EXECUTIVE SUMMARY

New Information

In 2006, a programmatic EIS and revised Forest Plan were finalized for the WNF. The Forest Plan decision made all federally-owned minerals administratively available to be leased (Record of Decision, p 14). This programmatic decision was developed based on projections finding that horizontal drilling was "still not yet economically feasible" (EIS Appendix G, 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, pp 2-33 and 3-266).

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, 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).

Recent developments in technology, coupled with high energy prices have led to the increased development of shale-gas resources within the Appalachian region, including northern and eastern Ohio, through horizontal drilling using high-volume hydraulic fracturing (HVHF) techniques. The Bureau of Land Management (BLM) has reviewed the Reasonably Foreseeable Development Scenario (RFDS, Appendix G to the EIS, reproduced in this report as Appendix B), which contains the projections that informed the Forest Plan Record of Decision (ROD). In a letter dated May 3, 2012, the BLM documented that review and the determination that 13 horizontal well sites (10 on the Marietta Unit and 3 on the Athens Unit) could occur on the WNF for the remainder of the first 10 years (2006-2016) of Forest Plan implementation (Appendix C). This letter also compared conventional vertical wells to horizontal well sites (Table 1 below) so that WNF specialists could review the Forest Plan, EIS and associated planning documents in light of the new information. The BLM concluded the letter by stating that because the actual level of activity (20 acres of initial disturbance, scaled back to 10 acres of sustained disturbance) is substantially lower than what was anticipated, the incorporation of horizontal drilling activity is still within the original projection, thus the RFDS does not need to be revised.

Because the BLM has determined that horizontal drilling using HVHF is now economically feasible, the WNF has conducted a review in order to determine the sufficiency of the Forest Plan, EIS and associated planning documents in light of the new information. This review is documented in the Supplemental Information Report (SIR) and 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?

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

	Vertical Well Pad Site	**Horizontal Well Pad Site**
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

The questions to be answered are whether the Forest Plan EIS should be supplemented or revised, and if so, whether the Forest Plan should be amended to assure that 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 in 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.

When evaluating potential effects associated with the revised RFDS, it is important to note that the ownership patterns and the regulatory environment for minerals on the WNF are complex. Approximately 59% of the WNF surface lands are underlain by privately owned minerals. The remaining 41% of surface lands are federal minerals that are or can be leased. When federal minerals are leased, the BLM plays a large role in administering the lease sale and overseeing the "down hole" operations, such as the proper casing and cementing of the well. This oversight is shared with the Ohio Department of Natural Resources Division of Oil and Gas Resource Management (DOGRM). When the minerals are privately owned the BLM is not involved and the oversight of the "down hole" operations falls solely to the DOGRM. When minerals are privately owned the WNF negotiates with the mineral owner related to measures that will protect surface resources. Regardless of minerals ownership, the WNF's primary responsibility is to manage surface disturbing activities.

Issue Areas/Resource Reviews

Reviews were conducted of the following issue areas/resources: water, wildlife, forest fragmentation, botany, waste disposal, noise and light pollution, air quality, infrastructure, public safety, heritage and soils. During the reviews, specialists determined how the Forest Plan, EIS, associated planning documents, existing laws, rules and regulations addressed each issue area or resource.

It is important to note that a complete picture of how issue areas/resources are addressed through the Forest Plan, EIS, associated planning documents, laws, rules and regulations can not be reached through a reading of this summary alone. Far greater detail and discussion is provided in the full SIR and Appendices.

Water Resources

Considerations for the water resource review focused on contamination and depletion risks for both groundwater and surface water resources. Potential contamination threats posed to water resources from HVHF associated activities include: inadequate cementing or defective casing of the well, upward migration of fluids from the hydraulic fracturing zone, accidental releases at the surface, disposal of wastes and erosion and sedimentation.

Comments were received from members of the public during the review process related to an 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 USFS and the BLM entered into an inter-agency 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. In addition to other

responsibilities, the USFS is responsible for identifying and notifying the BLM of groundwater resources that may require protection.

