embankments during construction
- Constructing diversion ditches
- Hand placing slash and unmerchantable logs across slopes and trails
- Installing check dams and ditch lines
- Excavating sediment detention basins.

Road Stream Crossings

SFW-ARR-7: Design mitigation measures (e.g., sizing culverts to match the drainage area) into crossings of perennial, intermittent or ephemeral streams to meet site-specific needs.

GFW-ARR-8: Design stream crossings to be at right angles.

GFW-ARR-9: Design and construct new permanent stream crossings (ephemeral, intermittent and perennial streams) to maintain upstream and downstream passage of aquatic and semi-aquatic organisms.

SFW-ARR-10: Do not allow roads, trails or log skidding within streambeds except at designated crossings.

SFW-ARR-11: If stream crossings are removed, restore banks and channel to a natural dimension and shape.

GFW-ARR-12: Improve existing crossings to ensure passage of aquatic organisms when maintenance and reconstruction activities are scheduled.

Oil/Gas Pipeline Stream Crossings

The following standards and guidelines provide additional protection to surface water resources by addressing the related activity of siting and installing pipelines. Contamination concerns addressed include those both related to sedimentation and accidental releases of oil and/or gas.

SFW-ARR-13: Pipelines of nine-inch diameter or larger that cross streams on NFS land must be reviewed by the Ohio Public Utilities Commission and the Federal Energy Regulatory Commission.

GWF-ARR-14: Avoid the use of heavy equipment in flowing streams. Alternatives may include concentric pipe (double pipe) and plowing.

GWF-ARR-15: Encourage the location of pipelines at existing bridges.

GWF-ARR-16: When a pipeline crosses a stream on NFS land, the following should apply:

- Encourage the use of boring to locate pipeline crossings beneath Forest streams where topography, soil, and stream bottom conditions permit.
- Stabilize disturbed soil and protect streamside banks as work progresses.

SFW-ARR-17: Require appropriate technology on all pipelines that cross streams so that supply and flow can be shut off upon detection of a leak.

Additional Forest Plan-level guidance is provided by Notification 2 (regarding floodplains), Notification 4 (regarding compliance with public laws and federal regulations), Stipulation 15 (regarding controlled surface use in riparian areas), GFW-ARR-5 (regarding the establishment of filterstrips along waterbodies), GFW-ARR-23 (regarding avoiding adverse impacts to wetlands), GFW-ARR-29 (regarding prohibiting vegetation management within 100 feet of springs) and GFW-ARR-4 (regarding avoiding the construction of new facilities in riparian areas). These notifications, stipulations and guidelines were fully outlined earlier in this report.

Ohio Revised Code (ORC 1509.23(A)(2)) directs DOGRM to determine setback distances for oil and gas operations from rivers, lakes, streams, ponds and other bodies of water. Setbacks from rivers, lakes, streams, water wells, ponds and other bodies of water is 50 feet (Tomastik 2012e).

Well sites shall be constructed in a manner that minimizes clearing size and surface impacts and shall comply with DOGRM's Best Management Practices for Oil and Gas Well Site Construction manual, which discusses methods to effectively reduce sedimentation and erosion (OAC 1501:9-1-02(D)(1)).

Restoration of the land surface disturbed by oil and gas activities is required (ORC 1509.072). Within 6 months of the beginning of drilling (3 months if the well is in an urbanized area) the site must be restored. Restoration means the land must be graded or terraced and planted in order to prevent substantial erosion and sedimentation (ORC 1509.072(A)). Upon written permission from the surface landowner and when permitted by the DOGRM, the restoration requirement may be waived.

Conclusion

No additional analysis or protection measures at the Forest Plan level are needed. The EIS considered oil and gas activities and disclosed that erosion and sedimentation of waterways could occur as a result. Measures already existing in the Forest Plan minimize impacts to waterways from erosion and sedimentation. Therefore, the level of effect is not anticipated to increase.

Surface Water Depletion

HVHF operations require anywhere from 3.5 – 4 million gallons of water per well, whereas conventional hydraulic fracturing operations use approximately 44,000-85,000 gallons of water (Appendix C). Generally, it is expected that operators will obtain water from the nearest available surface water or groundwater source that can provide the volumes needed. In most cases, volumes of water needed will not be available from streams flowing through NFS lands because most streams on the WNF are headwater streams (intermittent or ephemeral). Larger river corridors do contain quantities of water sufficient for HVHF operations.

The Forest Scale Roads Analysis conducted in 2002 for the Forest Plan revision considered effects to water from oil and gas activities: "The potential indirect effects to surface water include water consumption during the early development of a [oil] field could have a short-term adverse effect on local stream flow, and secondary effects on downstream water use due to changes in water quantity or quality" (Forest Scale Roads Analysis, p 22). The following guideline in the Forest Plan limits the approval of surface water withdrawals to periods when the withdrawal will not impact other uses of the water.

GFW-WSH-1: Water should not be diverted from streams, lakes, or springs when in-stream flow needs or water-level assessments indicate that diversion would adversely affect stream processes, aquatic and riparian habitats and communities, or recreation and aesthetic values.

Ohio's reasonable use doctrine in relationship to water rights was fully described in the Groundwater Depletion section.

Conclusion

Because of the reasonable use water law in Ohio, the WNF would need to agree to any surface water withdrawals associated with oil and gas activities, if the withdrawals were proposed on National Forest lands. It is unlikely that surface water from the WNF would supply HVHF operations, since supply is limited on much of the National Forest.

No additional analysis or protections are needed at the Forest Plan level. While the 3.5 – 4 million

gallons required for horizontal operations represent a change from the conventional well operations, the level of effect is not anticipated to increase. By using the existing measures in the Forest Plan, supported by Ohio reasonable use doctrine, there is no increased effect to surface water due to depletion, since at the site specific level the WNF will be able to control withdrawals and limit them to periods when water is plentiful. Additional discussion related to water depletion can be found in the Wildlife section.

WILDLIFE RESOURCE REVIEW

This review will make reference to various documents such as the Biological Assessment for federally threatened and endangered (TE) species (EIS Appendix F1), the Biological Opinion developed by US Fish and Wildlife Service for the Forest Plan (EIS Appendix F2), and the Biological Evaluation for Regional Forester sensitive species (RFSS) (EIS Appendix F3). Together, federally threatened and endangered species and Regional Forester sensitive species are termed TES. This review will cover various wildlife species with the focus primarily on TE wildlife species. The primary reason for this focus is that the Forest Plan goals and objectives and the associated standards and guidelines focus strongly on wildlife habitat and minimizing effects to TE species.

Forest Plan Information Related to Wildlife

For the Forest Plan and EIS, Oil and Gas Management (EIS Appendix G) was addressed and the RFDS for oil and gas was described. Cumulative totals of anticipated levels of various activities that affect wildlife species are detailed within Appendix D to the EIS, pages D-11 and D-12 (*See Forest Plan corrections for additional information regarding acres/miles for specific activities, since adjustments have been made, though adjustments have not been made for activities associated with oil/gas development*) and information regarding incidental take for TE species in Appendix F2, Biological Opinion, Page 78. Tables 5 and 6 display the cumulative total of acres analyzed and disclosed for activities that may occur during the life of the Forest Plan, including activities related to oil/gas development (compiled and summarized information, EIS Appendix G, pp G-5 and G-6). These acreages are figured into the cumulative effects analysis. Additional information and references related to anticipated levels of habitat modification for oil and gas well development is notated within Table 5. For oil and gas well development, total acres reflect clearing area, the well pad and a portion of road. Regarding Table 6, it needs to be recognized that oil and gas development in itself did not rise to the level of “take”. Take is defined in the Endangered Species Act as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct”.

Table 5. Management activities related to or possibly associated with oil/gas development. (EIS Appendix F2, p 21)

Activity	Acreage
Even-aged Hardwood Timber Harvest*	1,725 acres
Development of Permanent Forest Openings *	500 acres
Oil & Gas Well Development (Total Activity)**	272/121 acres*** (234 wells)

* Can be associated with oil/gas development depending on the location and restoration objectives for the specific site after development.

** This figure combines anticipated activities for both private activity and federal lease activity on the WNF. Biological Assessment, Page F1-13, Table 7 specifies: 234 Wells and 121 Acres (Acres after reclaimed: Remaining Pad/Road). Forest Plan Appendix B, Table B-5 specifies: 234 wells. EIS, Appendix G specifies: 234 wells and 272 acres (Total acres of disturbance before reclamation). EIS page 3-262, Table 3-69 specifies forest-wide values. Biological Opinion, Page 22, Table 2 specifies: Oil & Gas Well Development (federal leases) 80 wells (42acres) (acres displayed for after reclaimed).

***121 acres refers to the acres after restoration of the drilling pad, thus remaining pad and road needed during the production phase.

Table 6. Management activities causing habitat modification rising to the level of take over ten years possibly related to oil/gas development.*(Information compiled from EIS Table 2-4, p 2-20; Table 3-24, p 3-124; Table 3-35, p 3-152)

Activity	Measure
Permanent Road Construction & Reconstruction**	392 acres
Utility Development	50 acres

*These activities may or may not be necessary for oil and gas development depending on the site location. Note: a portion of road miles (converted to acres) was factored into Oil and Gas Development displayed within Table 4 (see Appendix G to the EIS for additional information).

**It should be noted that out of the total of 392 road acres analyzed in the Forest Plan EIS, only 45 miles or approximately 87 acres would be due to oil and gas activity. It is important to note this, as the Infrastructure/Transportation section of this report will instead focus on the 45 miles of road that could be attributed to oil and gas activities.

Forest Plan, Appendix H, Lease-Specific Oil and Gas Notifications/Stipulations provide various protections for TES species. Special Notification 1 specifies that “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.”

Activity Evaluation

This section provides information within various subject groupings related to hydraulic fracturing of oil and gas wells and describes how it was addressed within the Forest Plan or associated documents for the wildlife resource.

Reserve Pits

As specified by Mark Storzer, BLM Northeastern States Field Manager (Storzer 2012a), “The reserve pit is designed only for cuttings and associated drilling fluids and usually does not include fracking fluids. Under current operating procedures the fracking fluids are not stored in the reserve pit.” Note:

The usage of “usually” was further explained within the response by stating that hydraulic fracturing fluids might be pumped into the reserve pit if there were an undesirable event such as an emergency situation with the potential of loss of human life.

The following information related to reserve pits and drill cuttings is found in Appendix G to the EIS:

“A large ‘reserve’ pit is dug on the well pad. The cuttings are then dumped into the reserve pit. In a mud based system, pumps direct mud down the drill pipe, back up the hole, and out to the reserve pit where the rock fragments will settle. In a compressed air system, air compressors direct air down the pipe, thereby forcing the rock cuttings up the well bore and into the reserve pit.”

Also, the “Production Operations” section (Page G-9) specifies the following regarding workover drilling fluids: “Workovers take place on existing well pads and sometimes may require a small pit to contain any fluids circulated from the wellbore. After the workover is completed, any fluids remaining in the pit are vacuumed out and disposed of in accordance with State requirements. The pit is then backfilled and revegetated as appropriate.”

During a review of current literature, a US Fish and Wildlife Service report was considered. This report discusses reserve pit management (Ramirez 2009) and specifies the following:

“Earthen pits, also known as reserve pits, excavated adjacent to drilling rigs are commonly used for the disposal of drilling muds and well cuttings in natural gas or oil fields. The contents of reserve pits depend on the type of drilling mud used, the formation drilled, and other chemicals added to the mud circulation system during the drilling process. If the reserve pit contains oil or oil-based products (i.e., oil-based drilling fluids), the pit can entrap and kill migratory birds and other wildlife. During the drilling process, reserve pits probably do not attract aquatic migratory birds such as waterfowl due to human activity and noise. However, once the drilling rig and other equipment are removed from the well pad, the reserve pit is attractive to birds and other wildlife. Birds are attracted to reserve pits by mistaking them for bodies of water. Insects entrapped in reserve pit fluids also attract songbirds, bats, amphibians, and small mammals. The sticky nature of oil entraps birds in the pits and they die from exposure and exhaustion. Birds and other wildlife can also fall into oil-covered reserve pits when they approach the pit to drink.”

Ohio Revised Code 1509.072 (see below) specifies that reserve pits will be filled within two months (14 days in urbanized areas) after the date upon which the drilling of a well is completed, thus minimizing potential contact with wildlife species.

Ohio Revised Code 1509.072, Duty To Restore Disturbed Land Surface:

“No oil or gas well owner or agent of an oil or gas well owner shall fail to restore the land surface within the area disturbed in siting, drilling, completing, and producing the well as required in this section.

(A) Within fourteen days after the date upon which the drilling of a well is completed to total depth in an urbanized area and within two months after the date upon which the drilling of a well is completed in all other areas, the owner or the owner’s agent, in accordance with the restoration plan filed under division (A)(10) of section 1509.06 of the Revised Code, shall fill all the pits for containing brine and other waste substances resulting, obtained, or produced in connection with exploration or drilling for oil or gas that are not required by other state or federal law or regulation, and remove all drilling supplies and drilling equipment. Unless the chief of the division of oil and gas resources management approves a longer time period, within

three months after the date upon which the surface drilling of a well is commenced in an urbanized area and within six months after the date upon which the surface drilling of a well is commenced in all other areas, the owner or the owner's agent shall grade or terrace and plant, seed, or sod the area disturbed that is not required in production of the well where necessary to bind the soil and prevent substantial erosion and sedimentation. If the chief finds that a pit used for containing brine, other waste substances, or oil is in violation of section 1509.22 of the Revised Code or rules adopted or orders issued under it, the chief may require the pit to be emptied and closed before expiration of the fourteen-day or three-month restoration period."

Conclusion

No additional analysis or protections are needed at the Forest Plan level at this time. As specified above, the WNF planning documents discussed the use of reserve pits for drilling fluids and cuttings. Reserve pits can be a hazard to wildlife; however, as noted by US Fish and Wildlife Service, wildlife are likely not attracted to pits during the drilling process, due to human activity and noise. Once the well has been drilled to depth, pits must be reclaimed in a timely manner. Thus effects are not anticipated to increase.

