Chapter 3

Affected Environment and Environmental Consequences

Introduction

Chapter 3 of this Final EIS describes the existing physical, biological, and social resources of the environment that may be affected by the alternatives presented in Chapter 2. It also presents the effects that the alternatives would have on those resources. This look at the affected environment and environmental effects was combined into one chapter to give a clearer picture of resources on the Wayne National Forest and how they would be affected by the different alternatives. The analysis of environmental effects provides the basis for the comparison of alternatives that appears at the end of Chapter 2.

Organization

The remainder of Chapter 3 is organized by resource, focusing on those resources related to the issues described in Chapter 1:

Issue 1 – Watershed Health

- Watersheds
- Soils
- Air Quality

Issue 2 – Plant and Animal Habitat

- Oak-hickory ecosystem
- Pine forest
- Early successional habitat
- Interior forest upland
- Interior forest riparian
- Grasslands
- Federally listed and Regional Forester sensitive species
- Species of public interest (including white-tailed deer and ginseng)

- Non-native invasive species
- Timber harvest
- Prescribed fire

Issue 3 – Recreation

- Recreation opportunities
- Recreational off-highway vehicle use
- Scenic quality

Issue 4 – Land Ownership

- Land ownership

Issue 5 – Minerals

- Oil and gas
- Coal

Resources Not Directly Related to a Revision Issue

- Social and economic effects of National Forest land ownership
- Environmental justice
- Heritage resources
- Economic effects (employment and income)
- Suitable Forestlands (timber production/allowable sale quantity)

Each resource section is presented in the following format:

Affected Environment

This section describes the current conditions of the resources relative to the issues. It may also include accounts of the history, development, past disturbances, naturally occurring events, and interactions that have helped shape current conditions.

Analysis Area

This section briefly describes the geographic area used for analysis. Analysis areas may vary depending on the resource, issue, or anticipated activities. Within a specific resource or issue, analysis areas for direct, indirect, and cumulative effects may also differ.

Environmental Consequences

Effects Common to All Alternatives

Describes the general type of effects that may occur to the resource from implementing the alternatives.

Direct and Indirect Effects

Describes the direct and indirect effects that each alternative could have on resources or issues. Direct effects occur at the same time and place as the action. Indirect effects occur later in time or are spatially removed from the action. Although a forest plan can guide management for 10 to 15 years, effects may be discussed for both the short (one to 10 years) and long term (greater than 10 years). Direct and indirect effects often overlap and are frequently discussed together.

Cumulative Effects

Describes cumulative effects by alternative for each resource or issue. Cumulative effects are incremental impacts of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes the other actions. Cumulative impacts can result from individually minor but collectively significant actions that take place over time.

Mitigation Measures

Mitigation measures, as defined by 40 CFR 1508.20 include:

- Avoiding the impact altogether by declining to take an action or part of an action.
- Minimizing impacts by limiting the degree or magnitude of an action or its implementation.
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of an action.
- Compensating for the impact by replacing or providing substitute resources or environments.

At a programmatic level, Forest-wide and management area standards and guidelines should provide the appropriate mitigation measures for all alternatives. While not listed specifically in the Forest Plan, all public laws, regulations, Forest Service manuals, administrative guidance and other public policy apply to Forest Service actions. At the site-specific project level, analysis may indicate the need for additional mitigation measures to resolve site-specific issues. Monitoring efforts will determine the effectiveness of mitigation measures. (See Chapter 4 of the Revised Forest Plan for the monitoring strategies.)

Relationship between Programmatic and Site-Specific Analysis

The Revised Forest Plan and Final EIS are programmatic documents. The Final EIS discusses environmental effects on a broad scale. Over the lifetime of the Revised Forest Plan, the selected alternative and the accompanying Forest-wide standards and guidelines will set Forest management direction by establishing and affirming rules and policies for use of natural resources.

Because this document contains a Forest-wide level of analysis, it does not predict what will happen when Forest-wide standards and guidelines are implemented on individual, site-specific projects. Nor does it convey the long-term environmental consequences of any site-specific project. Such effects will depend on the extent of each project and environmental conditions at the site (which vary across the Forest). Site-specific mitigation measures and their effectiveness will also play a role.

In preparing this document we focused on consequences most likely to occur. By combining this broad assessment with site-specific information, a reader should be able to make a reasonable prediction about the kinds of environmental effects that would result from a specific project.

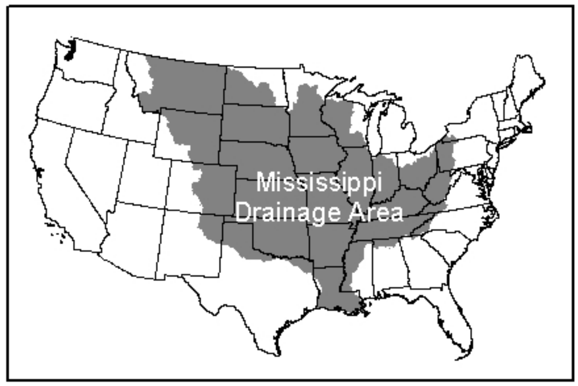
We do not describe every environmental process or condition on the WNF in this document. That would be impractical given the complexity of natural systems. The purpose of the Final EIS is to provide a survey of the broader environmental and social factors that are relevant to the programmatic planning process.

Watershed and Riparian Areas

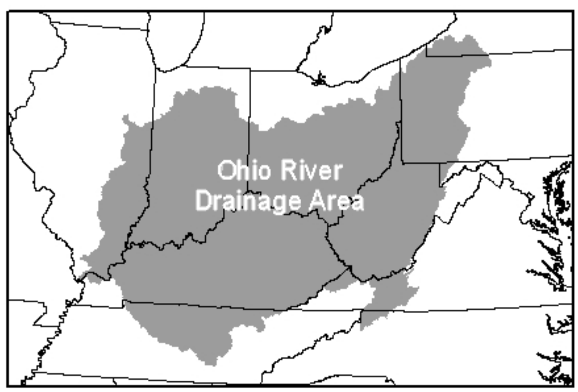
Affected Environment

Introduction: Watersheds

A watershed is a region or area draining to a particular watercourse or body of water. Watersheds can be small or large, and most are interconnected, eventually draining to the ultimate waterbodies-bays, gulfs, or oceans. Approximately one-third of the United States, including the Wayne National Forest, lies in the Mississippi River watershed.



The Ohio River is a tributary to the Mississippi River with a drainage area covering over 200,000 square miles. The WNF is located in southeastern Ohio, within the Ohio River drainage basin. Over 80 percent of stream miles in Ohio are composed of primary headwater streams. Headwater streams are the small swales, creeks, and streams that are the origin of most rivers. Primary headwater streams can be ephemeral, intermittent, or perennial, and generally have a watershed area of less than one square mile (Ohio EPA, 2003).



The climate of southeastern Ohio is continental with hot, humid summers and cold, cloudy winters. Approximately 40 inches of precipitation are received annually. Stream flows usually peak in spring following snowmelt while low flow periods occur during late summer and autumn.

Virtually all of the forest that covered southeast Ohio up until the late 1700s was cut for timber and firewood, mined for coal, iron ore, limestone, and clay, during the settlement and development of the late 18th and 19th centuries. In particular, the impacts of historic mining practices have left indelible marks upon the land. Since 1800, 3.4 billion tons of coal have been mined in Ohio (Crowell, 1997). According to the

U.S. Office of Surface Mining (OSM), there are over 575,000 acres of abandoned mine lands in the eastern United States. Figure 3 - 1 displays the extent of mining on a semi-regional basis. As can be seen from the dark shaded areas, the Ohio River drainage basin lies within the heart of the Appalachian Coal Fields.