Oil and gas wells undergoing hydraulic fracturing, whether low or high-volume (low-volume wells were considered in the EIS Appendix G, pp G-7 and G-8, see discussion on hydraulic fracturing fluids later in this summary) are constructed in a very similar manner to protect underground sources of drinking water. Lengths of steel pipe, called casing, are set in the wellbore and cemented into place. Appendix G of the EIS, 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 of 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 (excepting those provisions delegated to the Environmental Protection Agency in federal law) is delegated to the DOGRM (ORC 1509.02). 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 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.

Ohio has extensive oil and gas laws, rules and regulations (found at http://codes.ohio.gov/orc/1509 and http://codes.ohio.gov/oac/1501%3A9), which are administered by the DOGRM. Provisions in existing oil and gas law and/or the regulations developed in order to implement it include minimum setbacks from water features; considerations of additional terms and conditions in wellhead protection areas or 100-yr floodplains; water well testing prior to permit issuance; information included on permit applications; rules for the construction of wells (including blow-out preventing equipment; casing and cementing standards; additional requirements when drilling through a mine void and pressure testing to insure the integrity of equipment, casing and cement); notification of state inspectors prior to casing, cementing and stimulating a well; submission of reports detailing types and volumes of fluids used to stimulate a well, the method used for containing the fluids that returned to surface, pumping pressure and rate achieved and the name of the company that performed the stimulation; specifications for the acceptable equipment or structures for the temporary storage of wastes; requirements for the

transportation and disposal of wastes; disclosure of the exact makeup of fracturing fluids to emergency response personnel in the case of an emergency situation and additional restrictions in place in urbanized areas. An important feature of the law is the provision making the well owner and/or operator liable for any violation of laws, rules or regulations. In the case where water supply has been "substantially disrupted by contamination, diminution or interruption" because of an oil and gas operation, the well owner must replace the water supply or pay for the difference in value before and after the damage occurred. A thorough discussion on Ohio oil and gas law is found in the full report (please see the discussion on Ohio oil and gas law and rules and regulations found within the full text of the SIR, pp 26-31, 34-39, 41-42, 45, 72, 75-76, 78-79, 84).

ODNR has also developed a manual titled "BMPs and Recommendations for Oil and Gas Activities on State of Ohio Lands". These BMPs address many of the surface land impacts.

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).

Accidental releases are a possibility for oil and gas operations regardless of techniques and scale of operation. 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. The programmatic EIS recognizes that accidental releases are a possibility and pose a threat to water resources (EIS, p 3-18). 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). Forest-wide standards and guidelines were also developed to protect water bodies by establishing filterstrips guidance (GFW-ARR-5). Filterstrips can be increased when needed. Additional measures in the Forest Plan (guidelines, notifications and stipulations) further limit activities in close proximity to surface waterbodies. In particular, Notification 2 and Stipulations 15 and 16 (Forest Plan Appendix H) give the WNF the authority to restrict oil and gas activities on parcels within or near wellhead protection areas

and areas of high-yielding aquifers (see maps, Appendix D to the SIR). Areas of high-yielding aquifer are those recognized by the Ohio Department of Natural Resources to produce 25 gallons or more per minute. These restrictions allow for prohibiting surface occupancy on the portions of the parcels overlying these sensitive areas.

Hydraulic fracturing fluids and flowback were 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 describes a closed system and was 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 that which might occur at a conventional oil and gas well.

Again, the DOGRM has a great deal of authority to direct activities to prevent accidental releases or contain them in the event a release occurs (please see the discussion on Ohio oil and gas law and rules and regulations found within the full text of the SIR, pp 26-31, 34-39, 41-42, 45, 72, 75-76, 78-79, 84). Any spill that occurs constitutes a violation of Ohio state law and would be reported to the OEPA.

