CHAPTER 4A - EFFECTS ANALYSIS

ALTERNATIVE A

To offer 63 tracts (4,634 acres) of National Forest lands (Appendix 7, table 4 for tract list, Appendix 12 for maps) for oil and gas leasing with standard surface protection stipulations (Appendix 7-Table 8a) and the application of Best Management Practices (Appendix 9).

4.1 Forest Fragmentation

Direct and Indirect Effects

Direct effects associated with implementing this alternative includes habitat fragmentation by physical reduction of the area of the original habitat; alteration of habitat within and surrounding remnant habitats; isolation of populations dependent on the remaining patches; and increasing edge habitat relative to interior habitat (Crow 1990; Saunders et al. 1991). Saunders et al (1991) noted that the two primary effects of ecosystem fragmentation are alteration of the microclimate and isolation of remnant patches in the landscape, producing changes in the physical environment and biogeographic changes. Crow (1990) noted that fragmentation has been linked to the extirpation of a wide variety of organisms, including birds, mammals, amphibians, reptiles, plants, and insects. The extent of these effects depends upon the size, shape, and position in the landscape of individual remnants (Saunders et al 1 991). Harris (1984), in discussing forest fragmentation and island biogeography theory, noted that character of the land or matrix surrounding an old-growth forest island greatly affects the effective size of the old-growth island. Mcintyre and Barrett (1992) noted that the concept of fragmentation implies that habitat remnants are isolated by areas that function as hostile environments to the organisms within the remnants. They also noted that while many examples of such fragmentation can be cited, there are other situations where the intervening areas are modified versions of the original ecosystems and do not present the same barriers to native species as seen in other fragmented landscapes (1992 Plan Amend#8-FEIS).

Saunders et al (1991) noted that fragmentation of the landscape changes physical fluxes and that alterations in fluxes of radiation, wind, and water can all have important effects on remnant native vegetation. Higher temperature, higher winds, higher solar radiation, and lower humidity resulting from openings can cause a change in plant communities adjoining openings and edges. Forest plant communities and plant species requiring full shade and mesic conditions can be expected to decline near edges, while plant species adapted to high light levels

and drier conditions increase. Introduction and invasion of non-native, weedy plants is an indirect impact of forest fragmentation.

Microclimatic, structural and landscape changes resulting from fragmentation can alter animal communities associated with different plant communities associated habitats. Small openings and edges from new federal oil and gas leases would affect animal communities and add, to some extent, to effects attributed to forest fragmentation. Wilcove (1988) suggested that fragmentation affects certain species of forest interior birds and that there is evidence that other fauna, including certain mammals, amphibians, and reptiles, although not at well studied, are also affected. Forest fragmentation can create barriers to dispersal; eliminate the full range of microhabitats required by some organisms; isolate small populations which may have problems with population fluctuations, genetic deterioration, and habitat changes; introduce edge effects such as increased nest predation and parasitism in birds; and increase human disturbances and interactions with humans which may affect some animals (Wilcove 1988, Terborgh 1992). Microclimatic and other habitat changes may also destabilize competitive, predator-prey, and parasitic interactions (Saunders et al 1991); for example, elevated springtime temperatures on tree trunks at the forest edge may allow larvae of insects inhabiting tree trunks to emerge before their parasites, which emerge from the cooler forest floor, resulting in population buildups of the tree trunk insects. The degree of isolation of habitat remnants influences fragmentation effects.

Irreversible and irretrievable commitment of resources

The effects associated with forest fragmentation are irreversible and irretrievable but are expected to be less than significant.

Cumulative Effects

Declines in populations of neotropical migrant birds in the eastern deciduous forest have been linked to forest fragmentation in the temperate zone where these species breed and to destruction of tropical habitats where they winter (Robbins et al 1989, Askins et al. 1990, Robbins 1979, Terborgh 1992). Many of the forest-nesting neotropical migrant bird species that Robbins et al (1989) found to be declining, such as the Acadian Flycatcher, Wood Thrush, and Cerulean Warbler, also occur in the Wayne National Forest. While Peterjohn and Rice (1991) also indicated concern over population declines in Ohio of some forest-nesting neotropical migrant species which Robbins et al (1989) reported to be declining, they indicated stable or increasing trends in Ohio for some of the species, such as the Acadian Flycatcher and Eastern Wood Pewee. Thompson et al (1992) noted that forest fragmentation increases the proportion of forest edge to forest interior. In several field studies nesting success of songbirds is lower near forest edges than in the forest interior. Population and habitat modeling have shown that edge effects alone are sufficient to explain the

distribution and decline of forest interior species in fragmented habitats. However, Thompson (1992) stated that studies in Missouri suggest that in extensively forested areas, forest management by clearcutting is compatible with the maintenance of viable populations of neotropical migrant birds, although some species of forest interior birds will be less abundant, and others more abundant than In forests with no timber harvest.

Activities (farming, road building, strip mining, expansion of towns, housing, and recreational developments) that transform contiguous ecosystems into one or more smaller, disjoint areas which are surrounded or separated by disturbed, less suitable or unsuitable habitats contribute to ecosystem fragmentation. The 1992 Forest Plan Amendment #8 (page 4-35) states that the area of commercial forest land in the unglaciated Hill Country of southeastern Ohio, in which National Forest lands are located, increased slightly (2.5 percent) between 1968 and 1979, and that this trend would likely continue. Disturbances on National Forest lands from timber harvesting and opening establishment in the next 50 years, in management areas with such activities, are projected to remain near current levels or decrease, with an increase in older hardwoods. Considering other disturbances within the Forest, additional wells and associated roads and facilities anticipated from new federal leases would contribute a relatively small amount to ecological effects attributed to forest fragmentation, particularly if relatively undisturbed areas and more extensive forest areas are avoided. Considering the total amount of disturbance that has, is, and will be occurring in the future, with or without new federal leasing, the cumulative impact on forest fragmentation of by this alternative will be minor in the next decade.

Recommended Mitigation Measures

None Recommended

4.2 Heritage Resources

Direct and Indirect Effects

The presence of cultural resources at any specific location cannot be determined without an intensive pedestrian survey. Such surveys will be required and conducted under regulation 36 CFR Part 800. However, even if cultural resources are found at or near a proposed oil and gas exploration or development area, many such resources can be avoided with relatively small adjustments in facility locations. Many sites, whether historic or prehistoric, are small, much smaller than the provision in BLM's Standard Lease Terms for movement of proposed facilities by up to 200 meters if sensitive resources are identified. Although specific site impacts and appropriate mitigation measures are not known (and cannot be determined) at this time, it is possible to assess, in a general way, whether any (or all) oil and gas development alternatives are likely to result in significant impacts to cultural resources. This can be done because:

1) protection of cultural resources is required under 36 CFR Part 800, the implementing regulation for Section 106 of the National Historic Preservation Act (see Section 3-4), and 2) no development plan for any specific oil and gas lease will be approved unless cultural resource surveys and oil and gas facility plans demonstrate that impacts to cultural resources will be less than significant.

A project is considered to have a potentially significant impact on heritage resources if it could adversely affect a property that is eligible for the National Register of Historic Places. In accordance with 36 CFR 800.9(b), an effect is considered adverse when "it may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association." This would include any of the following potential effects:

1. Physical destruction, damage, or alteration of all or part of the resource;

2. Alteration of the character of the resource's setting, when the setting contributes to the significance of the resource;

3. Introduction of visual, audible, or atmospheric elements that are out of character with the resource or would alter its setting;

4. Neglect of the resource that could lead to its deterioration; or,

5. Transfer, sale, or lease of the property.

Direct and indirect impacts to heritage resources can sometimes be reduced to below the level of significance through mitigation. For instance, where a heritage resource is eligible for the National Register due to its informational content, the implementation of a data recovery program may reduce the impact below the level of significance. This is usually done by partially excavating the site, using methodologies defined in a reviewed and approved research design. Management of cultural resources will be accomplished through enforcement of BLM's Standard Lease Terms (which provide that the "lessee shall conduct operations in a manner that minimizes adverse impacts…"), in conjunction with the cultural resource regulations detailed in 36 CFR Part 800. Detailed surveys and evaluations of heritage resources, in the areas under consideration for any ground disturbance, would be conducted as part of a stand-alone NEPA compliance analysis prior to final decisions. If significant impacts to heritage resources are projected as a result of any proposed oil and gas activities, either mitigation measures to reduce such impacts to less than significant levels will be incorporated into the project description, or surface disturbance would not be allowed. With utilization of these procedures, and application of current laws and regulations protecting heritage resources, no significant impacts to heritage resources will result from implementation of Alternative A.