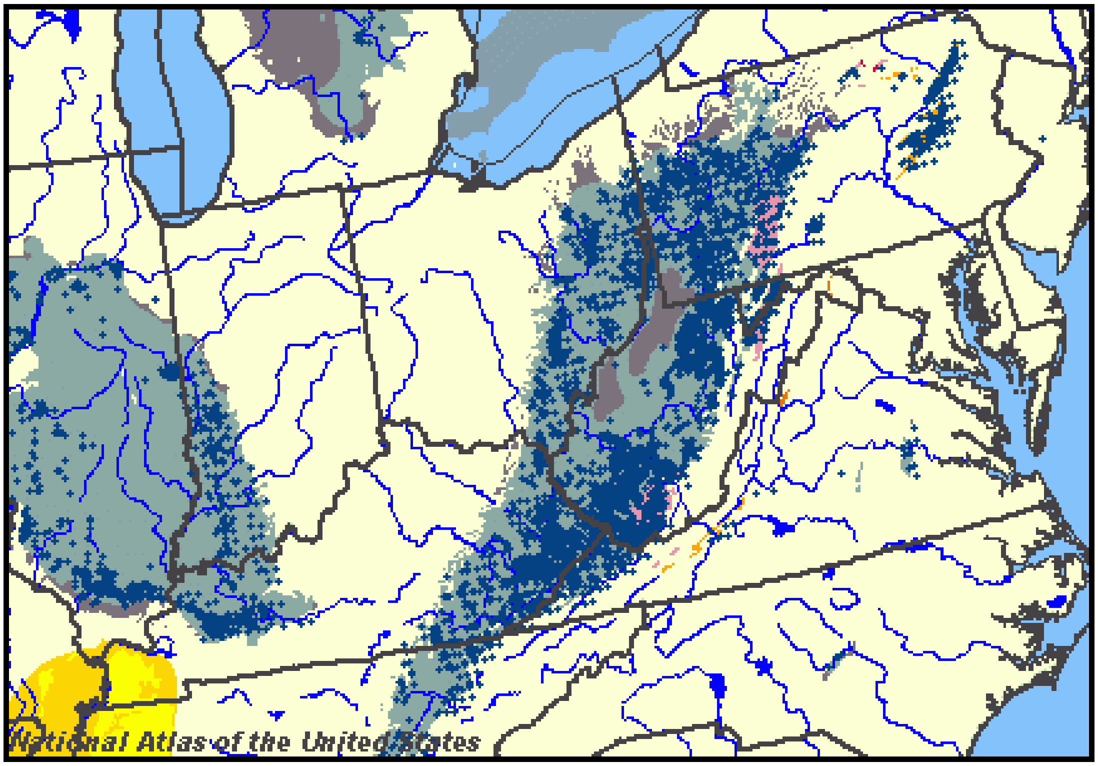


Figure 3 - 1. Appalachian Coal Fields.

During much of the 19th and 20th centuries, a significant amount of riparian area was destroyed by mining activities. The area of disturbed lands can range in size from a few acres to several square miles. However, the ecological and environmental impacts of abandoned mined lands can reach far beyond the limit of mining as a result of:

- Streams choked by excessive sediment loads
- Many miles of streams polluted by acid mine drainage (AMD)
- Freshwater streams captured by collapsed underground mine complexes
- Spoil or gob piles
- A landscape turned upside down by strip-mining.

Since 1970, Ohio's annual coal production has declined nearly 51 percent. However, mining's impacts on watersheds have left many streams impaired and nearly devoid of aquatic life (Crowell, 1997).

Restoration of abandoned mine lands has been ongoing. Management emphasis has shifted from treatment of eroding uplands to the restoration of abandoned mine lands and elimination of acid mine drainage. The 1988 Forest Plan's direction for management of streams, riparian areas, and floodplains emphasized protection of water quality and counteracting the effects of strip mining. Underground mining, the primary source of acid mine drainage, was not addressed in the 1988 Forest Plan because there was then no technology to effectively address acid mine drainage.

The WNF has an active program to reclaim abandoned mine lands and restore watersheds degraded by mining. The Forest works with other Federal, State, and local agencies to address these problems. Systematic efforts are required to restore these lands to productive uses.

The Forest Service, in conjunction with partners, has developed a five- to seven-year program for restoring abandoned mine lands. Since 1997, the following restoration activities have been accomplished:

- Reclamation of 25 acres of gob piles
- Closure and reclamation of 21 subsidence areas
- Closure or bat gating of seven open mine portals
- Enhancement of three acres of wetland
- Construction and/or installation of various systems to treat acid mine drainage.

Watershed Health: Restoration of Watersheds Impacted by Coal Mining and Protection of Streams and Riparian Areas

Current Condition

The WNF proclamation boundary falls within 31 fifth-level watersheds. Only 15 of these watersheds are comprised of at least one percent NFS land (Table 3 - 1; Figure 3 - 2). There is a significant amount of private ownership in all of these watersheds. Federal ownership is greatest in the Monday Creek watershed where there is almost 45 percent NFS land (Table 3 - 1).

Table 3 - 1. Percentage of National Forest System lands in 5th level watersheds.

Watershed	Watershed Number (Figure 3 - 2)	Hydrologic Unit Code	Watershed Size (acres)	Percent NFS lands
Monday Creek	1	0503020406	74,209	44.7
Pine Creek	2	0509010302	117,859	36.5
Symmes Creek (below Black Fork to below Buffalo Creek)	3	0509010109	64,168	35.1
Little Muskingum River (above Clear Fork to Ohio River)	4	0503020110	106,032	26.5
Ohio River (below Sunfish Cr. to above Muskingum R	5	0503020102	87,344	22.3
Sunday Creek	6	0503020407	88,773	21.9
Symmes Creek (below Buffalo Creek to Ohio River)	7	0509010110	96,987	17.9
Little Muskingum River (headwaters to above Clear	8	0503020109	95,313	15.5
Ohio River (below Big Sandy R. [W.V] to above Pine	9	0509010301	83,471	13.1
Hocking River (below Enterprise to above Monday Cr	10	0503020405	80,819	10.4
Symmes Creek (headwaters to below Black Fork)	11	0509010108	76,244	10.1
Raccoon Creek (headwaters to above Hewett Fork)	12	0509010102	86,715	6.7
Hocking River (below Monday Creek to Athens/RM33.1	13	0503020408	65,523	5.2
East Fork of Duck Creek	14	0503020111	87,190	1.7
Raccoon Creek (above Hewett Fork to below Elk Fork)	15	0509010103	99,234	1.4

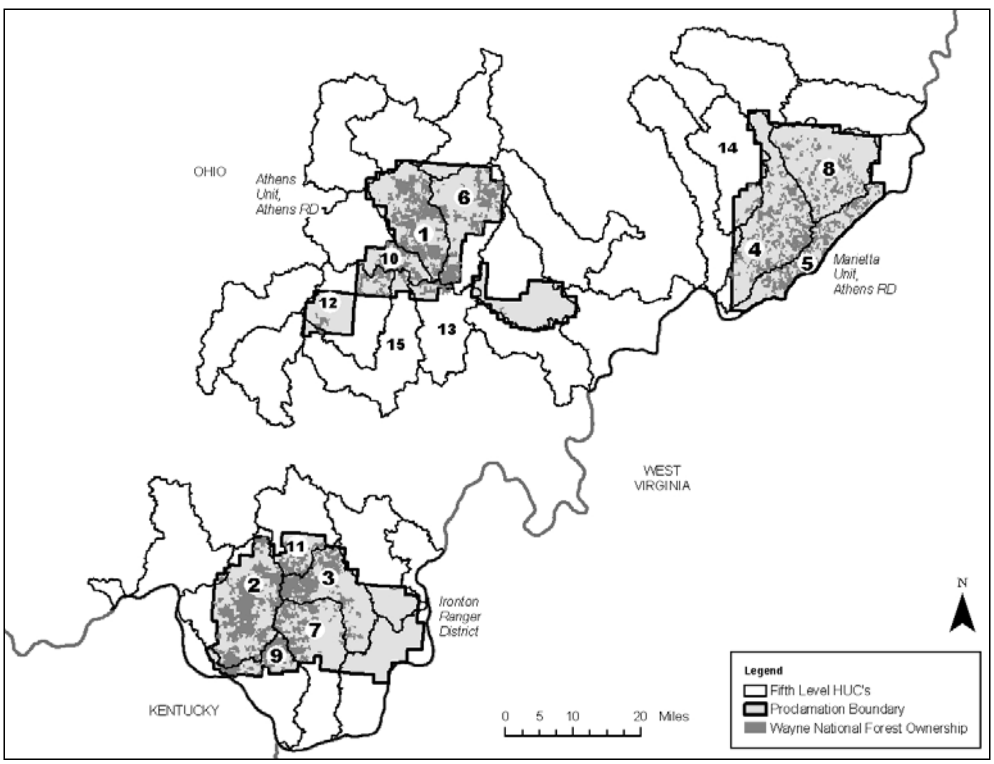


Figure 3 - 2. Fifth-level watersheds on the WNF. (See Table 3 - 1 for watershed names.)

In 2002, the Forest Service completed a watershed analysis for the WNF using the East-wide Watershed Assessment Protocol (EWAP) (Ewing and Stachler, 2002). This analysis was a rapid characterization of landscape information based on fifth-level watersheds, which provided an assessment of watershed health, or integrity.

EWAP characterizations are based on parameters that describe the physical and ecological conditions within a watershed as well as the parameters susceptible to change as a result of Forest Service management activities. Condition parameters quantify watershed disturbances (stressors), while vulnerability parameters denote values at risk that could be changed (positive or negative) as a result of Forest Service management. Watersheds with poor condition and high vulnerability are considered to have less integrity relative to those with better condition and lower vulnerability.

The relationship between condition and vulnerability for each of the fifth-level watersheds is displayed in the accompanying watershed integrity plot (Figure 3 - 3). The implied assumption is that as the condition and vulnerability scores increase, the watershed condition gets better and its vulnerability lessens.