The state of Ohio is the primary regulator of waste disposal from oil and gas activities (please see the discussion on Ohio oil and gas law and rules and regulations found within the full text of the SIR, pp 26-31, 34-39, 41-42, 45, 72, 75-76, 78-79, 84). The Forest Plan has additional measures in place that limit the potential disposal methods. A Forest-wide standard (SFW-SAFE-19) prohibits the disposal of non-federal wastewater on federal lands. Wastewater associated with oil and gas operations is considered non-Federal and would not be allowed on the Wayne National Forest, so road application of brine will not occur on the WNF. This standard can also be used to prohibit the siting of injection wells on the WNF.

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). Forest-wide standards and guidelines provide the operator with direction applicable to various activities associated with land disturbance in order to minimize erosion and sedimentation (GFW-ARR-4, GFW-ARR-5, GFW-ARR-6, SFW-ARR-7, GFW-ARR-8, GFW-ARR-9, SFW-ARR-10, SFW-ARR-11, GFW-ARR-12, GFW-ARR-23, GFW-ARR-29, GFW-WSH-8, Notification 2, Notification 4, Stipulation 15).

The DOGRM developed a manual titled "Best Management Practices for Oil and Gas Well Site Construction", which discusses methods to reduce erosion and sedimentation. Adherence to this manual is built into a permit issued by DOGRM (EIS Appendix F1, pp F1-120, F1-122 and EIS Appendix F3, pp F3-28, F3-31, F3-54, F3-60, F3-66, F3-72). Provisions in Ohio law are also concerned with minimizing erosion to the extent possible (please see the discussion on Ohio oil and gas law and rules and regulations found within the full text of the SIR, pp 26-31, 34-39, 41-42, 45, 72, 75-76, 78-79, 84).

The depletion of ground and surface water due to pumping and usage for HVHF was explored. 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 to 4 million gallons of water required for the typical hydraulically fractured well. Therefore, it is unlikely operators would attempt to use groundwater on most of the WNF. There is potential for sufficient quantities of groundwater along major river corridors. A similar scenario exists with regards to surface water. 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.

Because Ohio is a state governed by the reasonable use doctrine, an operator that wants to pump and use ground or surface water from larger river corridors where they pass through the National Forest would need to get WNF approval to do so. If the WNF receives an application to drill water wells or pump surface water, that activity would be considered on a case- by- case basis. 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" and "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). Forest-wide direction (GFW-WSH-1) instructs that the WNF will not allow water diversion 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. While this guideline specifically mentions diverting water from surface sources, it would also be applicable to groundwater pumping because 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.

Overall, elements of the Forest Plan considering effects to water resources from oil and gas activities would also be applicable to horizontal drilling and HVHF. No additional effects or increased effects are anticipated.

Wildlife Resources

Wildlife resources figure heavily into the development of any activity on the WNF. The wildlife resource review considered several areas related to horizontal drilling using HVHF techniques including reserve pits, hydraulic fracturing fluids, flowback, fluid retention ponds, runoff, accidental releases, water withdrawal, fresh water ponds, acres of surface disturbance, location and effects to federal threatened or endangered and Regional Forester sensitive species (collectively referred to as "TES") and aquatic and riparian resources. The review considered the latest additions to TES lists.

Potential effects to wildlife species from oil and gas activities were considered within the EIS and planning documents to the Forest Plan, specifically within the Biological Assessment for 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 RFSS (EIS Appendix F3). WNF staff reviewed this information to determine if the effects to wildlife from horizontal drilling using HVHF techniques would be markedly different from those analyzed and disclosed in the previous programmatic evaluation.

In the EIS, potential effects to TES wildlife species due to oil and gas development were analyzed based on the projections for surface disturbance and the activities described related to oil and gas development, both contained within the RFDS (EIS Appendix G).