Hydraulic Fracturing Fluids, Flowback and Fluid Retention Ponds

This paragraph summarizes the "Drilling Operations" (EIS Appendix G, pp G-7 and G-8) related to handling hydraulic fracturing fluids:

"Specialized trucks pump water or nitrogen mixed with sand or a mild acid into the well to fracture the producing formation to increase its flow rate. A large amount of the fluid volume that is pumped into the well is 'flowed back' into the tanks that were brought on site. Completing a well usually begins shortly after the hole is drilled, but may be delayed for several weeks pending availability of equipment. The truck mounted completion equipment is typically removed from the site in one to three days. The tanks may remain for a longer period until the well is 'cleaned up', that is, most of the injected fluid is recovered".

While the terminology of "hydraulic fracturing" was not specifically stated, this language describes the use and typical handling of those fluids. It is important to note that this description does not distinguish between conventional volumes of hydraulic fracturing fluids and high volume hydraulic fracturing.

Ponds for containing hydraulic fracturing fluids/flowback may attract waterfowl and other wildlife such as bats, songbirds and amphibians. If accessible to bats for drinking, the fluids/flowback would likely be toxic. Exclusion methods such as netting could cause entanglement and thus could be lethal (in the case of the Indiana bat this would mean take). Holding ponds also increase the potential for impacts to aquatic species (such as a dike failure in which fluids flow into streams or other water bodies). US Fish and Wildlife Service (Ramirez 2009) specified that "hydraulic fracturing fluids can contain chemicals that may be harmful to birds (e.g., surfactants, hydrochloric acid, caustic potash, and diesel fuel)."

Table 7 (EIS Appendix F2, Page 66, Table 5, Effects Analysis for the Indiana Bat) identifies the management elements and environmental impacts related to oil and gas development for the Indiana Bat. Exposure to significant quantities of environmental contaminants (i.e. hydraulic fracturing fluids and flowback fluids) was not identified. The use of tanks (a closed system) for handling hydraulic fracturing fluids and flowback was discussed as part of the RFDS within EIS, Appendix G, as described above.

Table 7. Effects Analysis for the Indiana Bat (oil and gas portion of the Table 5 from the Biological Opinion)

Management Elements			Environmental Impact	Indiana Bat Exposure	Indiana Bat Response	Population RND* Response
Mineral development	Oil/gas development (federal leases)	Temporary access roads	see transportation			
		Facilities construction and operation	noise/physical disturbance	all bats if in summer; none if winter	range from no response to temporary abandonment--> decrease foraging efficiency; slow pre- and post natal development-->increase energy costs	no response
			loss of trees	winter: no direct exposure	NA	
				winter: indirect exposure - all life stages	none because of S&G	
				summer harvest: all life stages	range from no response -->decrease foraging efficiency-->reduce young and adult survival	no response
			spread nonnative species	all life stages	no response	
		increase erosion; runoff	winter: none, summer: limited direct exposure to all life stages	no response due to S&G		

*RND stands for Reproduction Number or Distribution.

Notification 3 (Forest Plan Appendix H, p 3, reproduced here as Appendix A) provides protection of federally listed threatened and endangered, and Regional Forester sensitive species and their habitats with regards to oil and gas development, by requiring surveys prior to approving site plans. Notification 3 specifies that, based on the findings of the survey, there may be restrictions put in place on the operation or the plan may be denied.

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.

Because the RFDS described the handling of hydraulic fracturing fluids in a closed system (EIS Appendix G, pp G-7 and G-8), the exposure of TES wildlife species to those fluids was not anticipated or analyzed. If TES wildlife species or their habitats, including the Indiana bat and other bats and aquatic RFSS, were allowed to come into contact with hydraulic fracturing fluids there could be effects to those species that were not analyzed and disclosed in the programmatic EIS. The following Forest-wide standard instructs the WNF to require an approved operating plan.

SFW-MIN-2: Require that all proposed surface-disturbing mineral activities have an approved operation and reclamation plan before the activity begins.

Notification 3 and SFW-MIN-2 allow the WNF to require hydraulic fracturing fluids and flowback be contained in a closed system while on WNF lands, or be handled in some other way (as technology develops) that would prevent those fluids from potentially coming into contact with wildlife. Netting would not be allowed, since it could have a detrimental effect to bats.

Conclusion

No additional analysis or protections are needed at the Forest Plan level at this time. Hydraulic fracturing fluids were described in EIS Appendix G as being handled in a closed system. Existing measures in the Forest Plan provide for the appropriate protection of wildlife, by allowing the WNF to require that hydraulic fracturing fluids be handled in a closed system or some other manner that does not allow wildlife to come into contact with the fluids. Thus there are no anticipated effects to wildlife due to hydraulic fracturing fluids, flowback and fluid retention ponds.

Erosion, Sedimentation and Accidental Releases

Effects associated with erosion, sedimentation and accidental releases have been addressed at various locations for a host of species within the Forest Plan and Appendices. For example: Appendix F1 to the EIS (Biological Assessment), Page F1-59 (Indiana Bat) specifies “Runoff from production wells could contaminate nearby aquatic resources, which may be used by the Indiana bat for drinking or feeding. Brine spills could occur during oil and gas well development; however the operator is required to construct berms around the wells to contain any spills. The brine is required to be removed by tank truck.” Appendix F1, Page F1-120 and F1-130 (Fanshell Mussel and Pink Mucket Pearly Mussel) and Biological Evaluation F3-28 (Aquatic RFSS including clubtails {page F3-93} and the mud salamander {page F3-86}) specifies:

“Oil and gas activities have the potential to affect water quality as a result of soil disturbance and subsequent sedimentation. Effects are generally short-lived; revegetation of areas disturbed during the construction of the access road and well pad reduces the potential for soil erosion. Established Forest-wide standards and guidelines can mitigate the effects of oil and gas exploration and development (i.e., filterstrips, stream crossings, stabilizing disturbed areas, NSO on steep slopes). Controlled surface use is allowed in riparian areas and floodplains. In these cases, roads, well pads, tank batteries may be allowed in riparian areas or floodplains when placement of such facilities in adjacent upland areas would cause long-term effects to other resources (e.g., TES species, cultural site).”

“For reserved and outstanding rights (private minerals) oil and gas wells, operators must follow state regulations which include best management practices for protecting aquatic resources.”

“Brine or oil spills could occur during oil and gas well operations, although they are rare. The operator is required to construct berms around the wells to contain any oil leaks. The brine is required to be removed by tank truck. Forest-wide standards and guidelines require the installation of control valves on all pipelines crossing streams so that supply and flow of oil and gas can be shut down immediately upon detection of a leak.”

“Up to 121 acres {refers to after reclamation: see above Table 4} could be disturbed from oil and gas well development. Some sediment could enter the stream systems; however the amount is not expected to alter existing water quality or the composition of stream substrates.”

Table 7 (EIS Appendix F2, p 66, Table 5, Effects Analysis for Indiana Bat) specifies that for erosion and runoff there would be limited direct exposure for the Indiana bat due to the Forest Plan standards and guidelines.

Appendix F1 to the EIS, Page F1-122 specifies the cumulative effects of the selected alternatives for the Fanshell Mussel:

“Oil and gas well development on private lands may increase from present levels, based on a reasonably foreseeable future development scenario for federal lands. Operators are required to follow state regulations, which include best management practices for controlling erosion and minimizing impacts from potential spills.”

The following Forest Plan standards apply to runoff and accidental releases for federally and privately-owned minerals:

SFW-MIN-3: Require that operators conduct activities and maintain equipment to prevent the discharge of oil or brine onto the ground or into surface waters.

SFW-MIN-4: Upon discovery or notification of an accidental spill of crude oil or brine that discharges, or threatens to discharge, into surface waters, notify the Ohio Environmental Protection Agency Emergency Response and Special Investigations unit in Columbus.

SFW-MIN-5: The operator, as directed by Ohio EPA, is responsible for remedial action for cleanup of soil and water resources and timely repair of damaged wells, pipelines, or tanks.

Conclusion:

No additional analysis or protections are needed at the Forest Plan level. The EIS disclosed that there may be erosion and sedimentation as a result of oil and gas activities and existing Forest Plan measures provide for the appropriate protection of wildlife. Thus effects are not anticipated to increase.

Water Withdrawal

As described from the oil and gas information provided by BLM, significant quantities of water are required for hydraulic fracturing of horizontal wells. The Forest Service has complete authority for approving, not approving or approving with conditions the water source, the timing of withdrawal and methods utilized to withdraw water on NFS land (see Water Resource Review sections dealing with groundwater depletion and surface water depletion).

EIS, Appendix F1, notes that depletion of surface water is a potential threat to the fanshell (p 115) and pink mucket pearly mussel (p 129): "Other potential threats to this species include reduction of water flows, runoff from oil and gas exploration, toxic spills, water development projects, and collectors in rivers where the fanshell remains". The Forest Scale Roads Analysis conducted in 2002 for the Forest Plan revision considered effects to water from oil and gas activities: "The potential indirect effects to surface water include water consumption during the early development of a field could have a short-term adverse effect on local stream flow, and secondary effects on downstream water use due to changes in water quantity or quality" (Forest Scale Roads Analysis, p 22). The Forest Plan contains GFW-WSH-1 to provide protection to aquatic and riparian wildlife species and habitats, as well as other users of water resources.

GFW-WSH-1: Water should not be diverted from streams, lakes, or springs when in-stream flow needs or water-level assessments indicate that diversion would adversely affect stream processes, aquatic and riparian habitats and communities, or recreation and aesthetic values.

Depending on the location of water withdrawals, various federal and state laws could also apply (ODNR et. al. 2012c). Implementation of GFW-WSH-1 will provide protections for wildlife species and their habitats associated with water withdraw, if necessary for hydraulic fracturing (and other water uses) on the Wayne National Forest. Since large quantities of water would be necessary for hydraulic fracturing, sites for potential water withdrawal would likely be limited to larger streams or rivers or lakes. ORC section 1521.16 requires that the owner/operator of any facility that is capable of withdrawing 100,000 gallons/day or more must register with ODNR's Division of Soil and Water Resources. US Army Corps of Engineers permits may be required for associated activities (e.g. for stream alteration). Small streams or ponds would not provide the desired quantities of water necessary for hydraulic fracturing.

Conclusion

No additional analysis or protections are needed at the Forest Plan level. By using the existing measures in the Forest Plan, supported by Ohio reasonable use doctrine, there is no increased effect to surface water due to depletion, since at the site specific level the WNF will be able to control withdrawals and limit them to periods when water is plentiful. Additional information on this topic, including discussion on the Ohio reasonable use doctrine is found in the Surface Water Depletion subsection of the Water section.

Acres of Surface Disturbance

The RFDS for oil and gas specifies the total acres of surface disturbed by oil and gas drilling before reclamation as 272 acres (sum of the 3 units: Athens, Ironton, and Marietta) and the total acres of surface needed to support drilled wells that are completed for production (excess disturbance reclaimed) as 121 acres (sum of 3 units) (also see EIS, p 3-18, Table 3-8 and p 3-262, Table 3-69).

The total disturbance area of 272 acres and the remaining pad/road acres after reclamation (of a portion of the drilling pad) of 121 acres were the focus for cumulative effects analysis within the Forest Plan and associated Appendices for affected area. This can be referred to as the development phase (272 acres) and the production phase (121 acres). The non-reclaimed area of 121 acres needed for the production phase essentially is viewed as non-productive wildlife habitat. (Also, reference BA, Page F1-13, Table 7 and BE, Page F3-10, Table 6.) Some tables within the Forest Plan and the associated Appendices reference various acre figures, but these need to be placed in the context as described within the RFDS. The above acres are viewed as anticipated outputs and upper limits of projected outputs for the first decade of the Forest Plan.

Since 2006 the level of on-the-ground activity that has occurred is well below the level forecast in the RFDS; a total of 12 vertical wells have been developed, with 20 acres of total disturbance during the development phase and 10 acres after reclamation for the production phase (approximately 8% of the projected levels).

Tables 8 and 9 below display the anticipated total affected area (development phase) and after reclamation for the production phase for both vertical and horizontal well pads. Vertical well pad information was derived from Appendix G to the EIS (reproduced here as Appendix B), while horizontal well pad information was provided by the BLM in a letter dated May 3, 2012 (Appendix C). Whether a vertical or horizontal well/well pad is created, the acres described above (272 acres development and 121 production phase) are viewed as anticipated outputs and upper limits of projected outputs for the first decade of the Forest Plan. There are no restrictions within the Forest Plan for acreage size limits for well pads; there are limits for opening sizes for specific management areas associated with even-aged harvest/openings. The Fragmentation Review expands on this information.

Table 8. Total Affected Acres (Development Phase).

<u>WELLS</u>	<u>Total Initial Acre Effects</u>
Vertical Well Pad	1.16*
Horizontal Well Pad	5.5**

*See EIS Appendix G, Page 6 for additional information

**See BLM RFDS review letter, dated May 3, 2012.

Table 9. Remaining Affected Acres after Reclamation (Production Phase).

<u>WELLS</u>	<u>Remaining Pad Acres after Reclaiming Site</u>	<u>Remaining Access Road Acre Effects</u>	<u>Remaining Access Total Effect</u>
1 Vertical Well Pad	0.17-0.28 ac/pad	0.38 ac/road	0.55 – 0.62 ac
1 Horizontal Well Pad	0.3 – 1.00 ac/pad	0.38 ac/road	0.68 – 1.38 ac

Conclusion:

No additional analysis or protections are needed at the Forest Plan level. Total surface disturbance acres of anticipated activity will not increase above those acres described within Appendix G to the FEIS; oil and gas well development surface disturbance will not exceed 272 total acres and/or 121 acres of reclaimed acres. Elements of the Forest Plan have addressed acres of surface disturbance related to wildlife resources (including aquatic species). Thus the effects are not anticipated to increase.