Irreversible and irretrievable commitment of resources

Even though information is collected from the site during the investigative process, the impacts to the site are irreversible. Data recovery is not an effective mitigation for all sites. Certain sites are considered significant for reasons other than their scientific informational value. Sites associated with significant events or persons or which embody distinctive characteristics cannot have direct impacts mitigated merely through data collection. In these cases, memoranda of agreement stipulating other types of mitigation measures must be developed and signed before a proposed action can proceed. Mitigation of possible indirect impacts must also be considered at these sites. Indirect impacts to cultural resources include an increase in illegal collection of artifacts and possible vandalism to rock art or standing structures, resulting from increased access

Cumulative Effects

Effects to heritage resources are expected to continue, as a result of wildfires, general forest recreation, and special uses. These effects are expected to be eliminated or reduced to a minimum with the implementation of mitigation measures as conditions of approval. Potential cumulative impacts associated with oil and gas development include the potential for increased site vandalism or removal of artifacts where vehicular access is increased through construction of new access roads for oil and gas equipment.

Recommended Mitigation Measures

Future applications for exploration and drilling would require the preparation of a stand-alone NEPA compliance document. If cultural resources are identified, their eligibility would be evaluated on a case by case basis. Some operations may be relocated or restricted based on existing federal regulations and policies to protect heritage resources.

4.3 Land Use

Direct and Indirect Effects

Beginning in 1981, the Wayne National Forest Interdisciplinary (ID) team developed a Land and Resource Management Plan (Plan) and Environmental Impact Statement as required by the Forest and Rangeland Renewable Resources Planning Act of 1974, as amended. The Forest Plan was approved January 4, 1988 by the Regional Forester. The Forest Plan guides all natural resource management activities and establishes management standards and guidelines. The forest is divided into management areas or zones where an overall objective for future management direction is determined (see Management Area and future desired condition of the land table). Direct effects

to land use would occur if activities occur within each management area that are inconsistent with its overall management objective and future desired condition.

Leasing decisions will be brought forth into the Forest Plan revision. If further analysis during the Forest Plan revision process shows that the leasing decisions would conflict with revised Forest Plan direction, the leasing decisions could be changed, even to the degree of not allowing leasing in a particular area. If, however, leases have been issued by the BLM in the meantime, the Forest Service would be bound to honor the terms of these leases.

Irreversible and irretrievable commitment of resources

Leasing in special management areas would lead to road-building, installation of pipelines and other development activities would result in irreversible and irretrievable effects (see Appendix 7, Table 10 for acreage in management areas.).

Cumulative Effects

The Forest has been administering private and federal oil and gas activities on National Forest System lands in Ohio for over 50 years. As long as there is a market demand for oil and gas products, there will continue to be oil and gas exploration and development activities on public and private lands. Well spacing requirements and other social and environmental factors will eventually limit the number of wells per acre. Effects associated with oil and gas activities may not be in conformance with the future desired goals for some management areas that emphasize natural forest and nonmotorized recreation. Effects associated with future ground disturbing activities (8 acres for 4 wells, Appendix-1 RFDS) are expected to be less than significant and any adverse impacts to land use will be mitigated, as they are identified, in future stand-alone NEPA analysis.

Recommended Mitigation Measures

None Recommended

4.4 Mineral Resources

Direct and Indirect Effects

Implementing this alternative - by allowing leasing on 4,634 acres of federal lands for mineral exploration and development - will directly result in improving opportunities for understanding the geologic setting and the economic viability of future operations. In addition, it would allow exploration of target areas previously deemed technically inaccessible or administratively unavailable.

Indirect effects could be related to alleviating potential oil and gas resource draw down of resources underlying the 4,634 acres. These drainage distances depend on the combined factors of oil gravity (viscosity), reservoir permeability and reservoir pressure. Higher gravity (lower viscosity), greater permeability or greater pressure will independently facilitate greater drainage distances than their counterparts of lower gravity, lower permeability or lower pressure. Note that while both oil gravity and reservoir pressure are approximately constant over any given drainage area, permeability may be significantly greater in one horizontal direction than in another, especially along fracture trends. Reservoir drainage is not inhibited by property lines; if the distance from a producing well to the property line is less than the drainage radius for that well (the distance from that well to the edge of its drainage area), the producing well will drain a portion of the adjoining land (offset drainage). Fluid drainage from distances of 200-500 ft and gas drainage from distances up to a maximum of about 1500 ft is not uncommon. This is addressed by State regulations which contain spacing requirements.

In accordance with Code of Federal Regulations at 43 CFR 3100.2, compensation for drainage of federal oil and gas wells on adjacent private mineral rights may be collected by the Bureau of Land Management (BLM) after leasing the Federal tract. The Lessee can either drill the tract to protect the Federal acreage from drainage or pay the Mineral Management Service (MMS) compensatory royalty. If BLM is unable to lease the Federal tract due to a no leasing policy or if the if the lessee can not economically develop the tract, BLM is unable to collect any royalties and the Federal oil and gas resource is "lost" to drainage. Federal land use decisions such as "no surface occupancy" or "no leasing" may adversely affect the economics of developing a given well or tract. Tracts subject to drainage which would be offered would have a notice published in the sale notice that protective drilling or compensation for drainage would be required by the lessee.

Irreversible and irretrievable commitment of resources

Since the likelihood of returning any future extracted oil and gas to their original place of deposition is nil, any future oil and gas resources extracted, sold and used as an energy source are considered an irretrievable and irreversible loss of that mineral resource.

Cumulative Effects

Cumulative effects associated with implementing this alternative are negligible since most of the oil and gas resources are privately owned. Opening more federal lands for future oil and gas leasing will improve opportunities for new exploration targets, possible new discoveries and development activities. In 1992, there were approximately 5,000 oil and gas wells, on private and public lands, within the Wayne National Forest boundary. An additional 250 wells are

located, on private and public lands, in Management Area 6.2. In 1987, there were 800 oil and gas wells on National Forest System lands. In 1992, there were 1,048 wells. It was projected that by the year 2000, a total of 1,138 wells, 215 miles of road, 285 miles of pipeline and a total footprint of 1,202 acres scattered across the publicly-owned lands within the Wayne National Forest boundary. In the year 2002, there are 1205 wells and 225 miles of road, 289 miles of pipeline and a total footprint of approximately 1,349 acres. Effects associated with future ground disturbing activities (8 acres for 4 wells, Appendix-1 RFDS) are expected to be less than significant and any adverse impacts to adjacent mineral rights will be mitigated, as they are identified, in future stand-alone NEPA analysis.

Recommended Mitigation Measures

None Recommended

4.5 Noise

Direct and Indirect Effects

Sound energy from a point source attenuates or diminishes as it travels outward from the source, decreasing approximately 6 dB per doubling of distance from the source. Absorption of sound waves by air and the ground surface will further attenuate sound levels. The rate at which these factors attenuate the sound depends on sound frequencies, air temperature, humidity, terrain, and the type of ground cover. Urban areas are much noisier than rural areas, but the latter may be affected at times by noise of logging, agricultural equipment, off-road vehicles or aircraft overflights. Because of the attenuation of sound with distance, and the low density of noise-sensitive observers in rural areas, few persons will perceive high noise levels. However, because of the lower ambient sound levels existing in rural areas, some sound levels that wouldn't even be noticed in urban or suburban areas may be annoying to rural residents or people recreating. Sound levels associated with earthmoving equipment necessary to prepare the well pad might be louder than 61.5 db at times, if operating on the part of the well pad closest to the residence, but this would be only for a duration of several days or less, and then only during normal working hours.

Noise would result from seismic exploration, construction activities, well drilling and completion operations, construction of gathering lines, production, and abandonment and reclamation. Exploration noises are those from the trucks used to carry the seismic equipment and the rhythmical thumping while the equipment is in use. The noise is short term and is on or adjacent to the roadway. The construction, drilling and completion phase is when the most noise is produced. The sound of trucks, bulldozers and other heavy equipment is evident. The greatest noise would result from the diesel engines on drilling rigs. They are as loud at 1500 feet as a motorcycle is at 200 feet. Drilling could occur 24 hours a day. These noises are short term and occur over a two to four month

period. Production noises, mainly pumping and vehicle traffic, would be long term and last for the life of the well. These actions are periodic and not likely to occur on a daily basis. Gasoline powered engines on the pumps sound similar to lawn tractors. Electric motors can scarcely be heard. Gas wells are not pumped, so no noise is created. Abandonment and reclamation of well sites would involve removing well pipe and recontouring the site. Noise would result from trucks and heavy equipment. These noises are short term.

In operation, the engine driving the pumping mechanism emits the loudest sounds associated with an oil well. The engine power required is related to the depth of the well, and the amount of liquid being pumped. A typical engine with a muffler will generate sound levels of 71.7 dB(A) at 50 feet, which would decrease to 65.7 dB(A) if the well was 100 feet from a residential property line, and 48.2 dB(A) if the well site was moved 200 meters farther from the residence under provisions of BLM's Standard Lease Terms. Noise levels for an electric motor would be less than the typical 45 db(A) nighttime standards used in residential areas. Operational noise associated with worker traffic would be negligible - only one round-trip to the well site per day, in a standard automobile or pickup truck. For some wells, and in some geologic formations, hydraulic fracturing of the rock may be proposed after some years in order to enhance production. Although noise levels of such an operation are extremely high (up to 109 dB(A) at 50 feet), the operation is for a short period and would only be occurring from one to two days.