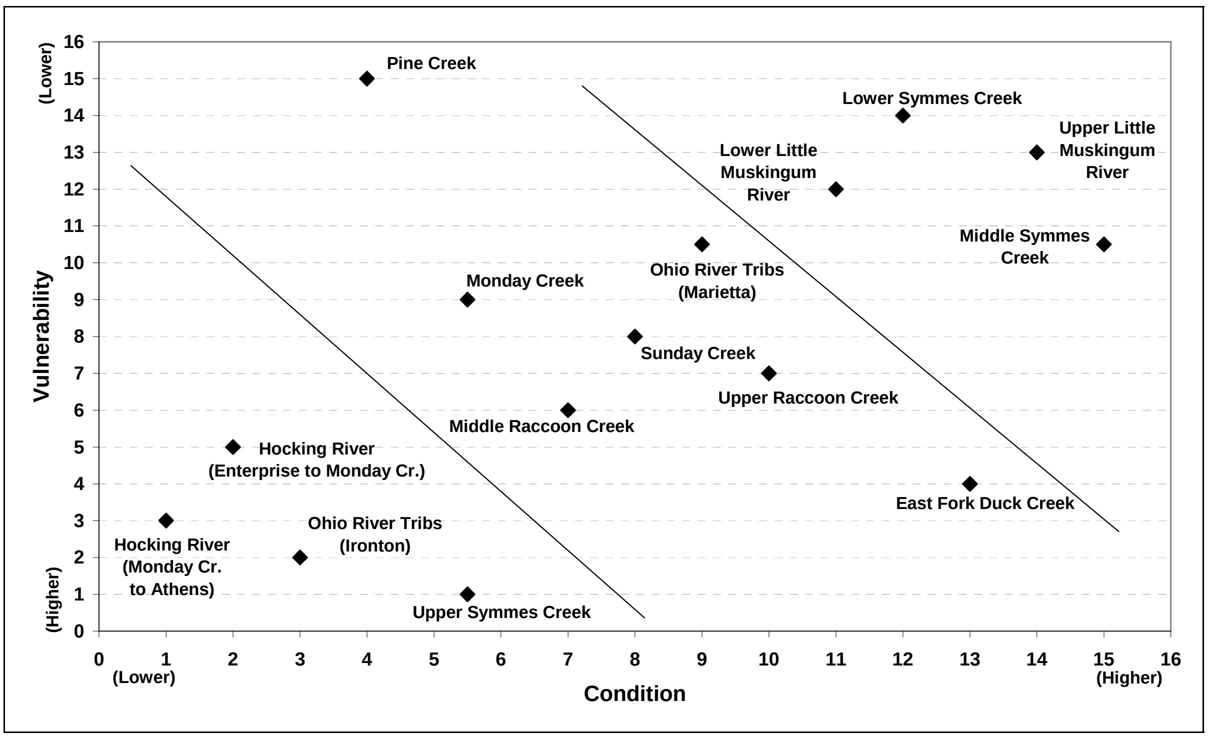


Figure 3 - 3. Watershed integrity plot of the 5th level watersheds that are comprised of at least one percent NFS lands.

Key summary points about WNF watersheds include the following:

- Private land comprises the majority of the 15 fifth-level watersheds that were analyzed using EWAP. National Forest System land comprises less than 45 percent of any of these watersheds. Because all watersheds have a significant component of non-Federal lands, collaboration is necessary to improve watershed health.
- Point sources, such as abandoned mine lands, play a major role in watershed health in these 15 watersheds. Southeastern Ohio lies in the coal mining region, and acid mine drainage from abandoned coal mines adversely effects large portions of some watersheds.
- Riparian areas adjacent to impaired streams can also be negatively impacted and/or destroyed by the effects of mining.

Water Quality Impaired Streams

The Total Maximum Daily Load (TMDL) program was established under Section 303(d) of the Clean Water Act and focuses on identifying and restoring polluted rivers, streams, lakes and other surface waterbodies. A TMDL is a written, quantitative assessment of water quality problems in a waterbody and contributing sources of pollution. The TMDL specifies the amount a pollutant needs to be reduced to meet water quality standards. It also allocates pollutant load reductions and provides the basis for taking actions needed to restore a waterbody.

The Ohio EPA has an evolving TMDL process that includes four broad, overlapping phases:

- Assess waterbody health (biological, chemical, and habitat)
- Develop a restoration target and viable scenario
- Implement the solution
- Validate to monitor progress.

The Ohio EPA has prioritized Ohio’s watersheds for TMDL development (Table 3 - 2). According to the Ohio EPA, a TMDL is currently being developed for Monday Creek and Sunday Creek. Not all of the WNF 5th level watersheds are identified as TMDL priority watersheds. Please refer to the Ohio EPA’s TMDL website for more information (http://www.epa.state.oh.us/dsw/tmdl/index.html).

Table 3 - 2. Schedule for TMDL development for 5th-level watersheds.

Watershed	Hydrologic Unit Code	Ohio EPA Next Field Monitoring	Ohio EPA Projected TMDL Development
Monday Creek	0503020406	2009	2004
Pine Creek	0509010302	2009	2011
Symmes Creek (below Black Fork to below Buffalo Creek)	0509010109	2009	
Little Muskingum River (above Clear Fork to Ohio River)	0503020110	2010	2012
Ohio River (below Sunfish Cr. to above Muskingum R	0503020102	2010	
Sunday Creek	0503020407	2009	2004
Symmes Creek (below Buffalo Creek to Ohio River)	0509010110	2009	2011
Little Muskingum River (headwaters to above Clear	0503020109	2010	2012
Ohio River (below Big Sandy R. [W.V] to above Pine	0509010301	2009	
Hocking River (below Enterprise to above Monday Cr	0503020405	2004	2006
Symmes Creek (headwaters to below Black Fork)	0509010108	2009	
Raccoon Creek (headwaters to above Hewett Fork)	0509010102	2009	2011
Hocking River (below Monday Creek to Athens/RM33.1	0503020408	2004	2006
East Fork of Duck Creek	0503020111	2010	
Raccoon Creek (above Hewett Fork to below Elk Fork)	0509010103	2009	2011

The Forest Service used the 1996 Ohio Water Resource Inventory (305b Report) and Forest Service water quality data to assess impairment of the more than 200 miles of perennial streams on the WNF. The information was summarized in the 1998 *National Forest System Inventory Eligibility Analysis; Forest Service Streams Not Meeting State Water Quality Standards* report. Based on the data, only 11 percent of the stream miles met Ohio water quality standards. Forty-eight percent were impaired and 41 percent had not been assessed by the Ohio EPA or the Forest Service. There is insufficient water quality data for intermittent and ephemeral stream miles.

Figure 3 - 4 displays water quality impairment within the WNF. Impairment is caused by two primary sources: agriculture and abandoned mine lands (Ohio EPA, 2004). Impairment on the Marietta Unit is due primarily to nutrients, siltation, and flow alteration from non-irrigated crop production, pasture lands, and onsite wastewater systems (septic tanks). Impairment on the Athens and Ironton units is primarily due to pH level, metals, and sedimentation from previous mining.

Acid mine drainage is considered to be the most significant non-point source pollutant in northern Appalachia (Kleinmann et al., 1995). Most mining on the WNF occurred on the Athens Unit (Figure 3 - 4 and Figure 3 - 5). The major watersheds impaired by acid mine drainage on the WNF include Monday Creek, Sunday Creek, Pine Creek and Symmes Creek.

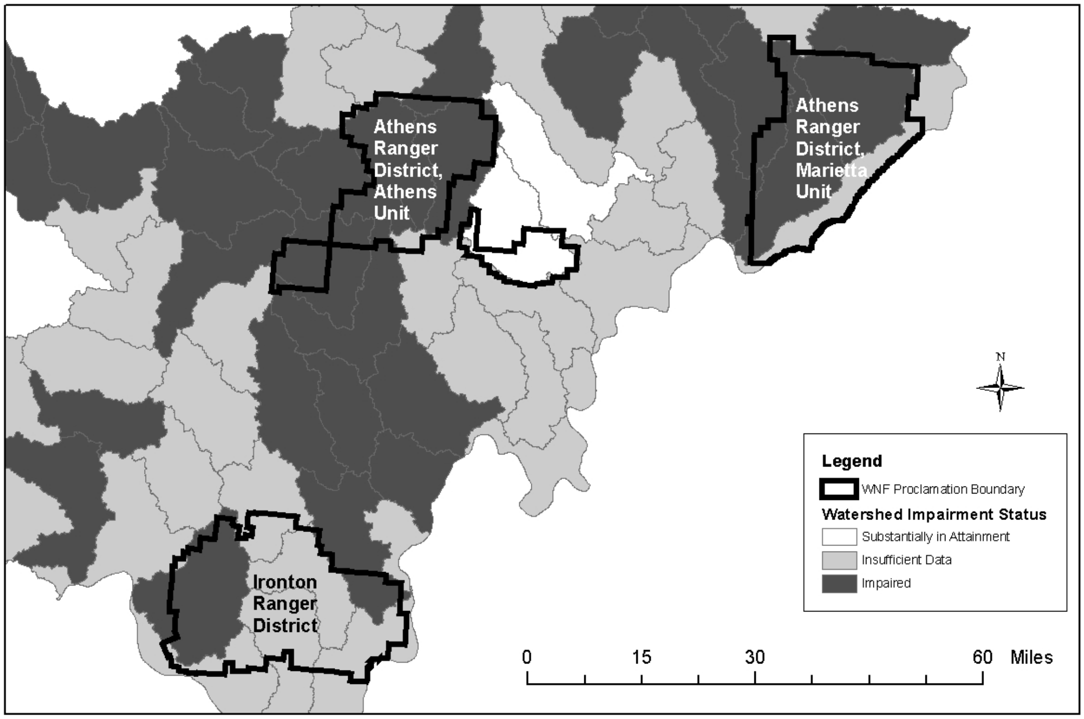


Figure 3 - 4. Impairment within WNF proclamation boundary and 5th level watersheds.