Location and Effects to TES Species

Forest Plan, Appendix H, Lease-Specific Oil and Gas Notifications/Stipulations provide various protections for TES species along with various Forest Plan standards and guidelines. Notification 3, provides protection to federally-listed threatened and endangered, Regional Forester sensitive species and their habitats. The notification specifies “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)” (Forest Plan Appendix H). Standard SFW-MIN-11 applies controlled surface use stipulations for the protection of known locations of federally listed species (TE) and Regional Forester sensitive species (also see Stipulations 12 and 13).

Federally Owned Minerals

SFW-MIN-11: Within management areas where surface occupancy is generally permitted, apply the Controlled Surface Use stipulation for new Federal leases where the following conditions occur:

- Riparian areas and wetlands
- Managed wildlife openings
- Developed recreation sites (located outside the Developed Recreation Management Area)
- Areas of land with a Scenic Integrity Objective of ‘High’ or ‘Moderate’
- Known locations of Federally listed species
- Known locations of Regional Forester sensitive species
- Portions of floodplains outside riparian areas
- Slopes between 35 and 55 percent.

For the **Indiana Bat** SFW-TES-2, GFW-TES-3, GFW-TES-9, SFW-TES-10, SFW-MIN-11, and Forest Plan Appendix H Notification 3, Stipulation 10 and Stipulation 12 provide protection to roosting, hibernating and foraging habitat. Associated with roosting habitat, Notification 3 (and SFW-MIN-11) provides the protective measure for primary roost trees and Stipulation 12 (see below) applies controlled surface use

measures for retention of snags, hickories or trees that are hollow and/or have major splits or broken tops during oil and gas development activities. Within Stipulation 12, if cutting of these types of trees/snags is necessary, timing measures are in place. (Notification 3 is listed in the Hydraulic Fracturing Fluids subsection of the Wildlife section and in Appendix A to the SIR.)

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 non-hibernation season the Forest Service biologist must be notified in advance. This stipulation applies only to trees over six inches in diameter. Indiana Bat text only, Bald Eagle and ABB section not included.

These provisions are also included within guideline GFW-TES-9 and standard SFW-TES-10 (below).

GFW-TES-9: Retain all shagbark and shellbark hickory trees > 6 inches dbh, unless removal is necessary to protect human safety or to avoid adverse impacts to steep slopes, erodible soils, floodplains or wetlands.

SFW-TES-10: During the non-hibernation season (April 15th-September 15th), do not cut, unless they are a safety hazard:

- Trees of any species 6 inches dbh or more that are hollow, have major splits, or have broken tops that provide maternity habitat.
- Snags 6 inches dbh or more that have Indiana bat roost tree characteristics. Consider any tree with less than 10 percent live canopy to be a snag.

When removal of hazard trees is necessary in a recreation area during the non-hibernation season (e.g., developed recreation sites, access roads, trails), conduct emergence surveys at the identified hazard trees that possess the characteristics identified above, and at any hazard trees that possess large areas of loose bark providing maternity habitat.

For protection of hibernaculum, Stipulation 10 applies no surface occupancy to provide protection at hibernacula (repeated within standard SFW-MIN-10 and SFW-TES-2 {see below}). Guideline GFW-TES-3 also applies protection at mine openings that are known Indiana bat fall swarming sites, but where actual Indiana bat hibernation has not been established.

Stipulation #10

No Surface Occupancy – Hibernacula

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

Federally Owned Minerals

SFW-MIN-10: Within management areas where surface occupancy is generally permitted, apply the No Surface Occupancy stipulation for new Federal leases where the following conditions occur:

- Slopes in excess of 55 percent and areas prone to mass soil movement
- Areas within ¼ mile of Indiana bat hibernacula
- Cultural resource sites of known significance.

Federally Listed Species Indiana Bat Hibernacula

SFW-TES-2: Establish a one-quarter mile buffer around all known hibernacula. Within this one-quarter mile buffer:

- Prohibit new trail and road construction.
- Do not conduct prescribed burning during the fall swarming period (generally mid-August to mid-October) or during the hibernation period (September 15 through April 15).
- Do not conduct prescribed burning during the fall swarming period (generally mid-August to mid-October) or during the hibernation period (September 15 through April 15).
- Do not permit surface occupancy for exploration or development of Federally owned minerals.
- Implement vegetation management only to maintain or improve Indiana bat roosting, swarming, or foraging habitat.

GFW-TES-3: Establish a one quarter-mile forested buffer around all mine openings that are known Indiana bat fall swarming sites, but where actual Indiana bat hibernation has not been established. Reduce or eliminate human disturbances within the buffer. Implement vegetation management only to maintain or improve Indiana bat roosting, swarming, or foraging habitat.

Appendix F2 to the EIS, Biological Opinion, Page F2-55 specifies for the Indiana Bat that “The environmental consequences of oil and gas development include loss of an undetected secondary or lesser important roost tree, alteration of foraging habitat and disturbance from noise/human presence as discussed under timber harvesting.”

Appendix F1 to the EIS, Biological Assessment pages F1-58 and 59 addresses private minerals with regards to TE species:

“An important difference in the administration of reserved or outstanding rights (private minerals) is that the exercise of those rights is not a privilege but a legal right owned by a private party. Private mineral owners are free to develop reserved or outstanding minerals (private minerals) on NFS lands in accordance with valid existing rights, severance deed rights, State and federal laws, the Secretary of Agriculture’s Rules and Regulations (for reserved mineral rights only) and an approved plan of operations. For reserved mineral rights, the Forest Service will approve an operation permit where required by the Secretary of Agriculture’s Rules and Regulations (1937, 1947 and 1963 rules). Even when a permit is not specifically required (1911 rules), the operator must still develop and submit a plan of operation for review by the Forest Service.”

“For outstanding minerals, a minerals operation plan will be negotiated. In the process of reviewing the plan of operation for reserved rights, or when negotiating the terms and conditions of a plan of operation for outstanding minerals, the Forest Service will request a voluntary adherence to Forest Plan standards and guidelines that protect Indiana bats and their habitat. It is possible that suitable roost trees could be removed during the non-hibernation season during the development of oil and gas resources on NFS lands with reserved or outstanding rights. There is a possibility, however low, that one or more Indiana bats could be directly harmed if such trees were occupied and removed during the non-hibernation season.”

Appendix F2 to the EIS, Biological Opinion, page 18 specifies:

“For outstanding private minerals, a minerals operation plan will be negotiated. In the process of reviewing the plan of operation for reserved rights, or when negotiating the terms and conditions of a plan of operation for outstanding minerals, the WNF will request a voluntary adherence to Forest Plan standards and guidelines that protect endangered species and their habitat. Outstanding mineral rights and reserved rights are non-discretionary actions that cannot be considered during this programmatic consultation.”

As identified within the Forest Plan EIS (EIS Appendix F1, p 102) surface disturbance could affect the **American Burying Beetle** (ABB) or its habitat: Construction of roads, trails, parking areas, recreation facilities, oil and gas wells and log landings compact the soil and eliminate potential areas for carcass burial. This was identified as an insignificant effects activity not likely to adversely affect the beetle or its habitat. Table 10 displays the projected cumulative total oil and gas development acres that could affect carrion sources or eliminate carcass burial habitat.

Table 10. Projected amounts of activities (for a ten year period) that could affect carrion sources or eliminate carcass burial habitat. Alternative E_{mod} (EIS Appendix F1, p F1-103)	
Permanent Road Construction and Reconstruction (acres)	392
Temporary Roads, Skid Trails and Log Landings	886
Recreation Trails (acres)	265
Recreation Facility & Parking Lot Construction (acres)	60
Surface Mining (acres)	1,250
Oil & Gas Well Development (acres)	121*
Total acres affected	2,974
Percentage of NFS lands affected	1.25
Percentage of action area affected	0.27

*See 2006 Forest Plan Section regarding 121 acres (reclaimed acres).

The following Forest Plan standards and guidelines and Stipulation 12 apply to the American Burying Beetle *for activity within a portion of the Athens Ranger District*:

Stipulation #12

Controlled Surface Use – Known Locations of Federally Listed Species

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.

ABB text only, Bald Eagle and Indiana Bat section not included.

GFW-TES-22: Limit ground compaction to the minimum area possible during major earth disturbing activities (including, but not limited to new road and trail construction, mineral resource exploration and development, or new facilities) that occur in suitable ABB habitat within 10 air miles of known occupied ABB habitat.

GFW-TES-24: In occupied ABB habitat, design new roads with the minimum safe width necessary for planned use of the road.

GFW-TES-25: Within 10 air miles of known occupied ABB habitat, keep ground disturbance to a minimum during the reconstruction and maintenance of existing roads. Limit width of road, ditches, and surface materials to the minimum necessary for the planned use.

For protection of **RFSS**, Stipulation 13 applies controlled surface use for known locations of RFSS species. In addition, for species associated with openlands and/or aquatic species see Stipulations 14 and 15, respectively.

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.

EIS, page 3-140 discusses the effects to the Four-toed Salamander:

“Management activities which could reduce canopy cover or affect vernal pools include even-aged timber harvesting, construction of roads, trails, or recreation facilities, development of oil and gas wells, surface mining and development of utility corridors. Occupied sites would be protected at the project level and no alternative should have an effect on vernal pool habitat. Each incorporates a measure to protect ephemeral wetlands (i.e., vernal pools) by avoiding them during ground-disturbing activities (GFW-ARR-23)”.

Wetlands

GFW-ARR-23: Avoid adverse impacts to ephemeral wetlands during ground-disturbing activities.

For protection of **specific habitats**, Stipulation 14 applies controlled surface use for wildlife openings (herbaceous and herbaceous/shrub habitat), while Stipulation 15 applies controlled surface use for riparian areas. For additional protections to aquatic and riparian habitats see the Water Resource section of this report.

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.

Conclusion:

No additional analysis or protections are needed at the Forest Plan level. The EIS and Appendices analyzed and disclosed effects, and existing measures in the Forest Plan provide for the appropriate protection of TES species. The analysis and protection measures are sufficient in light of horizontal drilling using HVHF and the level of effects are not anticipated to increase.

Aquatic and Riparian Resources

Forest Plan-level direction is provided by Notification 2 (regarding floodplains); Notification 3 (regarding protections for TES species); Notification 4 (regarding compliance with public laws and federal regulations); Stipulations 12 and 13 (regarding controlled surface use in areas with known locations of federally listed and Regional Forester sensitive species); Stipulation 15 (regarding controlled surface use in riparian areas); GFW-ARR-4 (regarding avoiding the construction of new facilities in riparian areas); GFW-ARR-5 (regarding the establishment of filterstrips along waterbodies); GFW-ARR-6 (regarding locating surface disturbing activities to sediment movement); GFW-ARR-7 through GFW-ARR-12 (all dealing with road/stream crossings); SFW-ARR-13, SFW-ARR-17 and GFW-ARR-14 through GFW-ARR-16 (all dealing with oil and gas pipeline/stream crossings); GFW-ARR-23 (regarding avoiding adverse impacts to wetlands); and GFW-ARR-29 (regarding prohibiting vegetation management within 100 feet of springs). These notifications, stipulations and standards and guidelines were fully outlined early in this report.

Conclusion:

No additional analysis or protections are needed at the Forest Plan level. Elements of the Forest Plan have addressed aquatic and riparian resources. The analysis and protection measures are sufficient in light of horizontal drilling using HVHF and the level of effects are not anticipated to increase.

Related Information

2011 Updated Regional Forester Sensitive Species

On December 19, 2011, the Regional Forester approved the Regional Forester sensitive species (RFSS) List, 2011 Maintenance Update. This update added new RFSS for the WNF. The newly added species are the: Northern Metalmark (*Calephelis borealis*); Redside dace (*Clinostomus elongates*); Little brown bat (*Myotis lucifugus*); Northern bat (*Myotis septentrionalis*); and the Tri-colored bat {Eastern Pipistrelle} (*Perimyotis subflavus*). Removed species include the bobcat, Blanchard's cricket frog, eastern sand darter, lilliput, and round hickorynut.

The WNF recently reviewed the newly listed species and determined that the Forest Plan and the associated management activities would have adequate protections already in place within the Forest Plan, primarily since the Forest Plan was developed around similar species and habitats (USDA FS 2012f). The Forest Plan was developed around the concept of providing habitat diversity (through various management areas and the associated long-term habitat objectives). Avoidance and minimization measures have been developed throughout the Forest Plan to provide protection to species (e.g. various standards and guidelines). The following address each of the new RFSS as related to oil and gas development.

The Northern Metalmark could potentially benefit by creation of permanent opening habitat associated with oil/gas development. Standards and guidelines have been developed within the Forest Plan for maintenance and creation of wildlife openings. The Forest Plan EIS assessed effects of management activities for a similar butterfly species, the grizzled skipper (a RFSS associated with openings). Appendix F3 to the EIS, page 48 of the Forest Plan Biological Evaluation identified activities (such as oil and gas development) that may impact individuals, but not likely to cause a trend toward Federal listing or loss of viability for the grizzled skipper. For oil and gas development, potentially suitable habitat could be permanently affected but site-specific review of projects would occur and at that time biologists would identify potentially suitable habitat and recommend options to avoid impacting it. Page 48 also specifies activities with beneficial effects that could result in more favorable habitat for the grizzled skipper or its host plant; these include timber harvest, development of permanent forest openings and utility corridor development and maintenance.