Irreversible and irretrievable commitment of resources

There are no irreversible or irretrievable commitment of adjacent noise-related resources such as solitude (normally associated with designated wilderness areas) that would result from leasing.

Cumulative Effects

The U.S. Environmental Protection Agency (EPA) set 55 dB(A) as the yearly average outdoor limit for residential areas, hospitals and schools. None of the 4,634 acres occur near a hospital or a school. The cumulative effects associate with leasing 4,634 acres in the Wayne National Forest will not exceed EPA's threshold and therefore determined to be less than significant. In addition, since noise attenuates with distance and topography, the specific location of oil and gas development activities, sensitive receptor, intervening terrain, and other factors will limit the extent of such effects. Also, if site-specific analysis indicates effects from operational noise, BLM may require an operator to move a site up to 200 meters for protection of a resource. Also, if noise effects are still possible even with that intervening distance, that lessees would utilize acoustical blankets to reduce drilling noise. Such blankets can result in sound level reductions of 10 dB (A). The requirement to use of acoustical blankets during drilling could further reduce sound levels. State vehicle laws and State OSHA requirements provide

limitations on the noise made by trucks and heavy equipment. State Law and Forest Service stipulations require mufflers/spark arresters on gasoline engines used to power the oil pumps. Effects associated with future ground disturbing activities (8 acres for 4 wells, Appendix-1 RFDS) are expected to be less than significant and any adverse noise-related impacts will be mitigated, as they are identified, in future stand-alone NEPA analysis.

Recommended Mitigation Measures

None Recommended

4.6 Recreation Resources

Direct and Indirect Effects

Effects on recreation would occur from seismic exploration, construction activities, well drilling and completion operations, construction of gathering lines, production, and abandonment and reclamation activities. Exploration-related effects are considered short-term when they occur on or near a roadway. The production phase is when the long-term affects occur. These last the life of the well which normally tops out at 20-30 years although some have produced much longer.

Oil and gas activities and facilities can affect the recreational experience in the proximity of a developed site. This can result through site, sound, vibrations and odors that are detectable from the developed recreation sites. Impacts increase as the distance from the sites decreases. The sights, sounds, vibrations, noise, and vehicles associated with oil and gas development could have a significant impact on the experience of recreationists at these developed recreation sites.

Irreversible and irretrievable commitment of resources

New oil and gas activities such as new roads, drill pads, pipelines, utility lines, oil wells, and tank farms would create an irretrievable loss of recreation opportunities in those areas. This loss would continue until the landscape is rehabilitated. To the extent that the entire impacted area is not or cannot be rehabilitated, the impact is irreversible. There may be some areas that are relatively free of effects and enjoyed by an individual or group. Their use could be disrupted by oil and gas activities. This would create an irretrievable loss of primitive recreation opportunities

Cumulative Effects

Opportunities for motorized recreation would increase as a result of implementing this alternative - due to the opening of new acreage to road building associated with potential exploration and development projects. Other than some areas in

the Ironton District, opportunities for solitude will continue to diminish as a result of implementing this alternative. Allowing oil and gas leasing would set the stage for future exploration and development which would introduce motorized activities and road building resulting in the reduction of opportunities for primitive, non-motorized recreation in some management areas. Effects associated with future ground disturbing activities (8 acres for 4 wells, Appendix-1 RFDS) are expected to be less than significant and any adverse impacts to recreation resources will be mitigated, as they are identified, in future stand-alone NEPA analysis.

Recommended Mitigation Measures

Gates and appropriate signs should be installed on any leased tract at key areas to discourage illegal use.

4.7 Road Analysis & Transportation

Direct and Indirect Effects

The effects to existing roads would differ between hot-mixed paved highways and gravel or other rock-based 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 State and County Highway Department. 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. In 1992, a total of 8,384 oil and gas wells being drilled in Wayne National Forest counties for 10 year period 1980-1989, or 838 per year. The present condition of the road systems is 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.

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. Since rural traffic is intermittent and oil and gas vehicles are already a portion of the present traffic patterns, little additional effects are anticipated. Specific routes for drilling-related traffic are proposed in Applications for Permit to Drill (APD). The proposed routes must correspond to requirements of State and local ordinances. Signs warning of unusual or increased traffic in areas such as that of high volume or poor visibility could be required along the proposed route as part of the APD approval. Power line or other rights-of-way may be used for

access to oil and gas sites assuming that permission can be obtained from the entity controlling the right-of-way. This would reduce the need for new roads. effects would be minimal given a condition of approval in the APD that requires avoidance of all permanent structures or facilities on the right-of-way.

Irreversible and irretrievable commitment of resources

Public roads are multipurpose. Any additional traffic commitment of resources would not be significant due to increase use by oil and gas producers for drilling on the tracts under consideration if all State and Local laws are followed with respect to load limits. Permitting the use of public road system is a local government responsibility where loads are in excess of that allowed under the current laws, and bonding may be required to allow local governments to recover damages by overloaded heavy equipment.

Aggregate road surfaces: While it is true that up to 95% of all surface wear and damage is directly attributable to heavy vehicles, the infrequency of the use is not likely to cause overly accelerated aggregate wear. Rutting is more likely to be cause damage long term, if not corrected in a timely manner. Concentration of water on aggregate and native surface roads accelerates erosion and degradation of the structure, leading to Irreversible and irretrievable commitment of resources in terms of soil loss and damage to waterways. Responsive maintenance is key to correcting this damage if it occurs. Paved roads are the exception to the above, as one heavy load on a paved surface can destroy the entire section leading to subbase and base course damage. In this case the entire effected area of the road would need to be reconstructed to repair the road. If roads are used during the period that minimal damage will result, due to optimal moisture and temperatures, the commitment of resources likely would be minimized. Some degradation of the road system is likely with increased use, but the extent will depend on regulatory control of the traffic associated with the drilling activities.

Cumulative Effects

If new sites are developed off the existing roadway an increase in the number of miles of road system can be expected. The Forest transportation system is considered mostly in place, thus new segments of road will likely be short. New roads engineered to the standard required for permitee will moderate the impacts to the environment. Initial disturbance will cause an increase sedimentation, though this is short term and if Best Management Practices (BMPs) are followed. A very slight increase in sedimentation produced by and degradation to existing transportation system is likely from associated heavy truck traffic. The application of stipulations and the use of the BMPs will mitigate potential impacts to a level less than significant.

Recommended Mitigation Measures

Forest Development roads will require the permitee to attain a Forest Road use Agreement to allow for repair of the roads in the event that damage is caused by their equipment.

4.8 Socio-Economic Resources

Direct and Indirect Effects

Implementation of Alternative A would create some increases in economic activity (for varying periods of time) in the study area counties. The magnitudes of the exploration and development effects would vary with the intensity and duration of exploration and development activities, but upon completion of work their effects would dissipate, leaving the local economies essentially at their pre-project levels of employment, output and income. Production of hydrocarbons would continue to generate some additional local income and employment from well operation and maintenance activities and payment of royalties, but the dollar amounts would be relatively small and of little significance to local jurisdictions.

Neighboring private property can be negatively or positively impacted by additional oil and gas leasing on neighboring National Forest public lands. The site, sounds, odor, air pollution, traffic, risk of spills from oil and gas development all present potentially adverse effects. These activities can also impact the sense of place and property values. Noise, air quality, traffic, and risk of spills are all covered in other sections. Oil and gas development on neighboring National Forest public lands can also have a positive economic effect on private properties. The property can possibly be of value to the oil and gas development for roads, transmission lines and well pads for slant drilling into neighboring NSO areas on National Forest public lands.

It cannot be concluded that development of the leases could not have some localized socioeconomic effects. Some communities in the immediate vicinity of one or another lease might experience some locally significant effects from movements of equipment, supplies, personnel and crude oil tanker trucks. Neighboring private property can be negatively or positively impacted by additional oil and gas leasing on neighboring lands. The site, sounds, odor, air pollution, traffic, risk of spills from oil and gas development all present potentially significant effects. These activities can also impact the sense of place and property values. Noise, air quality, traffic, and risk of spills are all covered in other sections. Oil and gas development on neighboring lands can also have a positive economic effect on private properties. The property can possibly be of value to the oil and gas development for roads, transmission lines and well pads for slant drilling into neighboring NSO areas on National Forest Lands. It is not feasible at this level in the process to determine specific effects to specific properties. That is more appropriately done once leases are sold and lessees propose their plans of operation.

The leasing of federal oil and gas rights will result in income to both the U.S. Treasury and local governments. Fifty percent of receipts from leasing are returned to local governments. The minimum rental rate for leases is $1.50 per acre per year for the first five-year period, and $2.00 per acre per year for the second five-year period. These amounts are usually higher for tracts with competitive bidding. As an example, if all 4,634 acres are leased, added receipts will be $6,913 per year for the first five years with $3,457 being returned to local governments. For the second five-year period, added receipts would be $9,218 annually with $4,634 being returned to the local governments. Rentals change over to a 12 1/2% royalty upon the drilling of a well(s), but will not be less than the rental rates in affect at that time.