Reserve pits for the containment of drilling muds and well cuttings, were discussed in the RFDS (EIS Appendix G, p G-6). A US Fish and Wildlife Service report (Ramirez 2009) has recognized reserve pits as a potential hazard to insects, amphibians, small mammals, birds and bats; however the report acknowledges that during the drilling process the pits probably do not attract wildlife due to the human activity and noise. Ohio Revised Code (ORC 1509.072) requires the timely closure of reserve pits (14 days in urbanized areas, 2 months elsewhere), thus minimizing the potential for wildlife to come into contact with the contents of the pit.

Hydraulic fracturing fluids and flowback were described in the RFDS (EIS Appendix G, pp G-7 & G-8) as being contained in a closed system. 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. The US Fish and Wildlife Service report (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)."

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. A forest-wide standard (SFW-MIN-2, listed in the Water section) and Notification 3 (Forest Plan Appendix H, listed below) 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.

> **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 Notification 3 deals with protections of TES species and states that if detrimental effects may occur the operators plans may be restricted, and because open storage of hydraulic fracturing fluids may cause detrimental effects to the federally endangered Indiana bat; the Regional Forester sensitive species little brown bat, northern bat and tri-colored bat; and aquatic RFSS, it can be used along with SFW-MIN-2 to require a closed system or some other method that prohibits contact of wildlife with hydraulic fracturing fluids be used.

The Forest Plan, EIS and associated planning documents have addressed effects to wildlife species from runoff and accidental releases at various locations for a host of species (including EIS Appendix F1, pp F1-59, F1-120, F1-122, F1-130; Appendix F2, pp 66; Appendix F3, pp F3-23, F3-86, F3-93; Forest Plan standards SFW-MIN-3, SFW-MIN-4, SFW-MIN-5).

Impacts to wildlife species from the withdrawal of water for HVHF operations has been addressed by the Forest Plan, with GFW-WSH-1, which allows the WNF to prevent the withdrawal of water from WNF lands if that withdrawal may affect other uses of that water. Various measures within the Forest Plan, including lease notifications and stipulations (Appendix H to the Forest Plan) and standards and guidelines provide protections for aquatic and riparian resources.

For acres of surface disturbance, the RFDS for oil and gas projected 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)(EIS Appendix G, p G-1, also see EIS, p 3-18, Table 3-8 and p 3-262, Table 3-69). These are the acres which were the focus for analysis within the EIS and associated planning documents. Whether a vertical or horizontal well site is created,

the acres described above (272 acres development and 121 production phase) were analyzed as upper limits for the first decade of the Forest Plan. There are no restrictions within the Forest Plan for acreage size limits for well pads. Thus as long as the cumulative total of disturbed acres are below what was projected (272 acres development and 121 acres production phase) the acreage effects are within what was analyzed and disclosed for 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).

Various measures within the Forest Plan, including lease notifications and stipulations (Appendix H to the Forest Plan, reproduced here as Appendix A) and standards and guidelines provide protections for TES species. Recently, additions were made to the federal list of threatened and endangered species and the Regional Forest sensitive species list for the WNF. The WNF reviewed these newly listed species and determined that the Forest Plan and the associated management activities have appropriate protections already in place (USDA FS 2012b, USDA FS 2012c and 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).

Overall, elements of the Forest Plan considering effects to wildlife species from oil and gas activities would also be applicable to horizontal drilling and HVHF. No additional effects or increased effects are anticipated.

Fragmentation

Issues related to fragmentation figure into the development of activities on the WNF. Within the Forest Plan, management areas incorporate varying degrees of fragmentation, by way of outlining percent ranges dedicated to openlands, early successional habitat and varying ages of forest (see Desired Future Condition for the various management areas, Forest Plan Chapter 3). This management area direction can be utilized in considering the location of well pads at the site specific level.

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 Table 1 and the paragraph in the wildlife resources section dealing with acres of surface disturbance, 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 (e.g. horizontal well pads), 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 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 of 26 percent (number of sites). 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.

The incorporation of horizontal wells will reduce the number of development sites on the landscape when compared with vertical well development as described above, thus would be viewed as a beneficial impact with regards to fragmentation.