The Redside Dace is a fish species limited in distribution to the northeastern portion of the Marietta Unit, where it occurs in small streams within deep pools in forested watersheds. Existing standards and guidelines developed for aquatic species would provide protection for this species and habitat, especially GFW-ARR-5 associated with retention of filterstrips. Appendix F3 to the EIS, page 28 of the Forest Plan Biological Evaluation identified activities (such as oil and gas development) that may impact individuals, but not likely to cause a trend toward Federal listing or loss of viability for aquatic species. Page 28 specifies:

“Oil and gas activities have the potential to affect water quality as a result of soil disturbance and subsequent sedimentation. Effects are generally short-lived; revegetation of areas disturbed during the construction of the access road and well pad reduces the potential for soil erosion. Established Forest-wide standards and guidelines can mitigate the effects of oil and gas exploration and development (i.e., filterstrips, stream crossings, stabilizing disturbed areas, No Surface Occupancy on steep slopes). Controlled surface use is allowed in riparian areas and floodplains. In these cases, roads, well pads, tank batteries may be allowed in riparian areas or floodplains when placement of such facilities in adjacent upland areas would cause long-term effects to other resources (e.g., TES species, cultural site). For reserved and outstanding rights oil and gas wells, operators must follow state regulations which include best management practices for protecting aquatic resources. Brine or oil spills could occur during oil and gas well operations, although they are rare. The operator is required to construct berms around the wells to contain any oil leaks. The brine is required to be removed by tank truck. Forest-wide standards and guidelines require the installation of control valves on all pipelines crossing streams so that supply and flow of oil and gas can be shut down immediately upon detection of a leak. Some sediment could enter the stream systems; however the amount is not expected to alter existing water quality or the composition of stream substrates.”

The Little Brown Bat, Northern Bat, and the Tri-colored Bat are bat species with similar habitat requirements as the Indiana Bat (a federally-listed endangered species). Though not identical, the protective measures developed for the Indiana Bat will provide adequate protection or minimization measures for these species. See Forest Plan standards and guidelines, Chapter 2, pages 2-19 thru 2-21 and the information provided in the Location and Effects to TES Species subsection of the Wildlife review regarding the Indiana Bat.

The addition of these three bat species to the RFSS list for the WNF was associated with the confirmation of white-nose syndrome (WNS) within the State of Ohio in 2011. In May 2008, a review of

new information for WNS and bat populations was completed (USDA FS 2008). During that review, the Forest Supervisor concluded that a correction, supplement or revision to the environmental documentation for the Forest Plan or an amendment of the Forest Plan was not necessary at that time. In 2011, the Forest Supervisor revisited the review and determined there was no need to update it, and that the conclusion drawn in 2008 would hold true today (USDA FS 2011b).

With regard to WNS, the Wayne National Forest has taken a proactive approach by proposing the addition of the little brown bat, northern bat and the tri-colored bat to the RFSS list; by implementing a closure order on all mines within the WNF; by increasing our monitoring efforts at the hibernaculum; and by adding additional acoustic detection routes to monitor populations. The WNF, ODNR and US Fish and Wildlife Service have expanded monitoring efforts within the state and are continuing to gather and assess monitoring information related to WNS and bat populations.

Conclusion:

No additional analysis or protections are needed at the Forest Plan level. The WNF conducted a review of new information related to the new RFSS species and determined that the Forest Plan and the associated management activities would have adequate protections already in place within the Forest Plan, primarily since the Forest Plan was developed around similar species and habitats. Thus the level of effect is not anticipated to increase.

Newly Listed Federally Threatened or Endangered Species

Recently the US Fish and Wildlife Service listed the Sheepnose Mussel (Federal Register Volume 77, Number 49: Tuesday, March 13, 2012), Rayed Bean Mussel and the Snuffbox Mussel (Federal Register Volume 77, Number 30: February 14, 2012). The WNF reviewed information related to these species and determined that the Forest Plan and the associated management activities would have “No Effect” on the Rayed Bean, Sheepnose or the Snuffbox Mussels. There would be no direct, indirect or cumulative effects to these mussel species from management activities (USDA FS 2012b and USDA FS 2012c). On April 12, 2012, the US Fish and Wildlife Service agreed with the determination and does not anticipate any impact to these species from the implementation of the Forest Plan (USDA FWS 2012).

Conclusion:

No additional analysis or protections are needed at the Forest Plan level. The WNF conducted a review of new information related to the newly listed species and determined that the Forest Plan and the associated management activities would have “No Effect”.

FRAGMENTATION RESOURCE REVIEW

Within the Forest Plan, management areas incorporate varying degrees of fragmentation. Some management areas were developed specifically with little activity (e.g. Future Old Forest Management Area, Forest Plan, p 3-23) while others were developed for a mosaic of vegetation types and variety of

activities (e.g. Forest and Shrubland Mosaic Management Area, Forest Plan, p 3-17) thus with a higher level of potential fragmentation.

Standard SFW-MIN-9 was developed to minimize effects of oil and gas activities within specific management areas. Fragmentation of mature forest habitat is minimized by SFW-MIN-9 since protection is provided to Future Old Forest, Special Areas, Candidate Areas and Research Natural Areas for federally owned minerals through the No Surface Occupancy Stipulation. The Future Old Forest management area was developed to provide habitat for area-sensitive forest interior species such as the worm-eating warbler, Louisiana waterthrush, cerulean warbler and wood thrush as well as species sensitive to human disturbance, such as black bear (Forest Plan, p 3-23). The Controlled Surface Use Stipulation, also described within SFW-MIN-10 and SFW-MIN-11, provides protection to a variety of habitats, thus minimizing fragmentation (see Acres of Surface Disturbance section in the Wildlife section above for SFW-MIN-10 and SFW-MIN-11).

Federally Owned Minerals

SFW-MIN-9: Apply the No Surface Occupancy (NSO) stipulation to new Federal leases in the following Management Areas:

- Future Old Forest
- Developed Recreation
- Timbre Ridge Lake
- Special Areas
- Research Natural Areas
- Candidate Areas.

(See Appendix A of this report for a complete list of Notifications and Stipulations for Federal leases).

Within the River Corridor Management Area, surface occupancy of National Forest System land is allowed for the exploration and development of federally owned energy minerals, but controlled surface use is applied within the riparian area (Forest Plan, p 3-32).

The purpose of the Diverse Continuous Forest Management Area is to emphasize “providing mature forest habitat for conservation of forest interior species” (Forest Plan, p 3-3). Within this management area:

“Evidence of human activities is apparent. Resource activities such as vegetative management and mineral extraction are evident. Structures, utility corridors and timber cutting as well as mineral exploration and development are also evident. However, these structures and activities are visible mainly from on-site locations or occasionally from a distance in broken terrain.” (Forest Plan, p 3-4)

Though not specifically developed for oil and gas development (associated with related timber harvest), guideline G-DCF-VEG-2 minimizes fragmentation within the Diverse Continuous Forest Management Area. Thus, whenever possible within the Diverse Continuous Management Area, oil and gas well sites should be located on the periphery of the management area or on the periphery of large blocks of mature forest habitat.

G-DCF-VEG-2: Use even-aged timber management (thinning, shelterwood, clearcut or two-aged harvest) on approximately 25 percent of the area to perpetuate visual and vegetative diversity. Concentrate even-aged management on the periphery of the management area or on the periphery of large blocks of land targeted for uneven-aged management.

Within Chapter 3 of the Forest Plan, long-term desired habitat composition objectives have been developed for each of the management areas (Forest Plan, p 3-1). Herbaceous or herbaceous/shrub habitat is one component of most of these management areas (Forest Plan, pp 3-3, 3-6, 3-10, 3-14, 3-17, 3-20, 3-23, 3-28, 3-31, 3-35, 3-40) . Herbaceous and herbaceous/shrub habitat is synonymous with forest openings or openland habitat. Each management area displayed within Table 11 has a component (range) of openland habitat which varies from 2 to 40 percent of the total management area acres. These management areas were chosen to be included in Table 11 because they allow surface occupancy for oil and gas activities on federal minerals. Guideline GFW-WLF-7 specifies that “Permanent forest openings should be larger than one acre in size, unless necessary to meet the needs of a site-specific species.” Openings were planned to occur within each of the management areas as displayed in Table 11. Permanent openings are further addressed in the next section of this review.

Acres limits for even-aged harvest were developed for each management area and are displayed for certain management areas within Table 10 (Forest Plan, pp 3-5, 3-19, 3-22, 3-33). When developing an oil/gas well pad, timber cutting would occur if the development is located at a forested site. No limits were developed for the opening size for oil and gas development within the Forest Plan. Oil and gas development (including development associated with horizontal drilling) at a specific site would not exceed those acres displayed within Table 11.

Table 11. Herbaceous and/or Herbaceous/Shrub Long-term Objectives and Even-aged Harvest Limits by Management Area.

<u>Management Area (MA)</u>	<u>Herb. and Herb/Shrub percentage*</u>	<u>Acres Standards and Guidelines (even-age treatments)**</u>
Diverse Continuous Forest	2-4%	20 (S-DCF-VEG-5)
River Corridor	3-6%	10 (G-RC-VEG-8)
Historic Forest	2-5%	N/A see MA, Desired Future Condition
Forest Shrubland Mosaic	3-6%	30 (G-FSM-WLF-1)
Grassland Forest Mosaic	30-40%	30 (G-GFM-WLF-8)
Future Old Forest with Mineral Activity	0-1%	N/A see MA, Desired Future Condition

*Long-term habitat Objectives, Forest Plan Chapter 3, Management Area Direction, pp 3-3, 3-11, 3-19, 3-23, 3-32, 3-35

**Maximum size of even-aged harvest units, Forest Plan Chapter 3, Management Area Direction, pp 3-5, 3-21, 3-25, 3-37

Appendix F3 to the EIS, Page F3-35 discusses fragmentation associated with the Cerulean Warbler, a RFSS:

“Development of permanent openings, construction of fishing ponds and lakes, construction of recreational facilities and parking lots, development of oil and gas wells, and surface mining would reduce the amount of potentially suitable cerulean warbler habitat currently available and could have the same fragmentation effects as roads and trails. These activities do not vary between alternatives. Development of permanent openings, construction of fishing ponds and

lakes, development of oil and gas wells and parking lots would result in small openings in the canopy, which may be favorable to this species.”

Note: GFW-ARR-32 specifies that the size of small lakes generally range from 2 to 25 surface acres; 5 acres or larger is preferred.

The RFDS for oil and gas specifies the total acres of surface disturbed by oil and gas drilling before reclamation as 272 acres and the total acres of surface needed to support drilled wells that are completed for production (excess disturbance reclaimed) as 121 acres (EIS Appendix G, p G-1). As specified in the Acres of Surface Disturbance subsection within the Wildlife section, typically there is a difference in the surface area between horizontal and vertical well pads. Based on the fixed total acres of disturbance of 272 acres, as the number of larger sites on the landscape increases, the less habitat fragmentation is likely to occur (though this can be dependent on the specific site locations).

An Example Scenario: The development of thirteen horizontal well pads would correspond to roughly 71.5 acres of total site disturbance. Given that the total disturbance is constrained to 272 acres, the remaining acres of total disturbance would be 200.5 acres. Based on these remaining acres of development, approximately 172 vertical wells could be developed. This combination of horizontal and vertical well sites would thus reflect a reduction of approximately 62 (vertical) well sites, compared to if all vertical wells were developed instead. A reduction in such a significant number of sites for oil and gas development would correspond to reduced fragmentation effects on the landscape, though the total affected area would be the same (272 acres). This scenario represents a reduction in the number of sites of 26 percent. Also, a reduced number of sites would correspond with reduced noise and human disturbance, even though the duration of drilling several wells at a horizontal site would be longer. (NOTE: this example scenario does not take into consideration the 12 wells completed to date. A discussion of pipelines is found in the Infrastructure/Transportation section of the report.)

Also associated with fragmentation is guideline GFW-TRANS-9 which reduces the potential for the illegal creation of routes and reduces impacts of disturbance by requiring permit holders to install and maintain barriers such as gates on special use roads.

GFW-TRANS-9: Require permit holders to install and maintain an appropriate physical barrier on special use roads to prevent unauthorized use. If special use roads remain in place without a barrier, the permit holder must reconstruct the road to Maintenance Level 3.

SFW-TRANS-6: All roads are closed to the public unless the Forest road atlas specifically lists them as Maintenance Level 2 to 5 (open to the public).

Conclusion:

No additional analysis or protections are needed. The Forest Plan was designed with varying degrees of fragmentation incorporated into different management areas. Some management areas were developed specifically with little activity, while others were developed for a mosaic of vegetation types and variety of activities thus with a higher level of potential fragmentation. Horizontal well drilling will reduce the number of development sites on the landscape when compared with only vertical well development and; therefore, would be viewed as beneficial to the wildlife resource with regards to fragmentation. Thus the nature and level of effect is not anticipated to increase.

Permanent Openings

Both conventional drilling of vertical wells and horizontal drilling with multiple wells fits into the Forest Plan objective for development of permanent opening habitat (creation of herbaceous or herbaceous-shrub habitat). Objective 4.1g is to “establish and maintain permanent forest openings (herbaceous vegetative cover or mix of herbaceous vegetation and shrubs) on a variety of sites, including ridge tops, mid-slope benches and valley bottoms, preferably where access by machinery is possible” (Forest Plan, p 2-15, see discussion below related to reclamation of the pad area).

EIS Appendix G (reproduced here as Appendix B) specifies in the “Drilling Operations” (Page G-8) related to entering the production phase: “At this time, the reserve pit is backfilled and the portion of drill pad not necessary for the production phase is revegetated. Then the access road is often upgraded at this time to provide all-weather, year-round access to the wellhead and the production facility. This includes revegetating the portion of the roadway beyond the running width.” This excerpted portion of EIS Appendix G describes the reclamation of disturbed areas not needed for production back to potential wildlife habitat.

The Forest Plan direction is to create 500 acres of herbaceous or herbaceous-shrub habitat (i.e. permanent openings) during the first decade of implementation (Forest Plan Appendix B, Table B-5). As identified in the Openlands Assessment (USDA FS 2010), opportunities exist within specific management areas (such as Forest Shrubland Mosaic, Grassland Forest Mosaic, and Diverse Continuous Forest) to create openings and improve wildlife habitat conditions. One opportunity to meet this need for early successional habitat on the landscape is through oil and gas development; this was identified within Forest Plan Guideline GFW-WLF-6 (described below). Also see GFW-WLF-7.