Irreversible and irretrievable commitment of resources

Implementing this alternative would not result in irreversible and irretrievable effects.

Cumulative Effects

The cumulative effects resulting from this alternative on the socio-economic resources are considered negligible since leasing results only in the granting of a leasehold interest in the oil and gas rights. Social impacts only come into effect when the leases are developed with wells.

Recommended Mitigation Measures

None Recommended.

4.9 Soils

Direct and Indirect Effects

Effects to soils and geomorphology are site-specific. These effects depend on:

1) type and extent of the activity (roads, drilling, pipeline, etc.); and

2) soils and land capability of the affected site

Soils effects from drilling include disturbances from temporary road access plus soil disturbances at well sites. Should a discovery occur, soil effects from oil and gas production include the effects mentioned above plus the effects of pipeline and additional road construction. During the construction phase, prior to implementation of reclamation efforts, some small soil losses would occur. Generally, effects on soils would be low where BMPs are followed and where reclamation, revegetation, and erosion control measures are implemented and are successful. The potential for slope failure increases for major excavations

requiring extensive cut-and-fill operations. Excavation of pipeline trenches alters soil profiles, and can bring boulders and poor productivity subsoils to the surface, resulting in revegetation and rehabilitation difficulties. If routes are placed on gentle slopes, the amount of cuts and fills would be reduced. Reduction in the amount of disturbance relates to the amount of soil erosion and loss of site productivity. Implementation of erosion control and revegetation measures immediately would reduce the amount of erosion. Under most situations, accelerated soil erosion and productivity losses would occur until pipeline rights-of-way are stabilized (two to five years). This is considered a short-term impact.

The 1st step towards reducing the risk of soil movement and loss of productivity is to avoid physical contact with highly-erodable soils. Locating well pads on more gently sloping surfaces greatly reduces the amount of cuts and fills and would result in less erosion. Where construction on steeper slopes is necessary, cuts and fills would be required and effects to soils would increase. Side hill cuts and fills on slopes greater than 50 percent would require extensive sidewall cuts that would cause slope instability and would result in large volumes of soil and rock debris being used as fill or being deposited onto otherwise undisturbed areas. In cut areas, replacement of sidecast material, regrading and revegetation is difficult. Successful application of intensive revegetation and mechanical erosion-control techniques would stabilize such areas within five years.

Construction of new access roads has the greatest potential for effects on soils. Increased sediment entering stream channels originates from Forest roads. Water quality is affected by the number and location of roads, as well as by road construction and maintenance. Proper planning, construction, and maintenance can substantially reduce watershed erosion from roads. Similarly, road construction and use has the potential to activate areas susceptible to land slides, slumping, and/or mass erosion. Depending on the type of binding materials used, exposure of bare soil could result in varying degrees of continued erosion losses. These effects would be greatest where extensive side hill cuts are constructed. Additional effects from access road construction include:

1) more area would become accessible to off-road vehicles and their land disturbance;

2) unsurfaced access roads may rut in wet weather or where constructed in wet areas; and

3) construction and maintenance activities reduce infiltration rates on road surfaces, disrupt natural drainage by concentrating subsurface and overland flow, and channel runoff resulting in gully erosion.

Soil losses can be reduced or minimized through the application of Forest Service Best Management Practices on a site-specific basis. Examples of such practices include use of erosion curtains to protect drainages, surfacing roads,

water bars and check dams to control runoff, stockpiling of topsoil for reclamation and revegetation, and use of rip-rap to control gullying and head-cutting. Other measures include appropriate engineering design of roads, well pads, and ancillary facilities; and avoidance of steep and/or unstable slopes and sensitive soils.

Irreversible and irretrievable commitment of resources

Irretrievable impacts could occur as a result of construction activities include soil movement, which could result loss of soil productivity due to erosion and landslides; water pollution from sediment; and loss of riparian/floodplain/wetland productivity due to sediment aggradation, flooding and channel erosion. Soil compaction reduces soil productivity by reducing degree to which roots can penetrate. Soil pore spaces are reduced, limiting the air and water available for root growth.

Cumulative Effects

The cumulative effects of any of the alternatives would be very small in comparison with all of the other soil disturbing activities now occurring within the boundaries of the Forest. The cumulative effect of this anticipated activity on 5 acres is very small when you add this to other past, present and reasonable foreseeable actions within the Forest boundary. Most of the soil disturbing activities within the Forest boundary, take place on the private cropland. For instance, there will be about 102,000 acres of private cropland plowed each year for farm crops. It estimated that on private forested land within the boundary there will be about 440 acres disturbed for road construction, trail construction and timber harvest activities. On Federal forestland, there is estimated to be about 160 acres disturbed for road construction, trail construction, and timber harvest for a total of 600 acres (440 + 160 = 600) of forested land disturbed on an annual basis within the boundary. It is estimated that there is about 100 acres disturbed each year within the boundary for strip-mining of private coal rights. Most strip-mining occurs on private lands within the boundary. There will be about 48 acres disturbed each year for oil and gas development activities on private land within the boundary and about 12 acres disturbed on National Forest System land (10 acres from prior existing rights and 2 from anticipated new releases) for a total of about 60 acres disturbed for oil and gas activities within the boundary. This adds up to 103,000 acres disturbed each year within the boundary of the 832,147 acres of which about 172 will occur on the Forest and about only 2 acres from anticipated new Federal leases resulting from this decision. The application of stipulations and the use of the BMPs will mitigate potential impacts to a level that is less than significant.

Recommended Mitigation Measures

None Recommended.

4.10 Threatened/Endangered/Sensitive (T/E/S) Animals

Direct and Indirect Effects

This Alternative involves an administrative decision to lease, or not lease, federal minerals. No activity will occur as a result of this project. Ground disturbing activities will only occur after a tract is leased, an operating plan is submitted, and a site-specific environmental analysis is completed. The actual administrative decision to lease, or not lease, federal minerals would have no effect on federally listed species or Regional Forester sensitive species. However, a discussion is included below to address the effects that would likely occur when a lease is developed. Again, a site-specific analysis would be conducted with more detailed information than can be provided in this programmatic effects analysis.

- No federally endangered or threatened species are known to occur on any of the tracts included in this Alternative, in the past or at the present time. Potential habitat exists for the Indiana bat on all tracts. One tract is located along the Ohio River and has potential roosting habitat for the bald eagle.

- Known occurrences and potential habitat exists for the cerulean warbler on selected upland tracts.

- Potential habitat exists for the Olympia marble on selected upland tracts on the Ironton Ranger District.

- There are some tracts located along the Little Muskingum River mainstem that are considered to possess habitat for the river otter, eastern hellbender, salamander mussel, Ohio lamprey, and eastern sand darter. The riparian area and floodplain are considered habitat for these species since the forest cover provides shade and nutrients to the aquatic system.

- There are tracts in the Buffalo Creek drainage (Symmes Creek) where the little spectaclecase mussel occurs.

There is a tract with potential timber rattlesnake habitat.

The direct and indirect effects on federally listed species and Regional Forester sensitive species would be similar to those displayed under Alternative A in the Wildlife and Fisheries Resources effects analysis section as leases are developed.

Alternative A is the same as the proposed action in the 2001 EA. The same stipulations used in the 2001 EA are attached to this Alternative (see Appendix 7, Table 8a). No new or updated stipulations are included with this Alternative.

Because of this, protection of these species and/or potential habitat would not be fully realized in this Alternative.

Alternative A does not apply the terms and conditions found in the Wayne's Biological Opinion to any potential leases. The terms and conditions in the Biological Opinion are deemed nondiscretionary by the U.S. Fish and Wildlife Service, and are considered necessary to remain in compliance with section 7 (o)(2) of the Endangered Species Act. Implementation of Alternative A would result in the need to initiate formal consultation on this project with the U. S. Fish and Wildlife Service because the Biological Opinion terms and conditions would not be applied to the leases.

Alternative A utilizes stipulation A2(g)(i) as it was written in the original 2001 environmental assessment to protect riparian resources. This stipulation defines the riparian area as being 100 feet, 50 feet, and 25 feet in width along perennial, intermittent, and ephemeral streams, respectively. These widths do not encompass the entire riparian area as defined in a Region 9 Supplement to Forest Service Manual 2500. Therefore, not all riparian and floodplain values, such as recruitment of woody debris or flood storage, would be protected on the leases.

Alternative A does not apply stipulations for protection of Olympia marble, timber rattlesnake, cerulean warbler habitat.

Irreversible and irretrievable commitment of resources

The irreversible and irretrievable commitment of resources would be similar to those displayed under Alternative A in the Wildlife and Fisheries Resources effects analysis section. Because the stipulation package associated with this alternative does not fully address protection needs of the species or potential habitats listed above, there would be a greater irreversible and irretrievable commitment of resources than in Alternatives B, C, and D. It would be possible for oil and gas production activities to be developed in areas requiring protection.