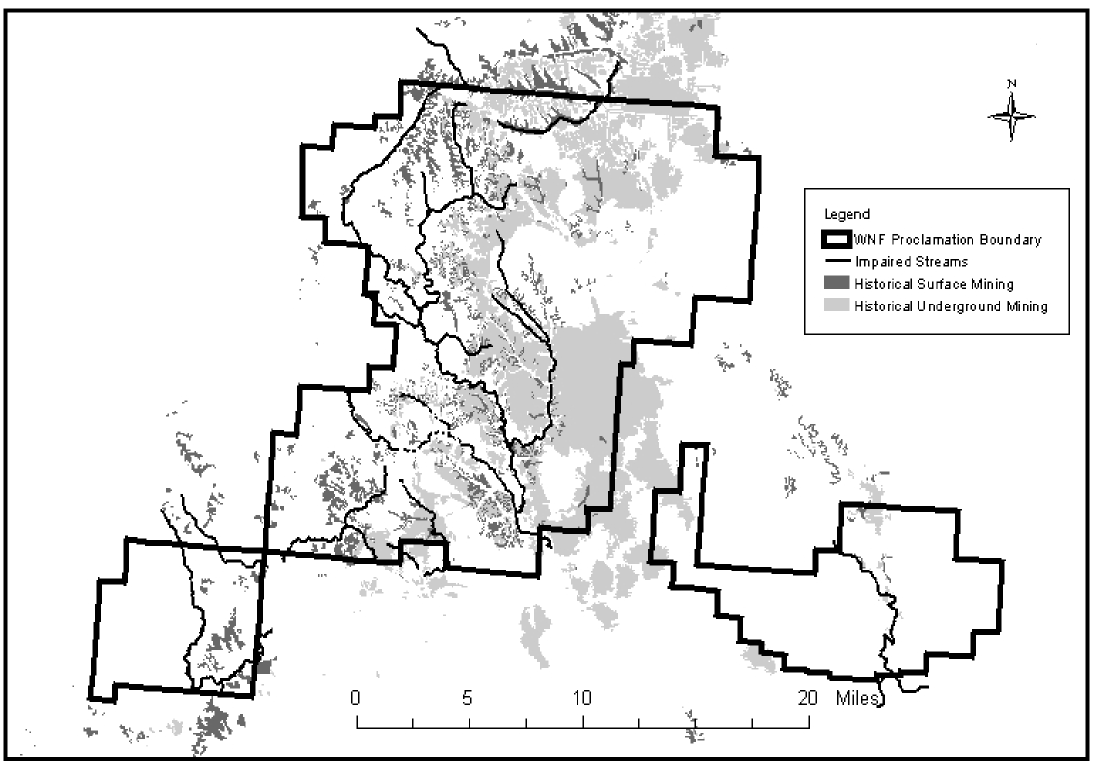


Figure 3 - 5. Impaired streams and historical mining areas on the Athens Unit.

In 1999, Forest Service (Region 9) and the United States Army Corps of Engineers (Huntington District) jointly developed a format and methodology to perform inventory abandoned and inactive mines on the Monongahela and Wayne National Forests. The inventory for the Athens and Ironton Units identified over 5,000 mining and health and safety related features. The majority of features identified are mining features that require treatment and/or reclamation (Table 3 - 3).

Table 3 - 3. Mining and health and safety related features on the WNF.

Portals	Gob Piles	Slumps	Subsidences	Seeps	Ponds	Highwalls	Structures	Rubbish Piles
1467	208	319	220	452	1999	99	206	614

Treatment of acid mine drainage is an evolving science. New technologies to remediate the effects of acid mine drainage (AMD) are continually being researched and developed. Current technology includes source control or the use of active or passive treatment methods.

Source control reduces the effects of AMD before it can reach a surface stream. On the Wayne, AMD source control is accomplished through closure of open subsidences, and the removal or capping of gob piles. Over time, the limestone cap over underground coal mines can collapse, and when this happens surface water can be introduced to the mine. Surface water can recharge and increase AMD that enters the surface at some other point. Closing subsidences reroutes surface water back into natural stream channels and helps to reduce AMD outflow into surface waters. Gob piles resulted from the waste coal products. Precipitation falls onto gob piles and filters through the material and AMD seeps out at the base. Removal or capping gob piles with an impervious material (e.g., clay) eliminates this AMD source.

Active treatments include chemical treatment systems that buffer acidity by applying alkaline chemicals such as calcium carbonate, sodium hydroxide, sodium bicarbonate or anhydrous ammonia. An example of an active treatment used on the Wayne is a doser system. Introduction of fine alkaline material raises the pH to acceptable levels and decreases the solubility of dissolved metals. Precipitates form and settle out from the solution. Active treatment systems require additional maintenance.

Passive treatments allow the naturally occurring chemical and biological reactions that aid in AMD treatment to occur in the controlled environment of the treatment system, and not in the receiving water body. Passive treatment conceptually offers many advantages over conventional active treatment systems. The use of chemical addition and energy consuming treatment processes are virtually eliminated with passive treatment systems. Also, the operation and maintenance requirements of passive systems are considerably less than active treatment systems.

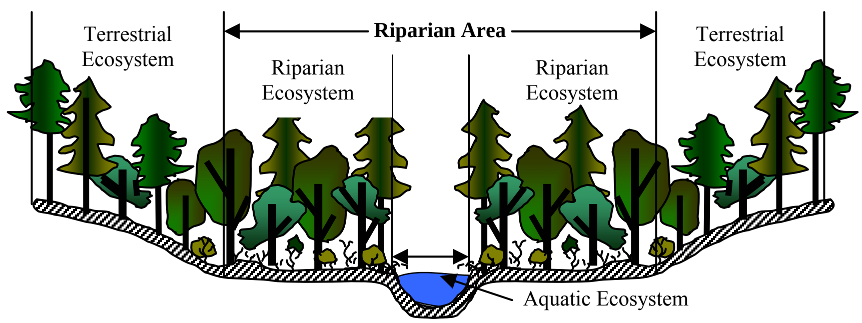
Passive treatments include construction of aerobic or anaerobic wetlands, open limestone channels, anoxic limestone drains, and the pyrolusite process.

Riparian Areas

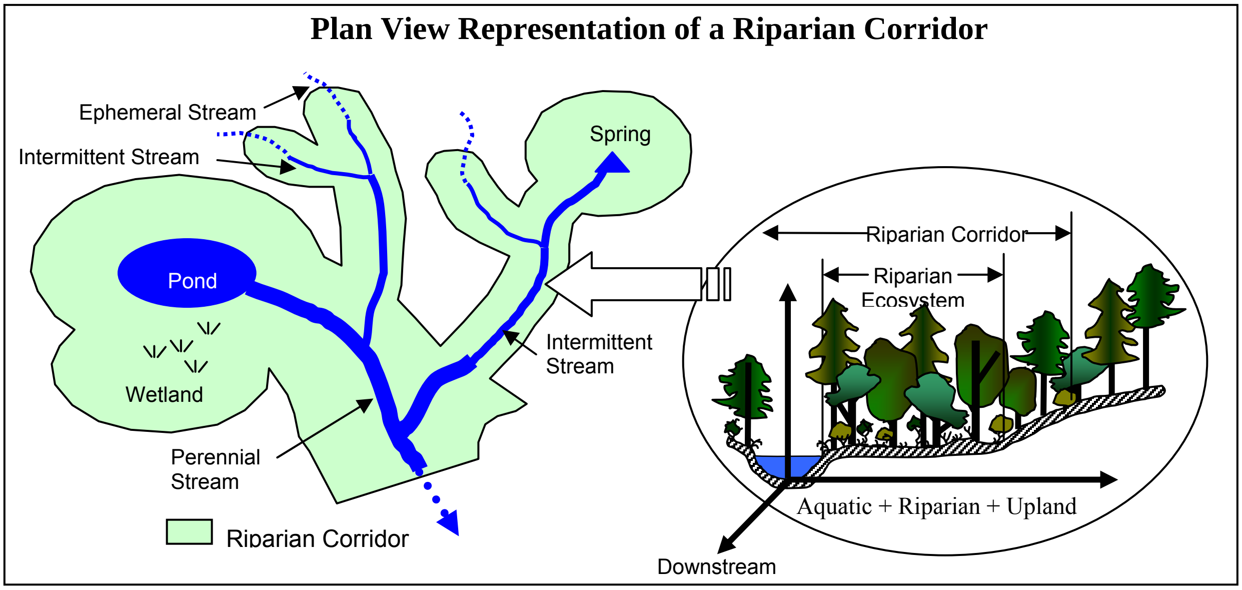
Introduction

Riparian areas are the links between the terrestrial and aquatic ecosystems, and are one of the most dynamic portions of the landscape. Under natural conditions, frequent disturbance events in the riparian area (e.g., floods) create complex mosaics of landforms and associated biological communities that are often more heterogeneous and diverse than those associated with upslope landscapes (Gregory et al., 1991).