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, or employ interim reclamation measures, such as the spreading of topsoil and seed, in order to provide habitat as quickly as possible

The Forest Plan incorporates fragmentation in varying degrees into the different management areas. 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. 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

Horizontal drilling using HVHF methods could cause increased effects to botanical resources from loss of habitat and from accidental releases of contaminants.

Botanical resources figure heavily into the development and analysis of any activity on the WNF. Within the planning documents for the Forest Plan, plants and their habitats are considered in four main categories: federal threatened and endangered species, Regional Forester Sensitive Species, 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 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 (including EIS Appendix F1, pp F1-142, F1-160, F1-175, F1-193, F1-194). The two main risks to botanical resources from oil and gas development considered during the 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, F1-193, F1-194). These risks were analyzed based on projections of activity provided in the RFDS. Standards and guidelines were created and together with notification and stipulations, avoid and mitigate effects to federal threatened and endangered and Regional Forest sensitive species, thus the effects analysis is still valid. The level and nature of effect is not anticipated to increase.

Information contained within the wildlife, fragmentation and botany reviews conducted by the WNF were provided to the US Fish and Wildlife Service. In a letter dated June 18, 2012 (Appendix G to the SIR), 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 (EIS Appendix F2). 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 federal threatened or endangered 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 federal threatened or endangered species with regard to the Forest Plan.

Waste Disposal

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

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. Thus, disposal of fluids associated with HVHF will not occur on the Wayne NF.

The disposal of solids and fluids used or created in the drilling, stimulation and production of oil and gas is regulated by DOGRM (please see the discussion on Ohio oil and gas law and rules and regulations found within the full text of the SIR, pp 26-31, 34-39, 41-42, 45, 72, 75-76, 78-79, 84). Solid waste must be removed from site for disposal and fluid waste disposal is limited to four methods: road application, injection into a Class II well, enhanced recovery or new methodologies approved as technology advances (disposal of fluid waste is further limited on the WNF by measures in the Forest Plan – see previous paragraph). 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.

While the volume of wastes associated with HVHF will be larger than in conventional wells, the nature and level of effects are not anticipated to change because of the measures in place in the Forest Plan and Ohio law.

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 various species due to noise and human interaction are analyzed and disclosed in the EIS and associated planning documents, including the Indiana bat (EIS Appendix F2, pp 48-49 and 55-56) and the running buffalo clover (EIS Appendix F2, p 74). Because horizontal drilling may involve the drilling of several wells from the same pad, noise and human disturbance would likely last for a longer timeframe than at conventional wells. However when the effects to the Indiana bat from noise and human disturbance from oil and gas well activities were considered, the analysis refers to the effects that may occur due to logging operations. Logging operations take more time to complete than the 3-5 days estimated in the RFDS for well drilling, thus the effects analysis considered a longer timeframe more like that which might occur at a horizontal well site. Furthermore, the Forest Plan has measures that allow the WNF to address noise and light pollution, including scenery management guidelines (GFW-SM-21, GFW-SM-23, GFW-SM-24, GFW-SM-25, GFW-SM-64) related to towers and a lease notification/stipulations (Notification 3, Stipulations 12 and 13) related to protections for federal threatened or endangered species and Regional Forester sensitive species. 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. 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. In "urbanized areas" (see definition, Appendix H to the SIR) the DOGRM attaches additional terms and conditions on a permit related to controlling noise and light pollution. Parts of the WNF are considered urbanized areas (see maps, Appendix D to the SIR).

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

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 and wildfires, while other management activities would have only negligible effects on air quality (EIS, pp 3-30 and 3-31). Forest Plan Goal 9.1 guides WNF to ensure that management activities on the National Forest comply with federal and state laws protecting air quality. Forest-wide guidelines instruct WNF to coordinate with air quality regulatory authorities. Additional guidance is provided in the USFS manual titled "Emission Reduction Techniques for Oil and Gas Activities".

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).