Cumulative Effects

No cumulative impacts to rare species are anticipated from any of the leasing alternatives, since site-specific past, present and reasonably foreseeable future actions are not being analyzed.

Recommended Mitigation Measures

The stipulation package associated with Alternative A (see Appendix 7, Table 8a) does not fully address protection needs of the federally listed species, Regional Forester sensitive species, or their potential habitats. It is recommended that stipulations identified in Alternative C and D, in this effects analysis section, be

incorporated to avoid adverse effects to these species or potential habitats. Otherwise, it is recommended that alternatives B, C, or D be considered in order to protect the species and potential habitats (see Appendix 7-Table 8, 8a and 8b).

4.11 Threatened/Endangered/Sensitive (T/E/S) Plants

Direct and Indirect Effects

The 1 to 2-acre openings, and associated roads and pipelines, resulting from oil and gas development may have a number of effects on plant communities. Effects would include direct habitat loss and indirect effects on adjoining plant communities. Removal of vegetation for roads, pads and pipelines causes direct loss to portions of plant communities. The effects of ground disturbance on vegetation are most important in areas that have not been greatly disturbed in the past, in areas where rare species or communities occur, and in areas with the greatest potential for restoration of natural plant communities and ecosystems. Indirectly, development of an oil and gas site would affect vegetation by altering nutrient cycling through both tree removal, and removal of organic matter and duff layers on the forest floor (Marks and Bormann, 1972; Swank and Douglass, 1977; Bormann and Likens, 1979). The degree of impact to the site depends on the amount of biomass removed, where greater biomass removal results in greater effects to nutrient cycling (Monk and Day, 1987). The site would eventually be revegetated to grasses and some forbs; however, studies have shown that trees contribute more to nutrient cycling than other vegetation types (Monk and Day, 1987).

Vegetation may be affected far beyond the area of actual soil disturbance due to edge effects (up to 250 meters; Primack 2000). The “edge effect” causes alterations in the microclimate along these disturbed edges, including:

1.) changes in radiation, which affect air temperature and light,

2.) changes in the wind profile, which can compromise stand structure and alter relative humidity, and

3.) changes in the local water regime, which can affect surface and groundwater flow, rainfall interception, soil runoff and deposition, and evapotranspiration (Saunders et al. 1991; Ranney et al. 1981).

In general, forest areas next to openings tend to have higher temperatures, increased wind exposure, higher solar radiation, and lower humidity (Brothers and Springarn 1992), conditions which have been found to cause increased water stress in understory trees closer than 30 meters to forest edges compared to those in the interior (Jacquart et al. 1992).

These changes in microclimate may result in changes in plant species composition. Pursell (1989), Whitney and Runkel (1981), Ranney et al (1981), and Wales (1972) observed composition changes in forests of Indiana, Ohio, Wisconsin, and New Jersey, respectively, up to 40 meters in from the edge. In general, plant species adapted to high light levels and drier conditions were favored close to the forest edge, pushing species that require full shade and mesic conditions further into the forest. Since the forest matrix has been reduced in size due to fragmentation (the edge-creating activity), a larger number of specially adapted species are forced to compete for a smaller amount of suitable habitat. For example, several Federal, Regional, and State listed rare plant species require the full shade and mesic conditions found in sites such as wooded stream terraces, floodplains, ravines, beech-maple and mixed mesophytic woods (the latter two communities primarily on north- to east-facing slopes). If openings were placed in the vicinity of these species, they could be negatively impacted by microclimatic changes or by competition from species adapted to open conditions, many of which are non native invasive species.

Irreversible and irretrievable commitment of resources

Native vegetation and suitable habitat for rare species would be lost where access roads, oil and gas well pads, and storage tanks are constructed. As previously mentioned, such a loss is most important in areas that have not been greatly disturbed in the past, in areas where rare species or communities occur, and in areas with the greatest potential for restoration of natural plant communities and ecosystems. Portions of tracts 38 and 39 are in designated Special Areas (Management Area 8.2) that contain unique natural features/communities deemed worthy of preservation and study (see Affected Environment- Vegetation). While the “no surface occupancy” stipulation in M.A. 8.2 (Amendment 8, Land and Resource Management Plan) prevents the location of “well sites, evaporation ponds, pits, tank batteries, and other oil and gas facilities on the lease,” access roads and transmission pipelines are permitted. Therefore, allowing acreage around Special Areas to be leased potentially compromises the integrity of these unique ecosystems.

Cumulative Effects

Disturbed edge habitats tend to favor common, opportunistic species, many of which are non-native invasive species (NNIS) like honeysuckle (*Lonicera spp.*), multiflora rose (*Rosa multiflora*), and garlic mustard (*Alliaria petiolata*). These exotic, invasive species pose a serious threat to plant and animal community health and diversity. Since exotic species, by definition, have been transplanted outside their original range, they often lack natural controls (e.g., disease, predators, parasites, or climate), which allows them to out compete and eventually replace more sensitive native species. Once NNIS become established, they are extremely difficult to eradicate, and the resulting change in community plant composition can alter ecosystem dynamics and functions over

time. With any management activity that results in soil disturbance or requires the use of heavy equipment brought in from off-site, there is a high risk of transporting NNIS and spreading into the project area. Furthermore, control of these exotic species, once they become established, would likely be a long-term endeavor in forested areas where oil and gas operations provide continuing avenues for NNIS invasion.

Recommended Mitigation Measures

Management requirements for protection and enhancement of Federal proposed, Endangered, and Threatened species, Regional Forester Sensitive species, and Forest Species of Concern are provided in Forest-wide Standards and Guidelines, pages 4-44 through 47, and Standards and Guidelines under Minerals and Geology, pages 4-52 and 53, of the Forest Plan (U.S. Forest Service 1988a). A modification of these Forest-wide Standards and Guidelines has been developed to address the need to coordinate with biologists, botanist, and ecologists before implementing oil and gas projects. These specialists will participate in environmental assessments of proposed project areas prior to any land-disturbing activity, to identify protection and mitigation needs for any listed species and their habitats.

Since all of the Federally listed species mentioned above, and many of the RFSS, are likely to be found in or near riparian areas, these environments should be protected from oil/gas development. Stipulations A:2g and A:2bg do not provide adequate buffers to these ecosystems, since the “edge effect” that results from vegetation removal is often evident up to 250 meters into the adjacent environment (Primack 2000). Because most rare plants are often precisely adapted to certain temperature, humidity, and light levels, changes in these variables due to increased edge could eliminate many of these rare species, and/or their suitable habitat, from the altered environments. A buffer of at least 250 feet should be required for all perennial streams and permanent waterways -- if analysis indicates that resource damage can be eliminated or minimized by relocation.

A stipulation preventing development within 100 feet of cliff faces or rock shelters should also be included (but is only recommended under Alternative C and D) in all leases to protect habitat for northern monskhood, as well as, other locally sensitive species (e.g., sullivantia and small-flowered alumroot). Forest-wide standards and guidelines (4-47) set a buffer of 50 feet, but for reasons mentioned above, a wider buffer is recommended. To minimize the impacts of ground disturbance, well sites, and their associated roads and pipeline corridors, should be located in already disturbed areas whenever possible, preferably along existing roads, corridors and openings. Using already affected areas would not only decrease the direct impacts to rare and native species, but would also decrease the potential introduction and spread of NNIS. To further reduce the risk of NNIS invasion, and thus subsequent habitat deterioration, a Wayne

National Forest approved seed mix comprised of non-invasive, non-persistent plant species should be used in all ground-disturbing projects.

4.12 Vegetation

Direct and Indirect Effects

Oil and gas exploration and development generally progresses through three operational phases: (1) preliminary exploration, (2) exploratory drilling, and (3) development, production and abandonment. The preliminary investigations often require only "casual" surface presence, but off-road vehicle travel and some access road construction can occur, particularly if seismic reflection or geophysical surveys are used in exploration. This could result in vehicular damage to unfenced sensitive plant populations. Potential direct effects of oil and gas development on botanical resources are greatest during exploratory drilling and oil/gas field development phases. These phases can last up to 20 years or more. Direct surface disturbance to vegetation and topsoil results from the construction of access roads, well pads and associated features. Typically an individual well pad requires the clearing of vegetation and topsoil and an access road. The acreage and location of associated facilities (flowlines, distribution pipelines and treatment facilities) are unknown. Typically, pipelines must be constructed in a linear fashion requiring the excavation of 10 to 15 foot wide strip that is backfilled and revegetated shortly after construction. The well pads and other facilities would not have the topsoil replaced and be revegetated until well abandonment (i.e., for up to 20 years or more from the start of development).

The 1 to 2-acre openings, and associated roads and pipelines, resulting from oil and gas development may have a number of effects on plant communities. Effects would include direct habitat loss and indirect effects on adjoining plant communities. Removal of vegetation for roads, pads and pipelines causes direct loss to portions of plant communities. The effects of ground disturbance on vegetation are most important in areas that have not been greatly disturbed in the past, in areas where rare species or communities occur, and in areas with the greatest potential for restoration of natural plant communities and ecosystems.