GFW-WLF-6: When oil and gas well developments meet, or can be made to meet, the objectives of permanent forest openings, designate them accordingly so they may also contribute to herbaceous habitat objectives.

GFW-WLF-7: Permanent forest openings should be larger than one acre in size, unless necessary to meet the needs of a site-specific species.

GFW-WLF-11: In conjunction with opening development and maintenance, retain existing snags and create additional ones, unless they pose a safety hazard.

As described within the Forest Plan, SFW-MIN-2 requires that all proposed surface-disturbing mineral activities have an approved operation and reclamation plan before the activity begins. A site restoration plan should be developed which incorporates either restoration of a portion of the area as a permanent wildlife opening (Objective 4.1g, stated above) or as early successional forest habitat (Objective 4.1d, stated below). If a portion of the site is designated as permanent opening, GFW-WLF-13 specifies to develop and maintain openland cover of native forbs and grasses, and to avoid utilizing fescues and other monotypic species.

Objective 4.1d – Create early successional hardwood or hardwood-pine habitat, interspersed within mid- and late-successional forest habitat to:

- Provide breeding habit for shrubland-dependent species
- Increase production of wildlife foods such as soft and hard mast and insects.

Other activities which could be developed within the site restoration plan could include:

Objective 4.1h – Construct waterholes and ephemeral wetlands to supplement limited water sources, enhance local biodiversity, and enhance aquatic insect production. (See Freshwater Pond subsection of the Wildlife section)

Objective 4.1i – Install artificial nesting or roosting structures to supplement natural cavities or snags when they are short in supply or to enhance wildlife-viewing.

EIS Appendix G (reproduced here as Appendix B), page G-8 specifies details regarding the production facilities. A Forest-wide standard (SFW-MIN-1) directs the WNF to prevent or eliminate occupancy that is not necessary for oil and gas operations. Another Forest-wide standard (SFW-MIN-2) directs the WNF to require an approved operating and reclamation plan prior to earth disturbing activities. These standards allow the WNF to:

- 1.) Require operators to consolidate production facilities to the extent reasonable in order to reduce the remaining footprint to the minimum necessary for safe operation.
- 2.) Require operators to employ a continuous drilling operation when there will be multiple wells developed from one pad, whereby all of the wells on a pad are developed consecutively. The excess disturbance would then be completely restored, including the removal of gravel and the spreading of topsoil. The other option would be to employ interim reclamation measures, such as the spreading of topsoil and seed over the gravel pad area, during the interim timeframe between well development in order to provide habitat as quickly as possible.

Restoration of the site should begin directly after development of the well or wells. Habitat should be restored as quickly as possible to regain benefits to wildlife species. Ohio Revised Code 1509.072 (see Reserve Pit subsection in the Wildlife section for entire wording) directs operators to reclaim the area not needed for production within 6 months (3 months in urbanized areas) of the commencement of surface drilling.

As with most existing wells, any perennial habitat associated with the oil and gas development should be maintained (meeting Forest Plan opening standards and guidelines: develop a feathered edge appearance between forested edge and opening and treat at a minimum of every 3-4 years to minimize woody encroachment to maintain quality openland habitat, GFW-WLF-6, GFW-WLF-7, GFW-WLF-8, GFW-WLF-9, GFW-WLF-12, GFW-WLF-13) by the operator until the well site is no longer in production.

Conclusion:

No additional analysis or protections are needed at the Forest Plan level. EIS Appendix G describes the reclamation of excess disturbance at oil and gas well sites after the well has been developed and is entering the production phase. The Forest Plan incorporates the management of oil and gas sites into the wildlife opening program, through GFW-WLF-6. Other existing measures in the Forest Plan allow the WNF to require that all wells be developed at one time at a well pad or the area be reclaimed in the interim period and to require that production equipment/facilities be consolidated to one area of the pad so that as much area as possible can be reclaimed for wildlife habitat as quickly as possible. Thus the nature and level of effect is not anticipated to increase.

BOTANY

Within the planning documents for the Forest Plan, plants and their habitats are considered in four main categories: federally threatened and endangered species (TE species), Regional Forester sensitive species (RFSS), species of public interest (including American ginseng) and non-native invasive species (NNIS). The first three are of concern for maintaining viable populations and the fourth is a concern in reducing suitable habitat and populations of native species.

In the analysis documents supporting the EIS to the Forest Plan (EIS Appendices F1, F2 and F3) it was recognized that oil and gas activities will continue on the Wayne National Forest as long as the demand for these substances remains high (EIS Appendix F1, p F1-142). The two main risks to botanical resources from oil and gas development considered during the Forest Plan Revision were the loss of habitat (including the introduction and spread of NNIS) and the accidental release of chemicals, oil or brine (including EIS Appendix F1, pp F1-142, F1-143, F1-160, F1-161, F1-175, F1-194). These risks were analyzed based on projections of activity provided in the RFDS (EIS Appendix G). Standards and guidelines were created to avoid and mitigate effects to TES species. There are two ways in which potential horizontal drilling and high volume hydraulic fracturing might create effects that are not covered under the current Forest Plan and associated planning documents: one would be if the total acreage likely to be impacted is greater than what was analyzed (i.e. cumulative effects) and the other would be if the activities have effects that are markedly different than what was considered during the Forest Plan development. The following discussion considers whether either of those conditions exists.

Loss or Alteration of Habitat:

Loss or Alteration of Habitat Due to Construction Activities

Development of a horizontal well site will likely involve the clearing of roughly 3-5.5 acres of land for a pad and a portion of the access road (Table 1). Once the wells are developed the excess cleared area can be reclaimed, leaving a smaller 0.68 – 1.38 acre area needed for the production of the wells (Table 1). The RFDS developed by the BLM for the Forest Plan projected a cumulative total across the 3 units of 272 acres disturbed by oil and gas drilling activity and 121 acres of sustained disturbance after excess area is reclaimed for the production of oil and gas (EIS Appendix G, p G-1). It is important to recognize that the incorporation of horizontal drilling and hydraulic fracturing will not increase the total surface disturbance acres (272 acres) of anticipated activity or the sustained acreage of disturbance after reclamation (121 acres) above what was described in the RFDS. Those acreages are viewed as upper limits of disturbance for the first 10 years of Forest Plan implementation. The sustained acreage of disturbance (121 acres) is the amount that was considered during the cumulative effects analysis for the federally endangered running buffalo clover and a species of public interest - American ginseng (Appendix F1 to the EIS, pg 197 and EIS Ch 3, pg 152) - because the loss of habitat is for the life of the well (15-30 years) and is considered long-term (*only running buffalo clover and American ginseng are considered in this portion of review because they are the only plant species where the acreage impacts were originally considered in the Forest Plan EIS*). To date there have been 12 wells developed on the WNF with a disturbance after excess reclaimed of 10 acres. Using the current BLM projection for horizontal well sites (13 total, 10 on the Marietta Unit and 3 on the Athens Unit) and the estimated sustained disturbance for those sites (1.38 acres, after excess is reclaimed), gives a total of 17.94 acres of disturbance once the excess is reclaimed. The level of disturbance from the current projections does

not come close to meeting or exceeding the upper limit of 121 acres; therefore, the effects analysis in regards to acres for impacts to running buffalo clover and American ginseng from oil and gas activities is still valid.

The Forest Plan, EIS and associated planning documents foresaw anticipated disturbance as an impact to TES species and, aside from analyzing those impacts up to the upper limit of acreage required after excess is reclaimed (121 acres), also put in place notifications and stipulations, and standards and guidelines to further minimize impacts.

In the case of federal minerals, the Forest Service has latitude to restrict surface activities if they might directly impact individuals or populations of applicable rare plants (i.e. the loss of habitat). For federal minerals, TES are protected from direct impact by notification and stipulation (Forest Plan Appendix H, Special Notification 1, Notifications 3 & 4 and Stipulations 12 & 13) attached to the parcel at the time of leasing. Stipulations 12 and 13 indicate that surface occupation is limited and only apply to a lease if the presence of a TES species is already known. Notification 3 is applied to all leases and provides for the mandatory survey of the area for TES species once an Application for a Permit to Drill and Surface Use Plan of Operations is submitted (i.e. the site-specific level). If individuals, populations or suitable habitat of a federally threatened and endangered species are found the WNF has the authority to place restrictions on the activity or to deny the Surface Use Plan of Operations. If individuals, populations or suitable habitat exist for Regional Forester sensitive species restrictions providing for the avoidance and protections of those areas can be put in place; however, the application cannot be denied. Special Notification 1 applies to all leases and provides that operations will be consistent with the standards and guidelines from the Forest Plan. Notification 4 applies to all leases and incorporates all applicable laws and federal regulations that apply to Federal lands as well as the Forest Plan into the lease. Operators are required to comply with those measures.

Standards and guidelines provide an added layer of protection to TES species and/or their habitat. Forest-wide standards and guidelines that limit any vegetation management within 50 feet of rock faces (SFW-TES-32 and SFW-TES-33) and within filterstrips of 50-100 feet wide (SFW-ARR-5) protect potential northern monkshood habitat from disturbance (EIS Appendix F1, p 138). SFW-TES-30 provides protection for running buffalo clover during road construction by requiring activity be located outside of occupied habitat and maintaining the appropriate light levels. GFW-TES-31 provides for surveys for running buffalo clover in areas of suitable habitat prior to earth disturbing or canopy-disturbing activities. SFW-TES-32 provides for the protection and improvement of occupied RFSS habitat. Additional Forest-wide standards and guidelines minimizing erosion and stabilizing disturbed areas protect potential habitat for TES species and species of public interest from erosion and sedimentation threats associated with earth disturbing activities (see the Erosion and Sedimentation subsection of the Water section for these standards and guidelines). Additional mitigation measures and design criteria can be developed in excess of the standards and guidelines if they are warranted to protect species.

It is important to note that the notifications and stipulations are applied to the parcel at the time of leasing. Surveys and resultant mitigations or design criteria will be done at the site-specific level.

Potential impacts to TES species from oil and gas activities are due to the direct destruction of individuals, populations and habitat when the site is located where the plants occur. Impacts from these activities are considered long-term, since the sites will remain altered for the life of the well (15-30 years). As stated in the previous paragraphs, these impacts can be avoided by relocating the pad, impoundments and access road. In the case of running buffalo clover, “while the heavy construction

associated with road development may result in the loss of suitable habitat, over the long-term, road corridors will provide for semi-permanent breaks in the forest canopy that the species requires, and therefore could benefit clover habitat along edges of roads” (EIS Appendix F1, pp 191-2). Table 12 appears in the Programmatic Biological Opinion and indicates there should be no negative or positive response of running buffalo clover populations due to oil and gas activity on the Wayne National Forest because of the standards and guidelines in place, with one exception being potential reduced fitness from the increased competition of non-native invasive species (discussed in the next section).

Loss or Alteration of Habitat Due to the Introduction and Spread of Non-Native Invasive Species (NNIS)

Executive Order 13112 states that the Federal Government should not undertake an activity that is known to introduce and spread NNIS, unless it is able to show that the benefit to resources far outweighs the costs of later control and lost biodiversity.

Cumulative effects analysis in the EIS and associated planning documents of potential NNIS infestations due to minerals development accounted for a total of 1,441 acres of disturbance (EIS, pp 3-173 and 3-175). The 1,441 acres was determined from Table 2-4 (EIS, p 2-20) by combining the acres of surface coal mining, depleted and orphan wells plugged and oil and gas well development. BLM has indicated a likelihood of up to 13 horizontal well sites (10 in the Marietta Unit and 3 in the Athens Unit), each containing multiple wells, for the remainder of the first 10 years of Forest Plan implementation (Appendix C). Disturbance sustained for the life of a horizontal well site (17.94 acres), coupled with the level of disturbance seen already (10 acres) is still well under the cumulative total acres of sustained disturbance that was projected and analyzed/disclosed in the effects analysis. The end result is that the projection of cumulative acreage of surface disturbance is still reasonable, thus the impacts to resources due to NNIS invasions are still within those analyzed for the Forest Plan.

Additional measures are in place. When NNIS are already on-site or are introduced, a programmatic Environmental Assessment has been completed by the WNF, which provides for the rapid response to limit the spread of those species (USDA FS 2007a and USDA FS 2007b). State law requires seeding of disturbed areas within six months (three months in urbanized areas) of the beginning of the drilling operations (ORC 1509.072(A)). The Forest Plan requires the use of non-invasive seed and weed-free mulch and prioritizes the use of locally-adapted native seed when areas are re-vegetated (SFW-WSH-6 and GSW-WSH-7). Site specific plans may be developed to provide for excess disturbance to be planted in openland and/or prairie species, which would help promote habitat that is lacking within the WNF (USDA FS 2010).

Table 12. Effects Analysis for the Running Buffalo Clover (oil and gas portion excerpted from Biological Opinion)

Management Elements		Environmental Impact	RBC Exposure	RBC Response	Population RND*	
Energy	Oil/gas development	noise/physical disturbance	NA			
		loss of trees; canopy breaks	plants and seeds	beneficial for germination and reproduction	none to increase in numbers and reproduction	
		soil compaction	plants and seeds	none due to S&G	none	
		spread nonnative species	plants and seeds	reduced fitness due to competition	none	
		increase erosion; runoff	plants and seeds	none due to S&G		
		Facilities construction	noise/physical disturbance	NA		
			loss of trees/vegetation	plants and seeds	none due to S&G	none
			spread nonnative species	plants and seeds	reduced fitness due to competition	none
			increase erosion; runoff	plants and seeds	none due to S&G	
		facilities operation	noise/physical disturbance	NA		
			increased human access	NA		

*RND stands for Reproduction Number or Distribution for species.