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 p 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, with 2 miles of road and 13.27 acres of utilities having been developed (see Table 12 in the SIR).

The Forest Plan addresses infrastructure activities and mitigations related to oil and gas development with standards and guidelines related to transportation and location of pipelines. In addition there is the 2002 Forest-Scale Road Analysis, which disclosed effects to different standards of roads from oil and gas activities (pp 22 and 31) and noted that a site specific analysis of roads would be conducted when specific proposals were received (p 31). A recent update to Ohio's oil and gas law requires operators to attempt to enter into a Road Use Maintenance Agreement with local governments (Ohio Revised Code 1509.06(a)(11)(b)).

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. The level of effect due to

infrastructure needs associated with horizontal well development is not anticipated to increase above the levels analyzed and disclosed in the EIS, due to the protection measures already in place.

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. 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).

Forest-wide standards direct the WNF to post warnings of dangerous conditions or to consider closing areas that present dangers to the public.

> **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. However, meaningful analysis cannot be done at the Forest Plan level. A meaningful assessment would require information on well location, transportation needs, travel routes, etc. That is not available at this time.

The Forest Plan provides for employee and public safety 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)

Impacts to heritage resources (pre-historic and historic) figure heavily into the development and analysis of any activity on the WNF. Numerous federal laws provide protections to cultural heritage resources. Potential lessees are made aware of WNF's responsibility to conduct surveys and protect sites of significance through notifications and stipulations attached to parcels at the time of leasing. Sites that are eligible for listing with the National Register of Historic Places are protected from disturbance by federal statute. Sites that are of less significance can still be protected through site specific mitigation measures put in place when a proposal on a federal lease is received. Operators are directed to cease activities if potential heritage resources are inadvertently discovered during implementation. Heritage staff will assess the site to determine its significance. Necessary avoidance measures will be developed as appropriate to protect the resources. These measures are in place and effective, regardless of the scale of oil and gas operation. Because of the mandatory nature of surveys and avoidance measures, the nature and level of effects is not anticipated to increase.

<u>Soils</u>

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

The EIS discloses that effects to soil resources from oil and gas activities may occur, namely increased erosion and compaction and decreased productivity (EIS, p 3-18). Notification and stipulations (Forest Plan Appendix H, Notification 5, Stipulations 8, 9 and 17) acknowledge that some areas on the WNF are not suitable for construction activities, and thus prohibit or limit occupancy in those areas. The nature of effects possible to soil resources would not change from what is described in the EIS. The Forest Plan contains various Forest-wide standards and guidelines that protect soil resources and/or conserve them on-site to be put back in place once construction activities are completed (GFW-WSH-10, GFW-WSH-11, GFW-ARR-5, GFW-ARR-6, SFW-MIN-2, SFW-MIN-3, SFW-MIN-5, SFW-MIN-10, GFW-SM-54, GFW-TRANS-8). The EIS notes that, "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" (EIS, p 3-18). Horizontal drilling using HVHF creates a larger disturbance, so there is possibility for more erosion and more compaction. However, the existing notifications, stipulations, standards and guidelines would apply to

horizontal drilling and HVHF activities, and would likewise prevent adverse effects, so that the effects analysis is still valid. Thus the nature and level of effect is not anticipated to increase.

Summary

The potential effects of HVAF are not different in kind from the effects of conventional drilling, or horizontal drilling as considered in the Forest Plan EIS. They are, however, potentially different in scale or quantity, as exemplified by water consumption. However, the overall effects across the analyzed resources will be within limits disclosed in the Forest Plan EIS. That is because the pace of development to date has been well below that envisioned by the original Forest Plan RFDS, measures in the Forest Plan are applicable and effective regardless of the scale of operations and the State of Ohio has kept pace with technological developments so that the effects to WNF surface resources are not markedly difference than those analyzed in the programmatic EIS. Over the planning period, acreage of disturbance and level of effects will not exceed 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 the 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, mitigating 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 appropriate protection of people and natural resources.