Indirectly, development of an oil and gas site would affect vegetation by altering nutrient cycling through both tree removal, and removal of organic matter and duff layers on the forest floor (Marks and Bormann, 1972; Swank and Douglass, 1977; Bormann and Likens, 1979). The degree of impact to the site depends on the amount of biomass removed, where greater biomass removal results in greater effects to nutrient cycling (Monk and Day, 1987). The site would eventually be revegetated to grasses and some forbs; however, studies have shown that trees contribute more to nutrient cycling than other vegetation types (Monk and Day, 1987).

Vegetation may be affected far beyond the area of actual soil disturbance due to edge effects (up to 250 meters; Primack 2000). The "edge effect" causes alterations in the microclimate along these disturbed edges, including: 1.) changes in radiation, which affect air temperature and light, 2.) changes in the wind profile, which can compromise stand structure and alter relative humidity, and 3.) changes in the local water regime, which can affect surface and groundwater flow, rainfall interception, soil runoff and deposition, and evapotranspiration (Saunders et al. 1991; Ranney et al. 1981). In general, forest areas next to openings tend to have higher temperatures, increased wind exposure, higher solar radiation, and lower humidity (Brothers and Springarn 1992), conditions which have been found to cause increased water stress in understory trees closer than 30 meters to forest edges compared to those in the interior (Jacquart et al. 1992).

These changes in microclimate may result in changes in plant species composition. Pursell (1989), Whitney and Runkel (1981), Ranney et al (1981), and Wales (1972) observed composition changes in forests of Indiana, Ohio, Wisconsin, and New Jersey, respectively, up to 40 meters in from the edge. In general, plant species adapted to high light levels and drier conditions were favored close to the forest edge, pushing species that require full shade and mesic conditions further into the forest. Since the forest matrix has been reduced in size due to fragmentation (the edge-creating activity), a larger number of specially adapted species are forced to compete for a smaller amount of suitable habitat. For example, several Federal, Regional, and State listed rare plant species require the full shade and mesic conditions found in sites such as wooded stream terraces, floodplains, ravines, beech-maple and mixed mesophytic woods (the latter two communities primarily on north- to east-facing slopes). If openings were placed in the vicinity of these species, they could be negatively impacted by microclimatic changes or by competition from species adapted to open conditions.

Disturbed edge habitats tend to favor common, opportunistic species, many of which are non-native invasive species (NNIS) like honeysuckle (*Lonicera spp*.), multiflora rose (*Rosa multiflora*), and garlic mustard (*Alliaria petiolata*). These exotic, invasive species pose a serious threat to plant and animal community health and diversity. Since exotic species, by definition, have been transplanted outside their original range, they often lack natural controls (e.g., disease, predators, parasites, or climate), which allows them to out compete and eventually replace more sensitive native species. Once NNIS become established, they are extremely difficult to eradicate, and the resulting change in community plant composition can alter ecosystem dynamics and functions over time. With any management activity that requires the use of heavy equipment brought in from off-site, there is a high risk of transporting NNIS into the project area. Furthermore, control of these exotic species, once they become established, would likely be a long-term endeavor in forested areas where oil and gas operations provide continuing avenues for NNIS invasion.

Native vegetation and suitable habitat for rare species would be lost where access roads, oil and gas well pads, and storage tanks are constructed. As previously mentioned, such a loss is most important in areas that have not been greatly disturbed in the past, in areas where rare species or communities occur, and in areas with the greatest potential for restoration of natural plant communities and ecosystems. Portions of tracts 38 and 39 are in designated Special Areas (Management Area 8.2) that contain unique natural features/communities deemed worthy of preservation and study (see Affected Environment- Vegetation). While the "no surface occupancy" stipulation in M.A. 8.2 (Amendment 8, Land and Resource Management Plan) prevents the location of "well sites, evaporation ponds, pits, tank batteries, and other oil and gas facilities on the lease," access roads and transmission pipelines are permitted. Therefore, allowing acreage around Special Areas to be leased potentially compromises the integrity of these unique ecosystems.

Irreversible and irretrievable commitment of resources

The loss of any species is a significant irreversible impact. An irretrievable impact is incurred for a period of time but is reversible. If habitat is affected, natural recovery does not occur and restoration is either not attempted or fails, a potentially significant irreversible biological impact occurs. No species are expected to be lost under any of the alternative leasing scenarios. If the disturbed habitat is restored and affected, species fully recover there is no irreversible impact. Until disturbed habitats are restored there is an irretrievable impact. No significant irretrievable impacts are anticipated relative to biological resources due to any of the alternatives.

Cumulative Effects

Cumulative impacts may pose significant barriers to preservation and recovery of listed species. Species so listed are often at population levels deemed non-viable and actions to improve their status are essential. Additional effects to their habitats, however limited, further reduce capabilities of recovery. Future forest management decisions and actions such as prescribed burning, new road building, recreation activities and wildlife management projects will affect the present biological systems. The effects of these actions can improve or inhibit, or both, long-term management of these biological systems, depending upon the species or species group. Given the intermixing of private and public lands within the subject areas, oil and gas or other development activities, on private lands would contribute to the cumulative effects affecting vegetation management. The application of stipulations and the use of the BMPs will mitigate potential impacts to a level less than significant.

Recommended Mitigation Measures

Ground disturbance can be minimized by:

1.) locating activities and facilities in areas that are least sensitive;
2.) using existing roads, corridors, and openings to the extent possible; and
3.) revegetating disturbed and abandoned areas with native species or non-invasive temporary cover.

4.13 Visual Resources

Direct and Indirect Effects

Direct effects associated with implementing this alternative include the physical loss of natural-appearing landscapes and loss of visual quality are the primary scenic effects associated with oil and gas leasing activities. The amount of loss depends upon visual absorption capability of the landscape, the context and intensity of the proposed activities, and existing scenic conditions. Scenic impact is related to size of the proposed activity and its resultant contrast in form, line, color and texture of its environmental setting. Losses of scenic quality are expected to be greatest in the exploration, development, and production stages, particularly where new roads, drill pads, structures, and other surface disturbance activities are located within landscapes having low visual absorption capability.

Oil and gas exploration and development could potentially result in direct site effects and indirect effects as seen from sensitive viewpoints (e.g. major scenic byways, recreation sites, roads, and trails) and cause substantial change in scenic conditions. Significant scenic effects could occur where strong visual contrasts could be perceived as human-caused, introduced, unnatural forms, lines, colors, or textures in the landscape. These effects might occur in the foreground, middleground, or background viewing distance zones.

Oil and gas exploration and development activities could result in high-contrast effects wherever visually contrasting elements or modifications are introduced in the characteristic landscape. Visually contrasting elements could include roads, drill pads, storage tanks, utility lines, and other facilities, as well as changes to landforms and vegetation patterns that could result from clearing and grading sites for these facilities. Essentially, any change to the form, line, color, and texture elements of the existing landscape could cause visual contrast. The introduction of visually contrasting elements or modifications of scale into the existing landscape by oil and gas activity could potentially alter the scenic quality of the area and/or impact views from sensitive viewpoints.

Exploratory drilling may result in scenic effects where this activity is visible in the foreground from sensitive viewpoints, particularly in previously undisturbed

landscapes. The presence of equipment potentially could be noticeable for two to three months. Roads could be noticed for several years. If no discovery is made, equipment would be removed and the area reclaimed. Field development visible in foreground from sensitive viewpoints typically creates strong contrasts that could result in significant viewer effects. Where a field development would be seen in middleground and background views, visual contrasts could range from strong-moderate to moderate-weak, depending upon the visual absorption capability of the landscape. Oil and gas activities that result in strong visual contrasts in the foreground or middleground distance zones would tend to be dominant in the landscape and be evident to casual forest observers, and would not meet the intent of either Retention or Partial Retention VQO's.

Irreversible and irretrievable commitment of resources

Effects to the visual resources on the 4,634 acres could also occur as a result of the development of private mineral development areas within the National Forest boundary. Oil and gas activities within private mineral areas are not required to meet Forest Plan objectives.

Cumulative Effects

The long-term effects are those resulting from production. The reclaimed well pad, pump, storage tank, pipelines, and service road remain for the life of the well. These effects are generally less severe because they blend in over time as the vegetation grows. Road use can lead to dust being deposited on vegetation. Wind and rain, however, usually minimize the effect. The effects from gas wells are generally less as pumpjacks are not needed and tanks are not always present. Abandonment and reclamation of well sites may bare soil and vegetation. This is a short-term effect. Mitigation measures include no surface occupancy, promoting rapid revegetation, planting vegetative screens, painting equipment, and prudently locating roads and equipment. The mitigation measures would be developed and applied on a site-by-site basis. The application of stipulations and the use of the BMPs will mitigate potential impacts to a level less than significant.

Recommended Mitigation Measures

None Recommended.

4.14 Water Quality

Direct and Indirect Effects

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 and produced water treatment, storage tanks and handling facilities,
  - sanitary facilities; and
  - oil/produced water transportation facilities (trucks, pipelines);

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 described above.