Forest Service Definition of Riparian Area (FSM 2526.05)



Riparian corridors include the riparian area, wetlands, and land that extends away from the bank or shore of aquatic ecosystems with direct land-water interaction that may affect ecological structure, function, and composition. They extend in a linear fashion from the small headwater streams to the larger mainstem tributaries of the Ohio River.



Various activities have caused changes in the condition of riparian areas and riparian corridors over the past 200 years. Bottomlands which were enriched by periodic floods, and were flat in comparison to the hilly terrain of southeast Ohio, proved to be prime farmland for early settlers. Some of these bottomland areas along the streams were cleared as early as the late-1700s and early-1800s. Many bottomland fields were ditched and tile drained to facilitate agricultural production. About 90 percent of the natural wetlands existing in Ohio at the time of European settlement have been destroyed (National Research Council, 1992). Very few natural wetlands or bottomland forests are found on the Forest today.

Mining for coal, clay, and limestone has impacted riparian areas. Strip-mining had replaced deep mining as a more efficient method for mining coal and clay by the mid-1900s. During the strip-mining process, many streams were rerouted, channelized, impounded, or polluted with mine wastes. Whole valleys were filled with mine wastes, while others have been mined and returned to the topography present before mining was started. Acid mine drainage adversely affects major portions of the streams on the Athens Unit and, to a lesser degree, some streams on the Ironton Ranger District.

Riparian areas were altered when streams were impounded for water sources, flood control, and recreation. Creation of flood control structures increased after the 1937 Ohio River Flood. In many cases this caused an increase in the amount of riparian area when compared to the pre-existing condition. The creation of the Ohio River Lock and Dam system also affected National Forest System lands in the Marietta Unit. Water was backed up into embayments, and wave action created from tows and barges affected the shorelines.

Current Riparian Conditions on the Wayne National Forest

Based on occasionally and frequently flooded soils as defined by the USDA Soil Surveys, the Wayne has 53,299 acres of riparian area within the proclamation boundary. There are 9,836 acres of riparian area on NFS lands. (Table 3 - 4) (National Landcover Database, 1992).

Table 3 - 4. Riparian Acres within the WNF Proclamation Boundary.

Open Water	Non-forested	Forested	Wetlands	Agricultural
697	907	30,914	317	20,463

Environmental Consequences

Direct and Indirect Effects Common to all Alternatives

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

Watershed Indicator 1: Restoration of Abandoned Mine Lands

Generally, reclamation of abandoned mine land sites on the Forest are accessed via existing roads and/or trails. However, in some cases, new road or temporary road construction is necessary. Any activity that disturbs the land surface, decreases cover, or alters vegetation can affect soils, water yield, water quantity and timing, runoff timing, and water quality. Essentially, sediment and erosion entering streams are the principal concern in protecting aquatic and riparian resources during the reclamation of abandoned mine land.

A significant percentage of mine land reclamation occurs in the riparian area. Abandoned mine land reclamation consists of, but is not limited to, construction of new stream channels, reconstruction of existing channels, capping of gob piles, reclaiming old strip-pits that impound acid water, development of various systems for treating poor water quality, and restoring flow paths in drainages where flow has been blocked by earthen berms. These activities can require a significant amount of soil disturbance during reclamation. The primary factors related to soil resource disturbance during reclamation are soil compaction, rutting, and soil displacement (top soil removal). Those factors are discussed in the soils section.

Watershed Indicator 2: Protection of Streams and Riparian Areas

During implementation of some management activities, some timber removal may occur. Timber removal from riparian areas and riparian corridors may decrease woody instream cover, contribute to destabilization of streambanks or lakeshores, reduce shading, increase water temperatures, and reduce inputs of fine litter which provides biological "energy" to adjacent bodies of water.

Although no specific issues regarding impacts to soils or watershed health were identified during public scoping for this Forest Plan revision, the following activities will be discussed in general terms because they can impact riparian areas and streams. The discussions will be more qualitative than quantitative and will focus more on roads since erosion and sedimentation are principal concerns during reclamation.

- Roads/Trails
- Vegetation Management
- Mineral Exploration
- Fire Management

Roads and Trails

Roads and trails directly and indirectly affect water by increasing sedimentation and concentrating runoff. Roads and trails expose and compact soils, alter surface and subsurface water flow, and can alter stream channels during construction. When left open, they will contribute to higher erosion and sedimentation rates than closed roads and trails. Sedimentation originating from both private and NFS land is the primary cause of reduced water quality in watersheds where no previous mining occurred.

Roads have long been recognized as the primary human-caused source of soil and water disturbances in forested environments (Patric, no date; Egan et al., 1996). As identified in the WNF's 2002 Forest-scale Roads Analysis, most impacts occur during initial road construction and then gradually decrease as roadside vegetation is reestablished and disturbed soil surfaces stabilize. Effects, such as landslides may persist when a road permanently undercuts unstable soils or landforms or when roads are disturbed by road maintenance. Poorly maintained roads can result in greater impacts as surface water is diverted, culverts plug, and other road design characteristics are compromised. Lack of maintenance commonly has detrimental effects on water and soil resources.

Temporary road construction has most of the same effects as permanent road construction but generally for a shorter term and for a more limited physical extent. Long-term effects can occur if temporary roads receive extended use and they are not decommissioned.

Vegetation Management

Vegetation management activities that affect soil and water include timber harvesting, site preparation, timber stand improvement projects, and skid trail construction. Loss of the protective soil cover (litter) from ground disturbance can increase erosion and sedimentation while decreasing soil productivity. Reduced transpiration and raindrop interception also increases water yield.

Mineral Exploration

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

Fire Management

Prescribed burning directly affects soil and water by removing a portion of the vegetative cover, exposing the soil to erosion. Control lines also expose mineral soil. These factors can reduce soil productivity and increase stream sedimentation. The significance of this varies widely depending on the soils, topography, and the intensity of burn.

Standards and Guidelines

All alternatives incorporate management direction that would provide for maintaining and, where practical, restoration of watershed health. This direction consists of desired conditions, objectives, standards, and guidelines that would apply to and limit the effects of any alternative selected for implementation in the Forest Plan.

Although standards and guidelines do not completely eliminate water quality and riparian impacts, they would reduce impacts to acceptable levels. Standards and guidelines provide a level of protection that the States and the U.S. Environmental Protection Agency have judged sufficient to meet the goals of the Clean Water Act (Ice et al., 1997).

The key to sustaining soil productivity, hydrologic function, riparian integrity, and water quality in the long-term is protection of the forest floor and associated soil properties and qualities through implementation of Forest Plan standards and guidelines. With successful revegetation of bare soil areas, erosion and sedimentation rates should diminish rapidly to pre-disturbance or background levels within three years. The greatest decrease in these respective rates should be achieved in the first two growing seasons. Soil erosion risk is at its maximum immediately after soil disturbing activities are completed (Burger, 1985).

Currently, all Forest Service permanent and temporary roads needed to access resource management sites are designed and constructed using soil and water guidelines that meet or exceed those required by the State of Ohio.

The long-term effects of abandoned mine land reclamation and restoration of associated riparian areas are positive in that acid mine drainage is reduced or eliminated, and both the aquatic and terrestrial resources are restored to a functioning ecosystem.

Cumulative Effects

The cumulative effects analysis for watershed and riparian resources focuses on management activities that may result in soil erosion and sedimentation of aquatic and riparian habitats. An analysis of how the alternatives would affect soil productivity is addressed separately in the Soils section. The cumulative effects analysis area for watersheds and riparian resources covers the 31 fifth-level watersheds that fall at least partially within the WNF proclamation boundary. These watersheds encompass 2,613,184 acres of land in southeastern Ohio. At this time, only 22 of the fifth-level watersheds contain NFS lands, but NFS ownership patterns could change in the future with continuation of the Forest's land acquisition program.