As stated above, the analysis focuses on the total acres of surface impact, not on the total number of wells. Based on the fixed total acres of disturbance of 272 acres, as the number of larger sites on the landscape increases, the less habitat fragmentation is likely to occur. For example, the development of thirteen horizontal well pads would correspond to roughly 71.5 acres of initial site disturbance. Given that the total disturbance on the WNF is constrained to 272 acres, the remaining acres of total disturbance would be 200.5 acres. Based on these remaining acres of development, approximately 172 vertical wells could be developed. This combination of horizontal and vertical well sites would reflect a reduction of 62 vertical well sites, compared to if only vertical wells were developed. A reduction in such a significant number of sites for oil and gas development would correspond to reduced fragmentation effects on the landscape, though the total affected area would be the same. This means there would be fewer sites where NNIS could potentially be introduced into the landscape through the construction of well pads and roads.

Conclusion:

No additional analysis or protections are needed at the Forest Plan level. The level of disturbance due to oil and gas activity is well below the analyzed acreages and no new or greater effects than those already analyzed were identified. The Appendices to the EIS disclosed that habitat loss may occur due to oil and gas activities, and the Forest Plan has appropriate measures in place to control surface occupancy and activities in order to minimize impacts to TES plant species. Thus the level of effect is not anticipated to increase.

Impacts Associated with Fluids and Solids:

As stated in the waste disposal and safety sections of this report, the Wayne National Forest will not allow for disposal of fluids by land application on roads, ground surface or vegetation (SFW-SAFE-19). This prohibition would apply even if the mineral rights were privately owned, because the road application of fluids (as allowed by Ohio law) is only permitted with the approval of the entity with jurisdiction over the road (see Disposal of Wastes subsection within the Water section for more information). Thus there is no danger to vegetation from the purposeful application of fluids onto vegetation of the Wayne National Forest. Effects to vegetation due to application of fluids was a concern based on a recent paper (Adams et. al. 2010) detailing the application of drilling fluids on the surrounding vegetation within the Fernow Experimental Station (Monongahela National Forest) and the unanticipated effects of that application. Approximately 80,000 gallons of fluid were land applied to approximately 0.5 acres of land. Defoliation and death of vegetation ensued. The disposal method was consistent with the permit issued by the West Virginia Department of Environmental Protection (Adams et. al. 2010). There are key restrictions in place in Ohio and the WNF that will prevent a similar occurrence here (just described above).

There is risk to plants from the *accidental release* of fluids associated with oil and gas operations. Dealing with federally threatened and endangered plant species, EIS Appendix F1 states:

“Mineral exploration and development activities may also result in accidental spills of crude oil or brine, which could affect surrounding vegetation, contaminate soils, and cause harmful runoff to streams... .. Dikes are required around all wells on the Forest to contain brine in the event of an accidental spill. In addition, the Ohio Environmental Protection Agency (EPA) is required to be contacted immediately upon discovery of an accidental spill. Remedial action for cleanup of

water and soil resources will be conducted by the lessee as directed by the Ohio EPA.” (F1-160, F1-143, F1-175, F1-194).

Regarding RFSS, EIS Appendix F3 states:

“Brine or oil spills could occur during oil and gas well operations, although they are rare. The operator is required to construct berms around the wells to contain any oil leaks. The brine is required to be removed by tank truck. Each alternative has Forest-wide standards and guidelines that require the installation of control valves on all pipelines crossing streams so that supply and flow of oil and gas can be shut down immediately upon detection of a leak until repairs and cleanup have occurred (MIN-3, 4, 5)” (F3-54, F3-60, F3-67, F3-72).

These risks are mitigated by existing measures in the Forest Plan and Ohio regulations for the construction of well pads and are discussed in detail in the Accidental Release and Disposal of Wastes subsections within the Water section of this report.

Conclusion:

No additional analysis or protections are needed at the Forest Plan level. The Appendices to the EIS analyze and disclose that there may be effects to plants due to spills of oil or brine from oil and gas operations. No potential effects of horizontal drilling different than those described were identified. Existing measures in place in the Forest Plan and Ohio regulations appropriately mitigate the risk. Thus the nature and level of effect is not anticipated to increase.

Additions to the RFSS List:

As noted in the Wildlife section, the RFSS list was recently updated for the WNF. A review was conducted on the WNF, which determined that the Forest Plan and the associated management activities would have adequate protections already in place within the Forest Plan, primarily since the Forest Plan was developed around similar species and habitats (USDA FS 2012f). The newly added species are the Large Sedge (*Carex gigantean*), Louisiana Sedge (*Carex louisianica*), Bushy Broom-Sedge (*Andropogon glomeratus*), Small White Snakeroot (*Ageratina aromatica*), Hirsute Sedge (*Carex complanata*), Slender Blazingstar (*Liatris cylindracea*), Wild Pea (*Lathyrus venosus*) and Fern-Leaf False Foxglove (*Aureolaria pedicularia*). Removed species include the Greenish-white Sedge, Maryland Butterfly-pea, Smooth Beardtongue, Little-headed Nutrush, Whip Nutrush, Large Marsh St. John's Wort and Summer Grape.

The 2006 Forest Plan was developed around the concept of providing habitat diversity (through various management areas and the associated long-term habitat objectives). Avoidance and minimization measures have been developed throughout the Forest Plan to provide protection to species (e.g. various standards and guidelines). Many of the new RFSS “plant” species are disturbance related species which will benefit by many projects which can create more open habitats. The team reviewed the list of new species and determined that the Forest Plan has adequate protections already in place for similar species and habitats which will protect and/or minimize effects of the anticipated management activities described within the Forest Plan EIS for these newly added species (USDA FS 2012f).

Conclusion:

No additional analysis or protections are needed at the Forest Plan level. The WNF conducted a review of new information related to the new RFSS species and determined that the Forest Plan and the associated management activities would have adequate protections already in place within the Forest Plan, primarily since the Forest Plan was developed around similar species and habitats. Thus the level of effect is not anticipated to increase.

US Fish and Wildlife Service

The information in the wildlife resource review, the fragmentation resource review and the botany resource review prepared for this report and the BLM letter (Appendix C) were provided to the US Fish and Wildlife Service. In a letter dated June 18, 2012 (Appendix G), Mary Knapp, Field Supervisor of US Fish and Wildlife Service, agreed that the incorporation of horizontal drilling using HVHF with oil and gas development is consistent with the activities presented during the Wayne National Forest planning process and associated with the programmatic biological opinion (November 22, 2005). The actions described under the Forest Plan for oil and gas development would not be modified in a manner that would cause an effect to TE species which had not already been considered. Thus reinitiation of formal consultation would not be necessary. Also, the activities described would not alter any of the findings for TE species with regard to the Forest Plan.

WASTE DISPOSAL

Horizontal drilling operations using HVHF methods creates a larger volume of wastes.

The RFDS described handling of waste water from oil and gas operations:

“Water produced along with the oil and gas is generally salty and sometimes sulphurous. Federal and State regulations require this saltwater, or brine, to be properly disposed of. The most common method of disposal in Ohio is for the brine to be trucked to a State-licensed disposal well where it is injected into underground formations already containing brine. A less common disposal method allowed in certain townships is road spreading of brine for the purpose of dust and ice control. Producing wells in the WNF typically produce only small amounts of brine.” (EIS Appendix G, p G-8)

The Forest Plan prohibits sewage lagoon, disposal plant or landfill siting within floodplains (GFW-WSH-2). In addition Stipulation 16 is for Controlled Surface Use in floodplains. The guideline and stipulation supports a prohibition of siting temporary waste pits associated with oil and gas operations within floodplains. A Forest-wide standard (SFW-SAFE-19) prohibits disposal of non-federal wastewater on federal lands, thus there will be no disposal of waste fluids by spreading on roads that are under the jurisdiction of the Wayne National Forest. This last standard can be used to prohibit the siting of injection wells on WNF. The EIS of the Forest Plan recognized waste spills associated with oil and gas operations as a threat to water quality (EIS, p 3-18), and two standards were developed to handle

incidences of accidental releases of materials associated with these operations (SFW-MIN-4 and FSW-MIN-5). These standards require notification of spills to the OEPA and direct the operator to be responsible for cleanup associated with any spills.

Fluids associated with oil and gas development, according to Ohio state law (ORC 1509.22(C)(3)), can be temporarily stored 1.) on-site in impoundments either dug into the ground and then lined with an impermeable barrier or set up above ground, or 2.) in steel tanks (e.g. a closed system). Both methods of temporary storage have secondary containment in the way of berms or dikes. The key to this provision is that it is temporary. Ohio Revised Code mandates that fluids must be removed from site within 2 months (14 days in urbanized areas) of the completion of drilling the well to total depth (ORC 1509.072(A)). Fluid evaporation is not permissible (ORC 1509.22(C)(1)). Tom Tomastik, Hydrogeologist with ODNR Division of Oil and Gas Resources Management, indicates that lining of pits and ponds is required; however, the operators in the shale-gas activity are using steel tanks with secondary containment (dikes) for the containment of flowback fluids because current policy is that no flowback fluids from horizontal wells are allowed to be discharged into open impoundments or pits (Tomastik 2012c and 2012e).

Disposal of liquid waste is limited by state law to four methods (ORC 1509.22(C)(1)): injection in a Class II injection well, road application for dust and/or ice control (only where permitted by the government body with jurisdiction over the road and only allowing application of produced water), enhanced recovery or other methods to test new technologies. Fluids transportation by truck is also regulated, whereby the vehicles must be registered and must indicate the origin and destination of the fluids (ORC 1509.222).

Increased seismic activity has recently been a concern of the public following a number of low-magnitude earthquakes centered on the Youngstown area. These earthquakes were within a mile of the Northstar 1 well, a Class II deep injection well. This injection well is one of 177 located within Ohio that disposes of oil and gas development fluid wastes. Based on a report written by Ohio Department of Natural Resources (ODNR 2012), following an investigation into the relationship between a deep injection well and low-magnitude earthquakes located near Youngstown, OH, increased seismic activity could be a potential issue for injection wells drilled into the Cambrian or Precambrian rock. A set of pre-requisites must be in place for any potential of induced seismicity due to injection wells, including: the pre-existence of a fault in the crystalline Cambrian or Precambrian rock that is at or near a failure state of stress; the proximity of the wellbore must be close enough and have a pathway to the fault; and the amount of fluid and pressure of injection must be great enough to cause slippage along the fault. In response to these seismic events and the possible linkage to the injection well the ODNR is pursuing reforms to the injection well program, including restrictions on injecting fluids in the Cambrian or Precambrian rock, requirements for testing and monitoring of pressures and injection rates and the installation of an automatic shutoff system, among other reforms (ODNR 2012).

Any solids that come out of a HVHF well (cuttings, drilling muds) can be temporarily stored on-site in a reserve pit (ORC 1509.22(C)) but must ultimately be removed from site and conditioned for reuse (in the case of the drilling muds) or disposed of in a sanitary landfill (USDA FS 2012e). Cuttings can be used for what is termed "beneficial use", which means the daily cover that is used at landfills (USDA FS 3/29/2012e). Well cuttings may have some naturally-occurring radioactive materials (NORM), but are not regulated as radioactive materials unless the level of NORM is higher than what is found in their natural state (ODNR et. al. 2012a). On-site burial of any solids associated with the operations is not permissible in horizontal wells (USDA FS 2012e).

Conclusion

No additional analysis or protective measures are needed at the Forest Plan level, since the RFDS discussed the common methods of waste disposal and this was used as the basis of the effects analysis conducted in the EIS. The RFDS did specify that wells on the WNF are likely to produce only small amounts of brine water. Larger volumes of wastewater are likely to be associated with horizontal wells. This larger volume represents a change. Ohio state law limits the disposal methods to the four methods discussed above and the Forest Plan further limits what methods can be utilized by prohibiting road application or injection well siting on the WNF. Thus, even though the volume of wastes produced is larger, the effects are not anticipated to change. (Discussion related to transporting brine can be found in the Accidental Releases and Disposal of Wastes subsections within the Water Resource section.)

NOISE AND LIGHT POLLUTION

Horizontal drilling operations may cause more noise and light pollution than conventional drilling.

When describing drilling operations the RFDS states, "Since drilling is a continuous operation until the total depth of the well is reached, the lights and engine noise from the rig are evident throughout the day and night. It takes a rotary rig about 3 to 5 days to drill a typical well on the WNF." (EIS Appendix G, p G-6). Effects to the Indiana bat and running buffalo clover due to noise and human interaction associated with oil and gas activity are accounted for in the EIS. EIS Appendix F2, (p 56) shows a possible response of the Indiana bat to noise and human disturbance related to oil and gas development. This is displayed in Table 6 within the Wildlife section of this report. Table 6 shows the potential for Indiana bats to be exposed to noise and human disturbance in the summer (no exposure anticipated in the winter, due to hibernation) with the response ranging "from no response to temporary abandonment--> decrease foraging efficiency; slow pre- and post natal development-->increase energy costs." EIS Appendix F2, (p 55) specifies for the Indiana Bat that "The environmental consequences of oil and gas development include loss of an undetected secondary or lesser important roost tree, alteration of foraging habitat and disturbance from noise/human presence as discussed under timber harvesting." Within the timber harvesting section of Appendix F2 dealing with the Indiana bat the following is stated:

"The environmental consequences of timber harvest include alteration of foraging habitat and disturbance from noise/human presence... ..Adverse effects to the Indiana bat may occur during timber harvesting due to disturbance from noise/human presence. Indiana bats may elicit a behavioral response to this exposure through temporarily abandoning roost sites. Although they may flee a specific roost during the activity, we anticipate the disturbance will be temporary, and bats will not need to abandon and search for a new roost site" (EIS Appendix F2, pp 48-49).

It should be noted that a typical timber harvest would take longer than 3-5 days, which was the timeframe predicted for drilling operations of a typical well. Therefore, when effects to Indiana bats from the noise and human disturbance associated with oil and gas activities was considered, a longer timeframe associated with timber harvesting was used.

EIS Appendix F2, Table 6 (p 74) notes that noise and human interaction are not applicable and will not cause effects to the running buffalo clover. The oil and gas portion of this table is reproduced as Table 11 within the Botany section of this report.