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 and produced water treatment, storage tanks and handling facilities,
  -sanitary facilities, and
  -oil/produced water transportation facilities (trucks, pipelines);

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

- secondary adverse effects of each of the above on seeps and springs.

Irreversible and irretrievable commitment of resources

Loss of soil productivity due to erosion and landslides; water pollution from sediment; and loss of riparian/floodplain/wetland productivity due to sediment aggradation, flooding and channel erosion could result in irreversible and irretrievable effects.

Cumulative Effects

Construction of roads, drilling pads and collection/distribution lines will result in both short and long term effects. This will result in a loss of vegetation growth due to clearing, grading and future maintenance of the transportation system. This would lead to soil exposure and susceptibility to erosion and deposition in streams and channels.

Recommended Mitigation Measures

Standard Lease Terms allow FS to require facilities to be moved up to 200 meters. This provision will be utilized on a case by case basis after analysis indicates that resource damage can be eliminated or minimized by relocation. It is recommended that a buffer of at least 250 feet should be the minimum allowance permitted for surface occupancy within riparian, wetlands, and floodplains. Again, this provision should be based on site-specific analysis rather than a standard operating procedure. In addition, BMPs are designed to protect soil productivity and water quality from loss due to erosion and mass wasting. The BMPs applicable to oil and gas development are listed in Appendix 9. Use of the BMPs will mitigate potential impacts to a level less than significant.

4.15 Wetland/Riparian/Floodplains (W/R/F) Resources

Direct and Indirect Effects

Watershed sensitivity is governed by soil erosion, land instability, steepness of slope, and drainage into a municipal water supply. Principal direct effects to wetlands/riparian/floodplains areas associated with implementing Alternative A could occur primarily during clearing and earth-moving operations for construction of well pads, access roads, pipelines, and support facilities. However, as Best Management Practices and Standard Lease Terms will be applied, none of the proposed alternatives allow uncontrolled activity in riparian, wetland and floodplain areas, and direct effects to these areas are not expected to occur with any alternative. Furthermore, all riparian and wetland areas that qualify as jurisdictional wetlands are regulated under Section 404 of the Clean Water Act and a Section 404 permit is required before any "dredge and fill" activities can occur in such areas.

Indirect secondary effects may result if site development occurs outside, but adjacent to, riparian, wetland and floodplain areas where lateral drainage is interrupted by road or well site construction, or when increased erosion affects water quality. Roads, well sites, pipelines, and other ancillary facility construction on side slopes above riparian and wetland areas all have the potential to cause sedimentation effects. Effects to riparian and wetland areas can be significant if changes in wetland extent or function occur. Secondary or indirect effects that occur to areas of adjacent wetlands, such as sedimentation from soil excavation, soil erosion, and other construction or drilling activities, would also be considered to be significant effects if normal functional value of riparian or wetland areas is reduced.

Secondary or indirect effects that occur to areas of adjacent wetlands, such as sedimentation from soil excavation, soil erosion, and other construction or drilling activities, would also be considered to be significant impacts if normal functional value of riparian or wetland areas is reduced.

Irreversible and irretrievable commitment of resources

Under certain conditions where occupancy is unavoidable (i.e., access to existing lease holds or private mineral estates can only be obtained by crossing a riparian or wetland area), irreversible and irretrievable effects to riparian, wetland, and floodplain areas could occur as a result of the disturbances.

Cumulative Effects

Wildfire is the primary future impact that may have adverse consequences to watershed resources. If such a wildfire were to occur within an oil and gas lease area, lessee watershed-impacting activities may need to be modified or restricted until the watershed can recover its vegetative growth and hydrologic function. Considering the Forest Plan management direction, present and reasonably foreseeable non-oil-and-gas activities on the Forest are expected to result in less than significant impacts to watershed resources since these activities would be mitigated with BMPs that, when applied properly, have provided watershed protection in the past.

Recommended Mitigation Measures

Standard Lease Terms allow FS to require facilities to be moved up to 200 meters This provision will be utilized on a case by case basis after analysis indicates that resource damage can be reduced or minimized by relocation. It is recommended that a buffer of at least 250 feet should be the minimum allowance permitted for surface occupancy within riparian, wetlands, and floodplains. Again, this provision should be based on site-specific analysis rather than a standard operating procedure. In addition, BMPs are designed to protect soil productivity and water quality from loss due to erosion and mass wasting. The

BMPs applicable to oil and gas development are listed in Appendix 9. Use of the BMPs will mitigate potential impacts to a level less than significant.

4.16 Wildlife/Fisheries

Direct and Indirect Effects

As with plant communities, effects associated with oil and gas exploration and development (construction of roads, well pads, and pipeline corridors) will have a direct effect on wildlife and wildlife habitat. Animals are displaced from the immediate area of development. Animals which are displaced may initially be absorbed by surrounding habitats, causing short-term changes in population densities in surrounding areas. Habitat quality would be reduced for some native species in the vicinity of development activity, due to loss of important structural components (canopy levels within the Forest and down woody material), fragmentation of habitats, development of barriers to travel for some species, and microclimatic changes resulting from openings. Species which are sensitive to human intrusions may be adversely affected by added oil and gas operations, especially where new activities occur in relatively undisturbed areas. Timing of activities could amplify these effects; for instance, disturbance during nesting, denning or rearing periods of nonmobile wildlife such as salamanders and most mammals, or species with small home ranges such as birds, could result in reduced or failed reproduction.

One of the major concerns about land-disturbing activities, such as oil and gas development, is the effect of fragmentation on forest ecosystems (See Fragmentation discussion). Alteration of the microclimate and isolation of habitats are the primary effects of fragmentation that influence animal populations. Changes in temperature, solar radiation, wind turbulence and water flux alter the vegetation community along the edges of remnant forest areas. Species more tolerant or adaptive come to occupy this altered habitat. Shade tolerant plant species may become restricted to the interior parts of the forested areas, with different species requiring different distances from the edge. Animal species associated with these different vegetative communities will likewise be segregated across a forest area. Microclimatic changes can cause changes in soil microorganism and invertebrate numbers and activity. For example, Lovejoy et al. (1986) attribute changes in butterfly community composition in tropical forest fragments partly to increased insulation within small remnants. Larger fauna can also be affected directly and indirectly by changes in resource availability.

Landscape fragmentation has two important consequences for biota: reduction in total area of habitat available and isolation of remaining habitat remnants. Time since isolation, contiguity of patches and the degree of connectivity are important determinants of biotic response to fragmentation. As habitats become fragmented and isolated, remnant areas are less capable of maintaining the

original suite of species. Species will be lost as changes brought about by fragmentation take affect (Harris 1984; Miller & Harris 1977; Wilcox 1980). This process of "species relaxation" is an inevitable consequence of area reduction and isolation (Saunders 1991). Species most susceptible are those that depend entirely on native vegetation, those that require large home ranges, and those that exist at low densities. As a result of changes in land use in Ohio, many large herbivores, large carnivores, and habitat specialists were extirpated years ago. Management of remnant areas must thus be an adaptive process (Walters and Holling 1990) directed at minimizing future species losses. The ability of a species to maintain viable populations in an area depends to some degree on the distance between habitat patches. For some small organisms, a road bed may be an effective barrier to dispersal.

Connectivity of habitat patches is also an important determinant in successful reproduction and recruitment. Landscape corridors are believed to provide benefits such as enhanced biotic movement, extra foraging areas and refuges for some species during disturbances. Removal of vegetation from an area may cause concentration of mobile species by displacement into the remaining habitat area (Lovejoy et at. 1986). Intra- and inter-specific interactions, such as competition and predation, can be increased, resulting in changes in fecundity and population stability. Influxes of new suites of species into the altered area can occur as the original species are displaced. Invasion may be restricted to the edges if disturbance factors decline with distance from edge. However, some species that increase because of landscape modification can have significant impact on other biota; for example increased pressure from brown headed cowbirds, a nest parasite, has affected passerine bird populations in fragmented systems (Brittingham and Temple 1983). Size, shape, and position in the landscape are important modifying factors influencing the degree of fragmentation effects on the biota. Larger remnants have a bigger core area that can sustain species sensitive to habitat fragmentation such as a number of neotropical migrant songbirds (Temple 1984). Larger patches of continuous forest habitat are more likely to support large, resilient populations of component species (Gilpin and Soule 1986, Soule 1987).

a. Construction of roads, well pads, and pipeline corridors:

The BLM has estimated that it is likely that four wells could be developed in the next five years (Appendix 1). On the average, a producing well can be expected to disturb about 1 acre. The well and storage tanks usually require about two thirds of an acre, and the access road usually needs about a third of an acre. Construction activities tied to the development of wells can directly affect wildlife and wildlife habitat. Animals can be displaced from the immediate area of oil and gas development. When this occurs, the animals would be initially absorbed into surrounding habitats creating short-term changes in population densities in surrounding areas. Oil and gas development activities can also create barriers to travel for some species, and can create changes in microclimate.