To estimate the cumulative effects of the alternatives on watershed and riparian resources, activities on adjacent non-Federal lands must be considered. Unlike many of the nation's larger National Forests where the land base is mostly contiguous, the WNF is significantly fragmented by private and State lands. National Forest System ownership determines the degree of influence Forest Service resource management could have in any particular watershed (Table 3 - 5).

Table 3 - 5. Comparison of NFS ownership among fifth-level watersheds and the relative degree of influence Forest management activities could have on fifth-level watershed integrity.

	Percent NFS ownership in fifth-level watersheds					
	0	**0-10**	**10-20**	**20-30**	**30-40**	**40-50**
Number of 5th level watersheds	9	11	5	3	2	1
Degree of Forest Service influence	N/A	Low	Low	Moderate	Moderate	High

An analysis of cumulative effects requires that proposed actions be analyzed together with past actions and potential future activities. As described earlier, extractive land use activities from the late-1700s through the 1900s resulted in the degradation of watershed integrity. However, efforts by the Forest Service and other natural resource agencies and conservation organizations have led to improvements in the damaged watersheds and riparian areas of southeastern Ohio. State and Federal agencies with regulatory authority aid in the protection of watershed and riparian health during the implementation of energy minerals development on private and public lands, as well as projects that may directly affect wetland and aquatic habitat integrity. In addition to a well-organized abandoned mine land restoration program in southeastern Ohio, Federal and State programs provide opportunities for private landowners to restore or improve wetland and riparian habitat. Furthermore, Federal and State agencies offer educational opportunities for private landowners to learn best management practices (BMPs) for logging, woodlands management, and riparian management. These programs are providing long-term beneficial effects to watershed health. For example, an evaluation of best management practices for logging on private lands indicated that BMPs were employed in at least 80 percent of all timber harvests and 95 percent of these BMPs were rated effective at minimizing sedimentation of streams (McClenehen et al., 1999).

Forest Service management activities such as road construction, skid trails and landings associated with timber harvest, and to a lesser degree, off-highway vehicle trails, fire line construction, and abandoned mine land reclamation have the potential to decrease soil stability and could result in sedimentation of aquatic and riparian habitats. Surface mining and oil and gas well development are management activities that could occur, but are dependant on proposals by private minerals owners or Federal minerals lease holders. In order to accomplish short-term and long-term land management activities, soil erosion and sediment transport may be an unavoidable consequence. However, Forest-wide standards and guidelines integrated into all alternatives minimize effects to soil stability and downslope and downstream areas. These Forest-wide standards and guidelines not only reduce the threat of short-term impacts, but minimize the likelihood for long-term adverse effects to soil and water resources.

The acreage of ground disturbing activities that could occur on NFS land during the first decade would vary little between the alternatives (Table 3 - 6). Based on small amount of ground disturbance expected from these Forest management activities with Forest-wide standards and guidelines designed to reduce impact, cumulative effects of Forest Service management activities on watershed integrity would likely be minimal. The alternatives vary little in the amount of potential soil erosion and sediment transport that could occur during the first decade, with less than one percent of the cumulative effects analysis area affected by ground-disturbing activities on NFS land. Furthermore, some activities that may be implemented could result in short-term disturbance but provide significant long-term benefits. For example, abandoned mine land restoration may disturb localized areas for a brief period, but could result in the restoration of habitable aquatic habitat for fish, mussels, and other aquatic invertebrates.

Table 3 - 6. Potential acreage affected by Forest Service ground disturbing activities within the cumulative effects analysis area.

	A	B	C	D	E	E Modified	F
Trail Construction	303.5	303.5	265	302	265	265	225
Recreation Facility Construction	60	60	60	60	60	60	60
Road Construction or Reconstruction	315	421	540	537	530	538	495
Skid Trails and Landings	198	441	747	739	718	740	634
AML Restoration	522	522	522	522	522	522	522
Energy Minerals Development	1,371	1,371	1,371	1,371	1,371	1,371	1,371
Utility Line Construction	50	50	50	50	50	50	50
Fireline Construction	15	15	14	14	14	14	14
Total Acres Affected	**2,834.5**	**3,183.5**	**3,569**	**3,595**	**3,530**	**3,560**	**3,371**
Percentage of Cumulative Effects Analysis Area	**0.11**	**0.12**	**0.14**	**0.14**	**0.14**	**0.14**	**0.13**

Soils

Affected Environment

The Wayne National Forest is located in southeastern Ohio, commonly referred to as Ohio's Hill Country. The Hill Country consists of a long series of narrow ridges and U-shaped valleys.

The slopes are seldom smooth with uniform gradient from crest to toe. Rather, they are benched or segmented, having alternate sections of steep and moderate slope gradients. Local relief (local relief refers to the difference in elevation between the top of a ridge and the bottom of its adjacent valley) varies as little as 50 feet in some areas to as much as 500 feet in others. Slope gradients range from 15 to 80 percent with dominant slope gradients ranging between 25 and 55 percent.

Benches result from erosion of strata with different resistance to erosion. Weak strata, such as shale or mudstone, weather more rapidly than resistant sandstone.

The surface texture of most soils is silt loam, loam, or sandy loam, but texture of subsoil ranges from sandy loam to clay. Because of the steep slopes and silty textured soil surface layers, erosion is probable if the duff layer is disturbed.

Current natural soil loss through erosion on undisturbed forested lands can be up to one-half ton per acre per year. This compares to a soil loss on cropland in the Forest area of seven tons per acre per year (Soil and Water Conservation Districts Resources Inventory, 1979). However, the scope of past land uses was much more broad in comparison to current impacts. Settlement of southeast Ohio by non-Native Americans from the late 18th through the 19th century dramatically changed land use in the area. The new settlers practiced logging, mining, and grazing. While these land uses continue on a small scale, they were more widespread and intensive in the past. These intense land-uses in that era were rarely accompanied by mitigation measures to prevent soil erosion. As a result, soil productivity and fertility both declined.

Soils on the Forest's uplands are relatively infertile, but research by Finney et al. (1962) indicates that soil fertility varies with slope aspect. They found soils on southwest-facing slopes generally to be more acidic and have thinner topsoil than those on northeast-facing slopes. These soil differences, however, are not of enough magnitude to have been reflected in local detailed soil survey maps. The surveys also describe soils influenced by flooding. Soils found near streams and in bottomlands are classified as occasionally or frequently flooded soils. The occasional category still exists in some surveys, but is no longer used in current survey standards.

Timber site quality has also been shown to be related to slope aspect as well as slope position. Research by Carmean (1967) has shown that site indices for black oak in southeastern Ohio tend to be highest on lower slopes with northeast aspects and lowest on upper slopes with southwest aspects. Mid slopes and southeast and northwest aspects have intermediate site indices.

Soil mass movement is possible on the steepest areas of the Forest. Virtually every valley contains some evidence of landslide soil movement. Concave slopes at the heads of valleys are most susceptible to mass movement, while convex slopes at ends of spur ridges are least susceptible. Valley head slopes are very sensitive to disturbance. Movement of soils is also commonly seen in areas affected by surface and underground mining. Areas that have been surface mined may be characterized by slumps and gob piles, while subsidences and portals are often associated with areas around underground mines.

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

Environmental Consequences

Direct and Indirect Effects

The Forest Service is directed by various laws, executive orders, and policies to protect or enhance long-term soil productivity while providing for multiple forest uses. Soil productivity is the inherent capacity of the soil to support the growth of plants and can be measured in terms of biomass produced.

While the Forest Service does not measure impacts to the productivity of soils with biomass because it is difficult to quantify, the Agency will describe impacts to soil productivity by estimating the number of acres likely to be affected by soil disturbing management activities. Some the impacts will be short-term (<5 years) and some long-term (>5). The intent is to show how each alternative will affect long-term soil productivity. By identifying impacts to soil productivity and minimizing the area to be affected, the soil's ability to function as an important part of the Forest's ecosystems can be protected.

Soil productivity can be affected by several factors and conditions resulting from Forest management activities (See Table 3 - 7). Compaction, erosion, topsoil removal (displacement), land use changes (e.g., forestland to parking area), fire, and soil improvement (fertilization/liming) can all impact soil productivity. Natural geologic weathering processes (rock to soil), organic decomposition (breakdown of dead biomass), fire, nutrient cycling, and atmospheric events (e.g., drought, precipitation, freezing) also influence soil productivity.

Table 3 - 7. Effects to Soil Productivity from Forest Service actions.