Various notifications and stipulations may apply to noise and light pollution, including Notification 3, Stipulation 12 and Stipulation 13 (listed earlier in this report and within Appendix A), if there may be impacts to TES species or their habitats. Notification 3 and Stipulations 12 and 13 can be used to direct the timing of drilling activities to coincide with periods when impacts to wildlife species would be the lowest, or might instruct the operator to utilize specific noise dampening technologies. By using SFW-MIN-2, the WNF can include measures related to visual screening and muffling of noise if the well site is located in close proximity to private homes and/or populated areas or to TES or their habitat.

The following guidelines are from the scenery management section of the Forest Plan and can be used to reduce noise and light impacts associated with oil and gas operations.

Scenery Management

GFW-SM-64: Strive to schedule mechanized activities along Concern Level 1 and 2 travelways, use areas, and water bodies to occur during low-use periods to alleviate noise and visual impacts.

GFW-SM-21: Avoid the need for lighted towers, particularly in locations visible from a lake or in the viewshed of a Concern Level 1 or 2 travelway or use area.

GFW-SM-23: Reduce visual impact of current and future obstruction lighting requirements as much as technology and FAA and FCC requirements will allow.

GFW-SM-24: Reduce visual impact by using such techniques as, but not limited to, directional lighting, tilting, shields, etc.

GFW-SM-25: Maximum intensity of lighting shall be the minimum required by FAA and/or FCC. Unless otherwise required by the FAA, only white (preferable) or red strobe lights should be used at night, and these should be the minimum number and intensity, with the minimum frequency of flashes (maximum duration between flashes), as required by the FAA.

State of Ohio regulations dealing with light and noise pollution would mostly apply in urbanized areas and focus around minimum setback distances, muffling noise and screening the well site to lessen impacts of the activities on people (ORC 1509.021).

Conclusion

No additional analysis or protective measures are needed at the Forest Plan level, since the RFDS described a continuous drilling operation and the EIS analyzed and disclosed effects related to noise and light as described above. Ohio regulations have kept pace with the advances in technology and address impacts to people from noise and light as described above. Measures existing in the Forest Plan allow for the appropriate mitigation of effects. Thus the effects are not anticipated to change.

AIR QUALITY

Horizontal drilling activities could release greater amounts of pollutants into the air, thus contributing to air pollution.

The EIS notes that most impacts to air quality from WNF activities would be due to prescribed fire and wildfires and other management activities would have only negligible effects on air quality (EIS, pp 3-30 and 3-31). The Forest Plan contains the following goal and guidelines that are pertinent to oil and gas operations:

Goal 9.1 Protect Air Quality- Ensure that Forest management activities comply with Federal and State laws protecting air quality.

Guidelines for Air Quality

GFW-AIR-1: Coordinate management activities with air quality regulatory authorities and with research activities on the impact of air pollution on Forest resources.

GFW-AIR-2: Coordinate with air quality regulatory authorities and with research activities on preventative practices to control any significant air pollution emissions resulting from National Forest management activities.

GFW-AIR-3: Conduct management activities (including permitted activities) in a manner that does not contribute significantly to violations of National Ambient Air Quality Standards or violations of applicable provisions in the State Implementation Plan.

GFW-AIR-4: The Forest Supervisor will advise the Regional Forester on the potential effects of proposals by the State of Ohio to modify air quality standards or attainment areas and the identification of present and potential impairment of Forest resources attributable to air pollution.

The US Forest Service has also created a document related to Best Management Practices titled “Emission Reduction Techniques for Oil and Gas Activities” (USDA FS 2011a). The following information is from the document Foreword and gives an overview of how the document may be used.

“This document is intended to provide techniques which may be applied to oil and gas operations to reduce or mitigate emissions from development and production operations. Emission reduction techniques described herein can be applied to existing operations or considered as mitigation measures to be applied in planning and analysis of potential future development. Depending upon their intended applications, users of this document may consider directly using or recommending an emission reduction technique described here, modify one of the described emission reduction techniques for use in a unique situation, combine two or more techniques, or use this information as a basis to research other unforeseen technology.”

The Ohio Environmental Protection Agency (OEPA) is the primary regulator of air quality and emissions in the State of Ohio. This authority is delegated to the OEPA by the United States Environmental Protection Agency (USEPA). The delegation is done through the use of a number of State Implementation Plans (SIPs). The SIPs are the regulations and other materials for meeting clean air

standards and Clean Air Act requirements associated with meeting the Nation's Ambient Air Quality Standards. Detailed information for the State of Ohio SIP may be found at the following website. (<http://www.epa.gov/reg5oair/sips/>).

All OEPA regulations related to air quality apply to any horizontal drilling that may occur on the WNF. OEPA air pollution regulations are located in the Ohio Administrative Code (OAC) in chapters 3745-14 to 3745-26, 3745-31, 3745-71 to 3745-80, 3745-100 to 3745-105, 3745-108, 3745-109, and 3745-112 to 3745-114. Additional chapters are added as needed to address new laws and requirements related to air pollution control. (<http://www.epa.state.oh.us/dapc/regs/regs.aspx>)

Conclusion:

Because of the low level of horizontal well activity projected to take place for the remainder of the first ten years of Forest Plan implementation (13 well sites) the EIS remains valid in that effects to air quality would be negligible. No other protections at the Forest Plan level are needed, since the Ohio EPA has the jurisdiction to regulate air quality and emissions

INFRASTRUCTURE/TRANSPORTATION

Additional infrastructure may be needed or larger demands may be placed on existing infrastructure by horizontal well activity.

Infrastructure needs were analyzed and disclosed in the programmatic EIS and associated planning documents, with an upper limit of 45 miles of new access road projected for oil and gas activities (EIS Appendix G, p G-1 and EIS, p 3-262) and 50 acres of utilities construction projected (EIS, pp 3-124 and 3-152). Note: Utility construction acres are not specific to oil and gas activities and include other types of utilities that may be proposed on the WNF. To date, the activity related to roads and utilities is well under the analyzed acreages (see Table 12). Effects from roads are analyzed and disclosed for various resources including: water (EIS, pp 3-20 and 3-21), soil (EIS, pp 3-24, 3-25, 3-28), oak hickory forest (EIS, p 3-51), American burying beetle (EIS, p 3-109), small whorled pogonia (EIS, p 3-111), running buffalo clover (EIS, pp 3-114 and 3-115), bald eagle (EIS, p 3-119), Indiana bat (EIS, pp 3-122, 3-124, 3-125, 3-126, 3-127, 3-128), four-toed salamander (EIS, p 3-140), American ginseng (EIS, pp 3-151, 3-152, 3-153) and NNIS (EIS, pp 3-164 thru 3-166, 3-172, 3-175).

Effects from utilities are analyzed and disclosed for various resources including: water (EIS p 3-21), oak hickory forest (EIS, p 3-5), yellow-breasted chat (EIS, p 3-62), Indiana bat (EIS, pp 3-123, 3-124, 3-127), four-toed salamander (EIS, p 3-140); American ginseng (EIS, 3-151 and 3-152) and NNIS (EIS, p 3-173).

Table 13. Roads and Utilities Acres Analyzed Compared to Acres Occurred To-Date

	Disturbance Analyzed in Forest Plan	Disturbance Occurred	Remaining Disturbance Analyzed
Road needed to support oil and gas activity (miles)*	45	2	43
Utility construction** (acres)	50	13.27	36.73

*It should be noted that a total of 392 acres of permanent road construction or reconstruction was analyzed in the Forest Plan EIS. Of that total, approximately 87 acres (45 miles) would be due to oil and gas activity.

**Utility construction acres are not specific to oil and gas activity and include other types of utilities that may be proposed to cross WNF.

A Forest Scale Roads Analysis was completed in 2002 for the Forest Plan revision. This analysis is located at http://www.fs.usda.gov/detail/wayne/landmanagement/planning/?cid=fsm9_006010 and reviewed the existing condition of the road system on the WNF. The Forest-Scale Road Analysis, page 31, states the following related to mineral management:

“MM (1): How does the road system affect access to locatable, leasable, and salable minerals?”

On the average a well and associated drill pad may cause up to 2 acres of surface disturbance. The location of existing roads (all jurisdictions) will dictate the distance of the access roads construction for access to the drill pad. The closer the pad is to an existing road, the shorter the distance of the new construction. Drill rigs and associated equipment on the roads is a concern, as heavy equipment does most of the damage to a road. The American Association of State Highway and Transportation Officials (AASHTO) estimate that up to 91% of road damage is due to heavy over-the-road equipment. The majority of the damage done to road surfaces are not caused by passenger vehicles or light trucks. This is a concern on FS roads and seasonal closures to this type of activity may be needed in some areas. This will be part of all project level Roads Analysis Process for oil well construction and special use in the future. The heavy concentrations of roads (non system and special use) are primarily a result of mineral exploration and extraction for the past 160 years. Many of these roads are now in need of removal or upgrade if use is to continue on the roads into the future. At the time of renewal of special use agreements for wells where access to the wells is over FDR’s [Forest Development Roads], the need for a road use agreement will be evaluated. The agreement would allow the FS to reclaim expenses associated with the use of our roads by the permittee’s heavy equipment through surface replacement dollars where applicable.”

“Currently the Forest has 3 types of mineral rights on the Forest:

1. Reserve Rights,
2. Outstanding Rights, and
3. Federal Rights.”

“On reserved and outstanding rights and on leased rights the FS must provide access unless it can be easily obtained from private or other public roads and ROWs. On reserve and outstanding rights, the FS authority is somewhat limited.”

Oil and gas activities were also discussed in the water section within the Forest Scale Roads Analysis. This section describes the damage that may be caused to roads from the heavy equipment and frequent truck passings on roadways to and from oil and gas wells.

“The effects to existing roads would differ between hot-mixed paved highways and gravel or other rockbased material roads. Heavy vehicles may cause paved roads to crack, or deteriorate, especially along the edges of the narrower roadways. Gravel and dirt roads may be subject to the formation of ruts, potholes, and washboard effects. The level of impact is dependent upon the amount of activity, weather conditions during the activity and the level of road maintenance

by the governing agency. Direct effects would occur during the drilling and plugging phases of oil and gas operations which usually require the use of heavy vehicles and equipment. A total of 8,384 oil and gas wells were drilled in Wayne National Forest counties for 10 year period 1980-1989, or 838 per year. The present condition of the road systems is partly a consequence of this oil and gas activity. The road system remains in place and continues to be used for travel and access. The counties included in the Wayne National Forest have local frost laws which restrict use of the roads by heavy vehicles when the roads would be most easily damaged during days of freeze and thaw. Vehicle operators are also subject to county road use and bridge weight requirements.” (Forest Scale Roads Analysis, p 22)

“Effects to traffic patterns on the road system within the Forest will vary depending on the location(s) of the proposed well(s) and the time of day the equipment uses these roads.” (Forest Scale Roads Analysis, p 22)

The Forest Plan addresses infrastructure activities and mitigations related to oil and gas development in several sections of the Forest Plan.

Transportation System

SFW-TRANS-4: Allow motor vehicles licensed for travel on the State and Federal highways to use National Forest System roads at Maintenance Levels 2 to 5.

GFW-TRANS-5: Place load limits on roads that are susceptible to damage.

SFW-TRANS-6: All roads are closed to the public unless the Forest road atlas specifically lists them as Maintenance Level 2 to 5 (open to the public).

GFW-TRANS-7: Avoid co-locating motorized trails with Maintenance Level 2 to 5 roads.

GFW-TRANS-8: Avoid new road construction:

- Within 50 feet of OHV or pedestrian trails (except at crossings)
- Within riparian areas
- Within the filterstrips of streams and waterways, except for infrequent crossings
- On mechanically unstable soils.

GFW-TRANS-9: Require permit holders to install and maintain an appropriate physical barrier on special use roads to prevent unauthorized use. If special use roads remain in place without a barrier, the permit holder must reconstruct the road to Maintenance Level 3.

GFW-TRANS-10: New road construction should follow the design guidance provided in Appendix A of the Forest-wide Roads Analysis document.

GFW-TRANS-11: Use existing roads as an alternative to construction of new roads whenever possible.

All State of Ohio and local regulations related to transportation also apply on roads that are not within the jurisdiction of the Wayne National Forest. Local communities can supply more regulation through the use of Roadway Use and Maintenance Agreements (RUMAs) that work specifically with the industries who are using local transportation routes. Amended Substitute Senate Bill 315 amended Ohio

Revised Code to provide for a RUMA to be in place on proposals for horizontal wells prior to submission of an application, between a well owner/operator and the authorities with jurisdiction over the roads proposed for travel (Amended ORC 1509.06(A)(11)(b)).

Standards/Guidelines for Riparian Corridors

Oil/Gas Pipeline Stream Crossings

SFW-ARR-13: Pipelines of nine-inch diameter or larger that cross streams on NFS land must be reviewed by the Ohio Public Utilities Commission and the Federal Energy Regulatory Commission.

GWF-ARR-14: Avoid the use of heavy equipment in flowing streams. Alternatives may include concentric pipe (double pipe) and plowing.

GWF-ARR-15: Encourage the location of pipelines at existing bridges.

GWF-ARR-16: When a pipeline crosses a stream on NFS land, the following should apply:

- Encourage the use of boring to locate pipeline crossings beneath Forest streams where topography, soil, and stream bottom conditions permit.
- Stabilize disturbed soil and protect streamside banks as work progresses.

SWF-ARR-17: Require appropriate technology on all pipelines that cross streams so that supply and flow can be shut off upon detection of a leak.

Infrastructure including pipelines associated with oil and gas activities that are proposed within the boundaries of the leased area are considered during NEPA analysis at the site specific level during the review of the Surface Use Plan of Operations. Additional infrastructure needs outside of the leased area (such as gathering pipelines and roads that are outside of the leased acres) but associated with oil and gas activity are subject to the special use permitting process, which includes NEPA analysis, that is required before occupancy is permitted on National Forest land.