In cases where surface occupancy stipulations are not required, removal of vegetation is necessary to construct roads, well pads, and pipeline corridors, however the vegetation removed may range from forest habitat to grassland habitat. The roads, well pads, and pipeline corridors can fragment the forest ecosystem. Alteration of the microclimate and isolation of habitats are the primary effects of fragmentation that influence animal populations. Changes in temperature, solar radiation, wind turbulence and water flux alter the vegetation community along the edges of remnant forest areas. Species more tolerant and more adaptive come to occupy this altered habitat. Microclimatic changes can cause changes in soil microorganisms and invertebrate numbers and activity.

The ability of species to maintain viable populations in an area depends to some degree on the distance between habitat patches. For some small organisms, a roadbed may be an effective barrier to dispersal. Connectivity of habitat patches is also an important determinant in successful reproduction and recruitment. Removal of vegetation from an area may cause concentration of mobile species by displacement into the remaining habitat area. Intra- and inter-specific interactions, such as competition and predation, can be increased, resulting in changes in fecundity and population stability. Influxes of new suites of species into the altered area can occur as the original species are displaced. Invasion may be restricted to the edges if disturbance factors decline with distance from edge. However, some species that increase because of landscape modification can have significant impact on other biota; for example increased pressure from brown-headed cowbirds, a nest parasite, has affected passerine bird populations in fragmented systems.

The degree of impact that fragmentation has on wildlife resources depends on the location of the activities and the species. Construction activities in areas that are already altered or largely fragmented will be less disruptive to natural processes, than activities in forest areas that are largely intact. While loss of natural plant communities and ecosystem fragmentation adversely affect many wildlife species, openings created by oil and gas development activities may be beneficial to some species which utilize open land or semi-open land habitats. Effects on species and habitat diversity are dependent upon location, distribution, and ecological potential of these openings; plant communities and vegetation structure resulting from management treatments in the openings; human activities in and near the openings; and other land uses in the area.

The effects of ground disturbance on wildlife are greater where there has been no previous ground disturbance, in areas where rare species or communities occur, and in areas that provide important components of biological diversity which are generally lacking locally or regionally. Aquatic animals and plants could be affected by construction activities if these disturbance activities caused soil erosion and sedimentation of aquatic habitats, and loss of riparian habitat. The construction activities can increase sediment load in streams. High water turbidity limits plant growth, adversely affects filter-feeding organisms like mussels, and

limits the ability of sight-feeding animals to adequately forage. Sedimentation of the substrate can limit the distribution of animals and plants, and can smother eggs and larvae. Removal of trees and brush along streams (perennial and non-perennial) reduces shade, nutrients such as leaves and needles, and sources of large woody debris.

There are twenty animals that are categorized as management indicator species in the Forest Plan. Some management indicator species could likely occur on some of the tracts in the lease package (i.e., cerulean warbler, pileated woodpecker, white-eyed vireo, common yellowthroat, field sparrow, pine warbler, ruffed grouse, wood duck, eastern bluebird, western chorus frog, wood frog, and bluegill). Most of the aquatic management indicator species could likely occur in streams that flow through or adjacent to tracts in the lease package (i.e., southern redbelly dace, redfin shiner, blackside darter, rainbow darter, golden redhorse, sand shiner, and banded darter). One management indicator species (Virginia rail) does not occur on the Wayne National Forest.

Terrestrial species may be affected by certain activities under Alternative A, namely tree or brush removal, or soil disturbance. Stipulations designed to protect cerulean warblers during the breeding season would in effect help protect the other terrestrial management indicator species. Aquatic species may be affected by sediment movement off-site from the developments, or from accidental spills of oil and gas materials. Riparian area, waterhole, wetland and pond/lake stipulations would protect aquatic habitats and aquatic management indicator species. Because of these protection measures and the fact that little disturbance is expected to occur as a result of implementing Alternative A (BLM estimates 4 wells may be drilled in the next five years), the overall impact to management indicator species would be insignificant.

(See Appendix 3 for Management Indicator Species Analysis).

Irreversible and irretrievable commitment of resources

Habitat for certain terrestrial species would be lost during production of the areas physically occupied by access roads, well sites, and tank batteries. Habitat quality would be reduced for some native species near the development activity due to loss of important structural components (canopy levels within the Forest and woody material on the forest floor), fragmentation of habitats, development of barriers to travel for some species, and microclimatic changes resulting from openings. The adjoining areas will be affected by the edge effects such as the invasion of exotic plants all along disturbed areas. Accidental leaks of oil products or brine from well sites or transmission lines could affect the aquatic communities. Certain chemicals associated with the pollutants affect the physiological processes of aquatic animals.

Cumulative Effects

Much activity has already taken place on the Wayne National Forest and adjacent private lands, creating a mosaic of plant and animal communities across the area. Communities consist of species associated with open land habitats to those more adapted to relatively undisturbed forest. Clearing of the land for agriculture, mining, oil and gas development, draining of wetlands and loss of riparian areas has affected the water quality of streams and impoundments on public and private land. Riparian areas and wetlands are being restored on the Forest, but other activities, especially on lands in other ownerships, are still impacting aquatic communities. Management of animal communities on a landscape level focuses on maintaining the integrity of forest ecosystems by minimizing long-term human alterations (roads and permanent openings), particularly in relatively undisturbed habitats. The greatest amount of oil and gas development on and near the Wayne has been associated with private or reserved mineral estates, rather than Federal rights. Future development will mostly be associated on private or reserved rights. Therefore, the cumulative effects on wildlife and fish will be dependent more upon the development of those estates.

It is estimated that about 8 acres of National Forest land could be disturbed by oil and gas activities in the next five years (wells sites, access roads, tank batteries). The development of oil and gas resources proposed in this environmental assessment will have minimal cumulative effects on wildlife and fish because of the relatively small amount of disturbance foreseen, and because of the protective standards and guidelines and stipulations which would be implemented and monitored. Considering the total amount of disturbance that has, is, and will be occurring in the area, and which ultimately affects the status and distribution of animal species, the cumulative impact of any alternative will be minor in the next decade, but possibly have greater effect in the future.

Cumulative effects may occur to aquatic ecosystems and their respective species as a result of increases in sediment run-off from well pads and roads; increases in contaminants from point and non-point sources; and potential changes in amounts of surface water if oil and gas drilling intercepts natural underground flow regimes. The application of stipulations and the use of the BMPs will mitigate potential impacts to a level less than significant.

Recommended Mitigation Measures

Specific guidance for protection of wildlife and fisheries resources from effects due to oil and gas activities is displayed in the Wayne National Forest Plan (see Forest-wide Standards and Guidelines, pages 4-13 through 4-62; Management Area Standards and Guidelines, pages 4-63 through 4-161), and in Amendment #8 (Appendix C). Locating facilities in areas that are already altered or largely fragmented; locating facilities along peripheries of large habitat patches rather

than in interiors; minimizing area to edge ratios of access and well sites where they are located in or along large forest patches; using existing roads, corridors, and openings to the extent possible; revegetating disturbed and abandoned areas with native species or non-intrusive temporary cover and requiring timing limitations for seasonally sensitive species can all help to minimize impacts of ground disturbance on wildlife and wildlife habitat. Amendment #8 (page C-7) lists the emergency spill response procedures to follow if an accidental spill of crude oil or brine is discharging, or threatens to discharge, into surface waters. The Ohio Environmental Protection Agency is to be notified and they will direct the leaser to complete remedial action for cleanup of soil and water resources and timely repair of damaged wells, pipelines or tanks. A Spill Prevention and Control Countermeasure Plan is required by State of Ohio regulations.

There is potential for birds and bats to enter open-vent exhaust stacks on oil and gas production equipment, become trapped, and die, or to perch near the vent portals and be overcome by vent fumes. A BLM standard Condition of Approval for APDs requires that all open-vent exhaust stacks on production equipment (such as heater-treater, separator, dehydrator, in-line units, etc.) be constructed, modified, and/or otherwise equipped to prevent birds and bats from entering, and to the extent practical, to discourage perching and nesting. BLM applies this condition to approved APD's on National Forest lands. Forest Stipulations are placed on tracts when certain resources are present. These stipulations help to protect specific resource values on the leased tract. Stipulation A2(g)(i) is placed on tracts in this alternative to protect riparian resources. The Stipulation requires no surface occupancy in 100-foot, 50-foot, and 25-foot buffers on perennial, intermittent, and ephemeral streams, respectively. Stipulation A2(g)(i) was developed for the 2001 EA, prior to a revision to the riparian definition and delineation direction in the Forest Service Manual (R9 Supplement 2500-98-1). It protects some riparian resources and functions, however does not provide protection for all riparian functions as does Stipulation A2(g)(ii) (used in Alternatives C and D). Stipulation C2(g) is placed on tracts with water bodies. It requires no surface occupancy within 100 feet of the waterhole, pond, lake, or wetland. In addition, stipulations B:5h, B;7h(a), and B:7(h)b provide timing restrictions for vegetation disturbance to protect breeding seasons for the Cerulean warbler and Indiana bat.

See Appendix 7, Table 8a for standard stipulations description.