• Direct Effects	• Indirect Effects
• Compaction	• Erosion/soil movement
• Land use change	• Vegetation removal/nutrient cycling
• Displacement (Topsoil removal)	• Fire use
• Soil improvement	•

Key indicators for effects to the soil resource include:

- Acres of timber harvest
- Miles of road construction
- Acres of prescribed burning
- Miles of trail construction

- Soil improvement
- Mineral development
- Acres of dispersed and developed recreation use and construction

The Forest and Rangeland Renewable Resources Planning Act (RPA, 1974) requires an assessment of the present and potential productivity of NFS land. Regulations are to specify guidelines for land management plans developed to achieve the goals of the program which "insure that timber will be harvested from National Forest System lands only where…soil, slope or other watershed conditions will not be irreversibly damaged." The National Forest Management Act (1976) amended RPA by adding sections that stressed the maintenance of productivity, protection and improvement of soil and water resources, and avoidance of permanent impairment of the productive capability of the land.

Compaction

Soil compaction is related to soil texture, structure, moisture, ground cover, rock content, and the type of activity. Soils with high moisture content are most susceptible to compaction. Fine textured soils without rock fragments are also more at risk. Rutting, increased runoff, erosion, and reduced root/plant growth can occur on severely compacted soils. If topsoil is removed, compaction is more likely, since the subsoil layers of many soils on the Forest have higher clay content and contain fewer rocks. However, if topsoil has already been removed, then soil productivity is already reduced on the area. Compaction is considered a short-term (less than 100 years) effect on soil productivity, since research has shown even severely compacted soils may recover in 10 to 60 years where mitigation measures of tilling and reestablishing vegetation have been used. Depth of compaction does not usually exceed 6 inches with the kinds of equipment currently used on the Forest. The actions associated with 2006 Forest Plan alternatives that can produce soil compaction include skid trail (unbladed access routes) use, dispersed recreation use, timber harvesting, grazing, and trail use.

Land Use Change

The ability to produce biomass, is a sign of soil productivity. If soil with biomass is converted to a parking lot, building site, paved road or some other use that prevents biomass production, then it has lost some or all of its productivity for some time, probably an extended period (greater than 100 years). Land use change is thus a long-term impact to soil productivity.

Displacement (Topsoil Removal)

Topsoil removal is considered a long-term impact on soil productivity because it means loss of the soil's most fertile section. The feeder roots of plants and many of the nutrients needed for soil organisms to grow are found in the organic layer and the soil surface beneath it. Many of the Forest's soils are formed in sandstones and shales that are naturally low in plant nutrients. Many are also acidic (low in soil pH). The upper layers of soil, where most of the organic material and microorganisms are found, are therefore very important in maintaining soil productivity. Soils require many years to recover their original productivity after their upper layers are removed. Soil formation typically occurs at a rate of one inch per 300 to 1,000 years and depends on many environmental factors.

Areas to which removed topsoil is relocated will be enriched by the new soil material and organic matter. The productivity of these topsoil disposal areas will be improved by increased soil depth, rooting depth, moisture holding capacity, and organic matter. However, this improved soil productivity does not offset the long-term loss of productivity in areas from which top soil is removed. It is noted here as an indirect effect of excavation and to document that not all effects from excavation are negative. Topsoil disposal areas will not be used to show any positive effects of excavation, since the extent of these areas is not easily estimated or displayed. Actions which can produce topsoil removal associated with Forest Plan alternatives include:

- Temporary road and skid road construction
- Log landing construction
- Developed recreation use
- New trail construction
- Oil and gas development
- Bulldozer constructed fireline
- Special use development and wildlife opening establishment.

Soil Improvement

The Forest's intent is to improve soil quality on about 10 acres per year. Special emphasis will be given to riparian areas to help reduce sediment delivery to stream channels, floodplains, and wetlands. Some watersheds may be targeted for this work to tie in with large-scale watershed partnerships, special concerns with species habitats and public water sources. The effects of soil improvement will be considered a long-term positive effect on soil productivity and an improvement of existing soil quality. Soil improvement actions associated with Forest Plan alternatives would include: slope stabilization, erosion control structures, and abandoned mine reclamation.

Prescribed Fire Use

Prescribed burning impacts soils in two ways:

- The fire itself burns up portions of the soil's organic layer, an important part of soil productivity.
- The combustion of these organic soil compounds under high temperature may leave a waxy residue, resulting in water repellent soils, reducing soil permeability, increasing runoff, and erosion potential.

Hotter fires with large fuel loads will burn up more of the organic matter than cooler fires. A few soils on the Forest with thin organic layers can lose their entire organic layer when a fire burns hot. Typically, these would be shallow, rocky soils, at or near ridge tops on steep slopes. In most cases, the effects of fire on the soils on the Forest are short-term. Soil organic layers are replenished by leaf fall. Existing vegetation takes advantage of a temporary increase in onsite available nutrients produced by the burning of organic matter (biomass), which adds new organic material to the site.

The construction of bladed firelines to control the burned area boundary is associated with prescribed burning. This form of topsoil removal has a long-term impact on soil productivity. Not all firelines are bladed, however. Non-bladed firelines are considered short-term impacts to soils.

Erosion/Soil Movement

Erosion (i.e., soil movement) is an indirect effect of removing a soil's duff layer to create bare mineral soil. An undisturbed soil with layers intact and growing biomass is not very susceptible to erosion. When soils are disturbed to expose bare mineral soil (soil surface and subsoil), then soils on slopes become susceptible to raindrop impact, displacement, and overland water flow. These forces can cause soil to move downslope, sometimes into stream channels, where it then becomes sediment and is incorporated into the bed load of the stream channel. Exposed slopes with low clay soils and soils without many rock fragments are most susceptible to soil movement.

Erosion in this case is considered soil movement rather than soil loss. Many factors influence movement of soil to new locations. Depositional areas may benefit from the addition of eroded soil. Due to Forest topography, erosion often results in deposition of soil on slope benches. Gully erosion is an extreme form of soil movement with a long-term impact on soil productivity. Gully erosion removes large amounts of soil that will not be replaced in the short-term (<100 years). Other forms of erosion are not as substantial and may last only until a vegetative cover is reestablished. Gully erosion is difficult to predict and depends on several factors. Soil movement erosion will be considered a short-term effect and will be estimated mainly to measure sediment delivery to stream channels.

Vegetation Removal/Nutrient Cycling

Reduced canopy (shade) can affect soil temperature, moisture, and nutrient cycling. This situation normally occurs with a timber harvest. The bole of the tree is removed from the site and the forest canopy opens up to allow more sunlight and moisture to reach the soil surface. Other parts of the tree will remain onsite to recycle into the soil system over time. Loss of trees will reduce evapotranspiration and increase soil moisture.

Loss of canopy will increase soil moisture and temperature in the topsoil. These conditions will increase soil organic matter decomposition and increase available nutrients on the treated area. Much of this increase in plant available nutrients will be taken up by the regeneration of hardwood trees and by the root systems of the remaining vegetation on the treated area.

Some nutrients may leach from the site and reach local streams. This leaching effect is short-term, and removal of the tree main stem alone will not reduce long-term soil productivity. These short-term losses are made up by leaf fall, atmospheric additions, and weathering of parent material. Any increased leaching of nutrients from the soil would be very short term (<5 years). Long-term productivity has been reduced with whole tree harvesting on short rotations, which is not prescribed for this Forest.

Table 3 - 8. Acres of treatments that could affect soil productivity.

Effects to Soil Productivity	Acres by Alternative						
	A	B	C	D	E	E Modified	F
Short-Term (10 year period)	552	552	552	552	552	552	552
Long-Term (10 year period)	2262.5	2610.5	2997	3023	2958	2988	2789
Soil Improvement Term (10 year period)	100	100	100	100	100	100	100
Long Term Cumulative effects (10+ Year Period)	2162.5	2510.5	2897	2923	2858	2888	2699
Percent of WNF with Long Term Cumulative Effects	1.2	1.3	1.5	1.5	1.5	1.5	1.4

Cumulative Effects

Cumulative effects are described by effects to soil productivity from management activities on the Forest, acid precipitation, and historic land use resulting from the 18th, 19th and 20th century settlement and development in southeast Ohio.

The cumulative effects to soil productivity from the actions taken during the first decade by each alternative are displayed in Table 3 - 8. Short-term effects to productivity (<5 years) are associated with removal of ground cover and compaction. Long-term negative (>5 years) effects to soil productivity reflect impacts from soil displacement and land use change due to road construction, dozer firelines, mineral activities, new trail construction, recreation development, special uses, and log landings. As shown, the alternatives would vary slightly in their impact to long-term soil productivity on the Forest. In the first decade of the plan, the table shows little variation between the alternatives. Long-term cumulative effects take into account the existing conditions on the Forest and add the impacts for the first decade. Soil productivity is being maintained on more than 98.5 percent of the Forest. Cumulative effects to the soils considered all resource management actions anticipated by the alternatives for the first ten years.