Conclusion:

No additional analysis or protections are needed at the Forest Plan level. The EIS considered effects from transportation systems on various resources. Currently the level of disturbance is well below what was anticipated. The Forest Scale Roads Analysis analyzed and disclosed effects of oil and gas activity on the existing roads system. Measures in the Forest Plan direct that existing roads should be used whenever possible, guide the placement of new roads and direct that permit holders will construct and maintain barriers to prevent unauthorized use of the road. Effects to various resources due to utility needs were analyzed and disclosed in the EIS. Currently the level of disturbance is well below what was anticipated. Measures within the Forest Plan provide for the appropriate protection of resources. Overall the nature of effects both to and due to infrastructure are not anticipated to be different than those analyzed and disclosed in the EIS and Forest Scale Roads Analysis. Thus the level and nature of effect is not anticipated to increase.

PUBLIC SAFETY

Public safety, namely due to increased truck traffic, is of concern in relationship to horizontal drilling activities.

A fundamental agency value of the Forest Service is to operate in a safe manner and to provide a safe environment for the public. It is intrinsic to all projects introduced and implemented on the WNF that safety is the most important factor. If something cannot be completed in a safe manner, then it may not be permitted to move forward into implementation. The Forest Plan identifies the following standard that is to be applied that provides for the health and safety of people and wildlife:

SFW-SAFE-19: Prohibit disposal of non-federal wastewater on federal lands.

Any waste water that originates from oil and gas operations would be considered non-federal and so disposal would not be allowed on Wayne National Forest lands (including roads under jurisdiction of the WNF). In addition, the Ohio Revised Code only allows for 4 different disposal methods of fluids associated with oil and gas operations: injection, surface application (on roads only, and only when permitted by the authority with jurisdiction over the road), enhanced recovery (reuse of the fluids in other wells) or other methods to test new technologies and methodologies (ORC 1509.22(C)(1)). Furthermore, the law specifically states that no one is allowed to place fluids associated with oil and gas operations in surface or groundwater or in or on the land in amounts that cause or could cause pollution of water used for human consumption (or consumption by domestic animals) or damage/injury to public health and safety or the environment (ORC 1509.22).

Other provisions for employees and the public that provide for safety that the WNF will put in place when needed are:

SFW-SAFE-17: Post warnings of dangerous conditions and threats of immediate concern for the safety of Forest employees and the public.

SFW-SAFE-18: Issue closure orders to protect the public when clear and present dangers cannot be mitigated in a timely manner.

It is anticipated that these conditions would exist mostly related to increased traffic along roadways leading to and from potential well sites. The appropriate time to do further analysis on these types of impacts is at the site-specific level, once there is information on well location, transportation needs, travel routes, timing, etc.

The WNF's ability to provide for public and employee safety is not hampered by the ownership status of the minerals. That is, regardless if the minerals are federal or private, the WNF has a responsibility along with state and local authorities to put the appropriate measures in place, when needed, to provide for public safety.

Conclusion:

No additional analysis or protections are needed at the Forest Plan level. Meaningful analysis cannot be done at the Forest Plan level because specific information would be required related to well location, transportation needs, travel routes, timing, etc. The Forest Plan provides for the safety of employees and the public by prohibiting waste fluid disposal, directing that warnings be posted of dangerous conditions and requiring that closure orders be put in place when conditions are such that dangerous

conditions cannot be corrected in a timely fashion. Thus, public safety is not anticipated to be compromised due to potential horizontal drilling activities.

HERITAGE

Horizontal drilling activities create a larger footprint on the ground, so there could be increased impacts to heritage resources.

The EIS states the following in relationship to heritage resources:

“Significant differences in effects to heritage resources by alternative implementation are not expected. Because law, regulation, and policy explicitly control heritage resource management on Federal lands, Forest management practices and their effects would not differ substantially among the alternatives (*referring to the various alternatives considered during the Forest Plan revision*). Forest management projects may cause surface disturbances and bring additional people in contact with heritage resources, but the difference between alternatives would remain low because of the protection and mitigation measures common to all alternatives. In general, alternatives that would result in more acres of planned and budgeted management activities could reduce adverse cumulative effects to some degree, due to an increase in inventory and evaluation. However, this additional management may also bring more possibility of inadvertent damage. Again, the protection and mitigation measures common to all alternatives would provide for identified site integrity.” (EIS, p 3-313)

Several federal laws provide protection to heritage resources, including the National Historic Preservation Act of 1966 (NHPA), as amended, National Environmental Policy Act of 1969 (NEPA), Archaeological Resources Protection Act at 1979 (ARPA), Native American Grave Protection and Repatriation Act (NAGPRA), Executive Order 13007 – Native American Sacred Sites, Sections 2360-2361 of the Forest Service Manual (1990), and the National Heritage Strategy (1999). These laws mandate the survey of project areas to determine if there are sites or artifacts present. Forest-wide standards, SFW-HERT-5, directs that sites that could be affected by Forest Service actions will be surveyed for heritage sites. If found, the areas are investigated and catalogued. A determination is made as to whether the site is eligible for the National Register of Historic Sites. Depending on the significance of the site and the level of disturbance proposed, avoidance measures are developed. For federal minerals, compliance with the law is ensured through Notifications and Stipulations (Forest Plan Appendix H, Notifications 1 and 4 and Stipulation 7) attached to a lease at the time of sale. Notification 1 discloses the mandatory nature of surveys for heritage resources and potential limits to occupancy based on the findings of the surveys. Notification 4 incorporates all applicable laws and federal regulations that apply to Federal lands as well as the Forest Plan into the lease. SFW-HERT-6 and SFW-HERT-7 provide protection for sites that have not been evaluated. Operators are required to comply with those measures. Stipulation 7 notifies the leaseholder that there are known heritage resources present within the lease parcels and that there is no surface occupancy in order to protect those resources.

Sites of lesser significance would not be protected by law. In the case of federal minerals; however, the WNF has the authority to require the operator to alter surface plans so that these areas are avoided as

well (SFW-MIN-2). In the case of private minerals, WNF staff would be able to negotiate with the minerals holder to avoid these areas, but could not require that the areas be avoided.

Regardless of minerals ownership, operators are directed to cease activities if potential heritage resources are inadvertently discovered during implementation (National Historic Preservation Act implementing Regulations found at 36 CFR 800 and SFW-HERT-15). Heritage staff will assess the site to determine its significance. Necessary avoidance measures will be developed as appropriate to protect the resources.

Conclusion:

No additional analysis or protections are needed at the Forest Plan level. The EIS discloses that inadvertent damage to heritage resources may occur as a result of Forest Plan implementation. The nature of effects would not change from those described in the EIS if horizontal drilling were to occur. Various federal laws and the Forest Plan provide protection to heritage resources through the mandatory survey of areas of proposed disturbance and the avoidance of significant sites discovered. When resources are found they are protected to the appropriate level. Thus the nature and level of effect is not anticipated to increase.

SOILS

The larger footprint associated with horizontal drilling could create greater impacts to soil resources related to erosion and compaction.

For minerals activity, the EIS considered water and soil resources together:

Mineral exploration and development can affect soil and water by increasing erosion and sedimentation, soil compaction, and water yield. In many cases soil productivity is reduced and turbidity and/or sedimentation may increase. The potential seepage or spillage of toxic substances from mining facilities or disposal areas may also pose a threat to water quality. (EIS, p 3-18)

The EIS expands on soil erosion:

“Serious erosion is usually limited to road use during excessively wet periods where roads are poorly located or lack erosion control devices. This effect is most likely on unauthorized roads and trails. Intermingled farms and rural roads, rather than forested land, are the major sources of soil erosion. In addition, serious soil erosion is common on private forest land, often caused by poor road location and lack of erosion control during and after logging operations.” (EIS, p 3-22)

“The key to sustaining soil productivity, hydrologic function, riparian integrity, and water quality in the long-term is protection of the forest floor and associated soil properties and qualities through implementation of Forest Plan standards and guidelines. With successful revegetation of bare soil areas, erosion and sedimentation rates should diminish rapidly to pre-disturbance or background levels within three years. The greatest decrease in these respective rates should be

achieved in the first two growing seasons. Soil erosion risk is at its maximum immediately after soil disturbing activities are completed.” (EIS, pp 3-18 and 3-19)

The 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 parcel.

Appendix H – Lease-specific Oil/Gas Stipulations

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.

Stipulation #8

No Surface Occupancy – Slopes in Excess of 55 Percent

No surface occupancy 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 Soil 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 #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.

The following standards and guidelines show the primary guidance related to soils for many management operations including those related to horizontal drilling and fracturing operations.

Soil Resources

GFW-WSH-10: Modify resource management practices according to soil characteristics and slope to protect soil productivity and minimize erosion and sedimentation. Refer to soil map unit descriptions and appropriate interpretive tables in the Wayne National Forest Soils Inventory (based on the USDA County Soil Surveys).

GFW-WSH-11: Plan and implement erosion control measures for management activities that create bare mineral soil conditions. Stabilize disturbed areas based on direction in SFW-WSH-6, and GFW-WSH 7 and GFW-WSH-8.

Filterstrips

GFW-ARR-5: Where earth-disturbing activities expose mineral soil, establish filterstrips along water bodies.

- Filterstrip width along perennial water bodies should be a minimum of 100 feet, measured horizontally from the edge of the aquatic ecosystem.
- Filterstrip width along intermittent streams should be a minimum of 75 feet, measured horizontally from the edge of the aquatic ecosystem.
- Filterstrip width along ephemeral water bodies should be a minimum of 50 feet, measured horizontally from the edge of the aquatic ecosystem.

GFW-ARR-6: Earth-disturbing activities that expose mineral soil may occur within the filterstrip only if effective sediment control measures that minimize and/or mitigate any detrimental effects are employed.

Federally and Privately Owned Minerals

SFW-MIN-2: Require that all proposed surface-disturbing mineral activities have an approved operation and reclamation plan before the activity begins.

SFW-MIN-3: Require that operators conduct activities and maintain equipment to prevent the discharge of oil or brine onto the ground or into surface waters.

SFW-MIN-5: The operator, as directed by Ohio EPA, is responsible for remedial action for cleanup of soil and water resources and timely repair of damaged wells, pipelines, or tanks.
Federally Owned Minerals

SFW-MIN-10: Within management areas where surface occupancy is generally permitted, apply the No Surface Occupancy stipulation for new Federal leases where the following conditions occur:

- Slopes in excess of 55 percent and areas prone to mass soil movement

Scenery Management

Minerals and Geology / New Projects

GFW-SM-54: Native soil should be removed and stockpiled before ground disturbance.

Transportation System

GFW-TRANS-8: Avoid new road construction:

- Within 50 feet of OHV or pedestrian trails (except at crossings)
- Within riparian areas
- Within the filterstrips of streams and waterways, except for infrequent crossings
- On mechanically unstable soils.

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 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.

Conclusion:

No additional analysis or protections are needed at the Forest Plan level. The EIS analyzed and disclosed effects that may occur to the soil resource as a result of oil and gas activity. The nature of these effects would not change if horizontal drilling were to occur. Measures in place within the Forest Plan provide for the appropriate protection of soil regardless of the scale of operation. Thus the nature and level of effect is not anticipated to increase.

SUMMARY STATEMENTS

It has been a concern of the public that the Forest Plan, programmatic EIS and associated planning documents do not discuss or analyze the effects of horizontal drilling and HVHF operations. Part of the purpose of the review of new information that was conducted was to determine if and how adequately the potential effects of horizontal drilling and HVHF activities are considered in the Forest Plan, programmatic EIS and associated planning documents. Horizontal drilling methods were discussed in the RFDS by stating that the activity was not likely to be economically feasible at the time (EIS Appendix G, p G-5); however, also mentioned was the possibility that the bottomhole of a well could be offset from the wellhead (EIS Appendix G, p G-4) and that 12 horizontal wells had been drilled within the counties that comprise the WNF between 1992 and 2002 (EIS Appendix G, p G-5). The programmatic EIS goes on to recognize that horizontal drilling techniques could be used to access minerals with a No Surface Occupancy Stipulation (EIS, pp 2-33 and 3-266). This suggests that while horizontal drilling was forecasted to be not economically feasible, it was seen to be a possibility during the first ten years of Forest Plan implementation.

The ID Team working on this review considered effects from horizontal drilling using HVHF methods on water resources, wildlife, forest fragmentation, botanical resources, air quality, public safety, heritage resources and soils. In addition, the team considered specific issues not directly related to resources including waste disposal, noise and light pollution and infrastructure and transportation. No effects were identified during this review process that are markedly different from those disclosed and analyzed in the existing Forest Plan EIS and supporting planning documents. The potential effects are different in scale or quantity, as exemplified by water consumption. However, the overall effects across the analyzed resources will be within those disclosed in the Forest Plan EIS. This is due to a few factors:

- 1.) The pace of oil and gas development to date has been well below that envisioned by the original Forest Plan RFDS.
- 2.) Measures in the Forest Plan allow the WNF to restrict activities so that potential effects are within the range of those analyzed and disclosed in the programmatic EIS

- 3.) The state of Ohio has kept pace with technological developments and has updated regulations in response to those developments. These updates manage the activity so that effects to WNF surface resources are essentially the same.

Over the first ten years of Forest Plan implementation, acreage of disturbance and similar indicators will not approach those disclosed in the Forest Plan EIS

Discussions found in the SIR are based on investigations into contents of the Forest Plan, programmatic EIS and associated planning documents; the rules and regulations of other federal and state agencies; and the best available science. The information contained within this SIR will be used by the Forest Supervisor to make a determination on the sufficiency of the Forest Plan, programmatic EIS and associated planning documents in relationship to analyzing and disclosing the potential effects of oil and gas activities with the incorporation of horizontal drilling methods, and, in combination with existing laws, rules and regulations, providing for the adequate protection of people and natural resources.

References Cited

36 C.F.R. § 228.102

36 C.F.R. § 800.3

40 C.F.R. § 1502.9

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