Modern Settlement and Development

Beginning in the late 18th and through the early 20th century, the lands of southeast Ohio were transformed dramatically by increased population and the supplanting of Native American culture. As settlement expanded and industrialization began, the natural resources of southeast Ohio were highly prized. Logging and extraction of minerals created the most changes in the landscape with agriculture and other modern developments playing a role. These varied activities all led to severe soil erosion during and well after the activities ceased. The resulting reduction in soil productivity and fertility permanently changed the landscape of southeast Ohio.

Acid Precipitation (Acid Deposition)

Acid rain falls on Southeastern Ohio. In many areas, acidic precipitation has a measurable impact on soil quality. The impact to soils in the southeastern Ohio, however, is considerably less than in areas with shallow soils and a low CEC (cation exchange capacity). The forested areas of southeast Ohio have what are considered deep soils (>20 in.). This soil depth, coupled with a high CEC, buffers the ph levels of acid rain. Soils where minimal impact may occur are on shallow (<20 in.) to very shallow soils (<10 in). The impact is minimal because these soils are often very coarse and the precipitation is quickly absorbed into ground water. (Martin NRCS Personal Communication, 2004)

While acid rain may reduce the buffering effect of the soil over a long period, soil acidity is more likely generated by in-situ microbial plant and animal processes (Kennedy, 1986). The amount and effects of acid deposition do not vary by alternative.

Air Quality

Affected Environment

The Clean Air Act requires that the United States Environmental Protection Agency (EPA) set National Ambient Air Quality Standards to protect public health and the environment. Hazardous air pollutants are those that cause or may cause cancer or other serious health effects or adverse environmental and ecological effects. EPA standards establish acceptable concentrations of six pollutants in the outdoor air. These pollutants are carbon monoxide, ground-level ozone, lead, nitrogen dioxide, particulate matter, and sulfur dioxide.

EPA designates areas that exceed these standards as non-attainment areas. For each such area, states are required to develop a detailed plan that lays out how attainment would be achieved. The Wayne National Forest manages land in 12 counties in southeastern Ohio, all but Washington County is considered in attainment for these pollutants. This means that the level of these pollutants in the air over the Forest is below the ambient air quality standards set by EPA. Washington County is a non-attainment area for the eight-hour ozone and fine particle pollution standard as of Sept.14, 2005.

Although air management issues can be very complex, three pollutants – sulfates, nitrates, and mercury cause the overwhelming majority of the impacts to ecosystems, the major source of these pollutants are the coal fired power plants throughout the Ohio River Valley. The Wayne National Forest lies within a region characterized by some of the highest levels of air pollution in the nation (Sams, 2002). As a result, this region also has some of the highest levels of acid rain and mercury deposition, which could contribute to a loss of ecosystem health. Sulfur dioxide and nitrogen oxides are precursors to important components of ozone and regional haze, resulting in inhibited visibility during hot sunny weather with stagnant atmospheric conditions. Sulfur dioxide and nitrogen oxide affect foliage and reduce the growth of species sensitive to these pollutants. The Wayne lies near some of the largest sulfur dioxide (SO_2) emitters in the nation. The resulting acidic sulfate deposition is the heaviest in the nation, and the Forest experiences high levels of acid deposition stemming from these and other nearby sources, it also important to note that much the SO2 produced in Ohio is transported by winds to other states.

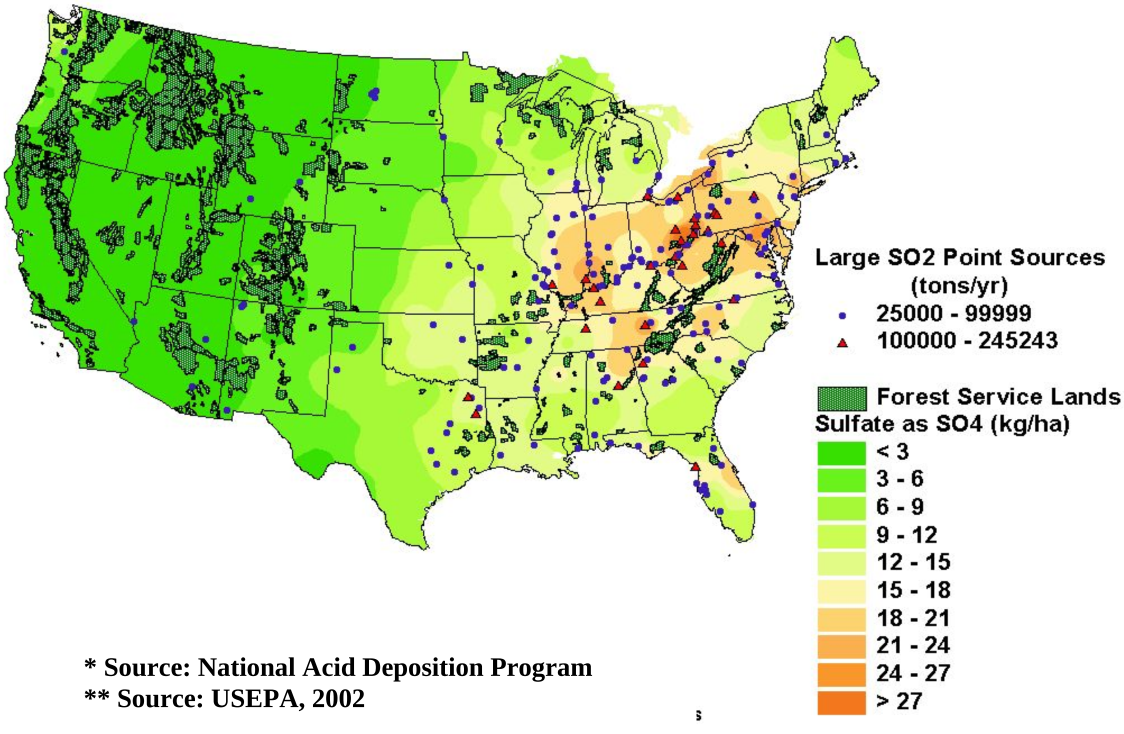


Figure 3 - 6. Sulfate Deposition During 1999* and Largest Sulfur Dioxide Point Sources.

Mercury depositions can occur anywhere due to long-range atmospheric transport. Mercury deposition can lead to the formation of methyl mercury in the aquatic environment. Methyl mercury is a potent neurotoxin, biomagnified in fish through the aquatic food chain. The State of Ohio issues fish consumption advisories for lakes and streams where mercury levels are unhealthy.

Particulate matter is a mixture of solid particles and liquid droplets in the air including dust, soot, and other microscopic particles. Particulate matter is a major component of smoke and can come from internal combustion engines, power plants, burning, or windblown dust. Scientists have linked exposure to particulate matter to serious human health problems. In addition, particulate matter can impair visibility.

Environmental Consequences

The major impact to air quality from management on the Wayne National Forest would be from wildfires and prescribed burns. Both wildfires and prescribed burns generate smoke that includes particulate matter that can temporarily degrade visibility and ambient air quality. Other management practices on the Forest are not expected to affect air quality to any noticeable degree.

Table 3 - 9. Total Acres of prescribed burning by alternative.

Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. E Modified	Alt. F
68,567	68,567	63,967	63,279	62,417	62,467	62,630

When prescribed burning is considered for use in restoring the role of fire in the ecosystem and to reduce fuels, the effects of smoke from wildland fire and prescribed burning must be taken into account. Fires emit large amounts of particulate matter (particulate matter size classes: PM 10 and PM 2.5 (microns)) and carbon monoxide as well as nitrous oxides (NOx) and organic compounds. Smoke created from burning is generally temporary. It dissipates and is not considered a significant factor in local air quality. The WNF implements most prescribed burning in the spring and fall when smoke would dissipate quickly. Burning during spring and fall would not affect the attainment status for pollutants, as the non-attainment days normally occur during the summer or periods of stagnant air. To minimize air quality impacts, all prescribed burns have an approved burn plan. These plans include measures to minimize and manage smoke. Prescribed burns also comply with State regulations for open burning. Other information related to prescribed fire and effects of smoke is in Chapter 3 Issue Indicator 11: Amount of NFS lands allocated to prescribed burning and mechanical fuels reduction.

Cumulative Effects

Timber harvest and motorized recreation affect air quality due to dust and the impacts of increased emissions. These impacts are expected to be negligible compared to background levels of air pollution from power plants and automobiles. Prescribed burning is accomplished in a controlled manner, and acreages are similar across all alternatives. Prescribed burn plans indicate the best conditions to conduct the burns, and include mitigations for air quality concerns.

Emissions from wildfire are expected to be constant across all alternatives and are outside the control of the Forest.

There is currently no evidence to suggest that air quality in Ohio and near the Wayne National Forest should constrain Forest management options or actions. In general, management actions improve forest health, which should allow the Forest to better withstand the stress caused by air pollution.