Plant and Animal Habitat

Background

Ecological Setting

The Wayne National Forest lies within the Southern Unglaciated Allegheny Plateau Ecological Section (Section 221E), which covers parts of Kentucky, Ohio, Pennsylvania, and West Virginia (Figure 3 - 7). The Southern Unglaciated Allegheny Plateau can be further subdivided into smaller ecological units, called subsections – three of which contain the WNF: the Ohio Valley Lowlands, the East Hocking Plateau and the West Hocking Plateau (Table 3 - 10). Thirty-one 5th level watersheds contain portions of the WNF (see Watershed and Riparian Areas in this Final EIS).

The National Hierarchical Framework of Ecological Units is a classification and mapping system for dividing the Earth into progressively smaller areas of increasingly similar ecology. Ecological units are mapped based on patterns of climate, soils, hydrology, geology, landform and topography, potential natural communities and natural disturbances.

Wayne National Forest Ecological Hierarchy

200 - Humid Temperate Domain
- 220 - Hot Continental Division
  - 221 - Eastern Broadleaf Forest (Oceanic) Province
    - 221E - Southern Unglaciated Allegheny Plateau Section
      - 221Ec - Ohio Valley Lowlands Subsection/LTA
      - 221Ed - East Hocking Plateau Subsection/LTA
      - 221Ef - West Hocking Plateau Subsection/LTA

Source: USDA Forest Service 1995

The WNF is located within a landscape that is fairly homogeneous compared to other Region 9 National Forests that are strongly influenced by glaciation or topographic relief. Landform, aspect, and slope are the primary factors that influence terrestrial forest communities on the WNF (USDA Forest Service, 1999). Landform and geology influence the physical aquatic systems, and subsequently the aquatic communities.

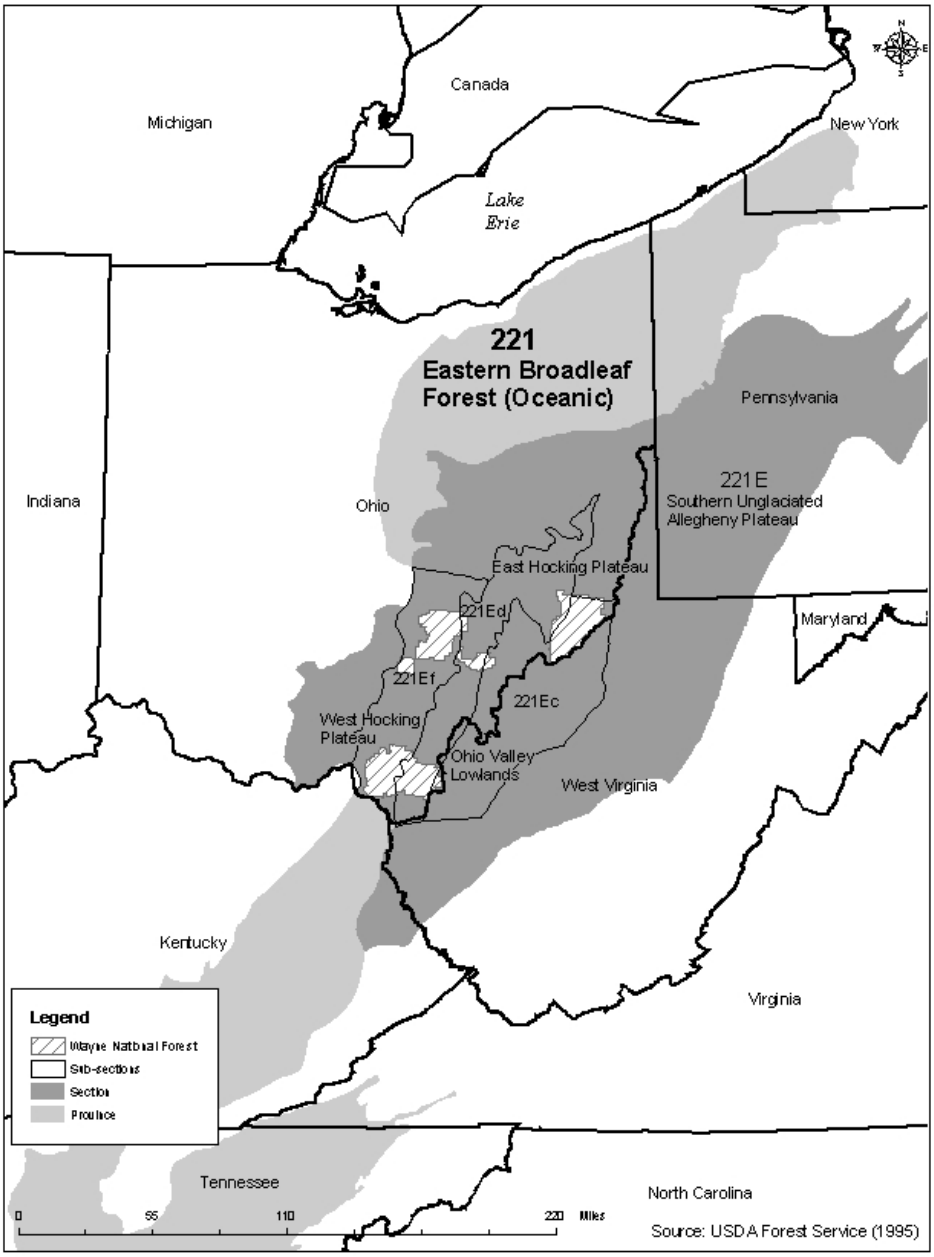


Figure 3 - 7. The Wayne National Forest in relationship to the Southern Unglaciated Allegheny Plateau Ecological Section 221E and three ecological subsections.

Table 3 - 10. Ecological patterns of the three ecological subsections that contain the WNF.

	Ohio Valley Lowlands Subsection (221Ec)	East Hocking Plateau Subsection (221Ed)	West Hocking Plateau Subsection (221Ef)
General Description	Rugged, wooded, and, commonly, too steep to be farmed. High gradient streams without acidity problems are characteristic and have developed on the underlying Permian shale, sandstone, and coal; on shale, the streams are often ephemeral and without large riffle-inhabiting fish populations.	Rounded hills and ridges that are generally less rugged than 221Ec, but are still steep. Gas wells, coal mining, and reclaimed land are locally extensive and associated stream degradation is common. Forests occupy steeper areas; dairy, livestock, and general farms also occur.	The ridges are forested while its floodplains and broad, clay-filled, flat-bottomed, preglacial valleys are used for general farms. Characterized by extensive bituminous coal mining (especially in the north) and associated stream degradation. Originally, the hill slopes had mixed oak forests, while the broad, Teays-age valleys supported mixed mesophytic forests.
Physiography	Unglaciated, except in the extreme west and northeast. Highly dissected plateau with rounded hills, ridges, landslips. Steep slopes of high relief along the Ohio River. Stream flow can be low in the summer.	Unglaciated. Dissected plateau, rounded hills and ridges, narrow valleys, steep slopes of high relief. Landslips. Some streams impacted by acid mine drainage.	Unglaciated, except in the extreme northwest. Dissected plateau with broad, flat-bottomed, hanging, pre-glacial valleys. Stream degradation associated with coal mining.
Natural Vegetation	Mostly mixed oak forest; with mixed mesophytic forest, oak-sugar maple forest; beech forest in broad valleys in Meigs and Athens counties.	Mixed mesophytic forest and mixed oak forest; beech forest in wide valleys of certain counties.	Extensive mixed oak forest on hill slopes. Teays-age valleys support mixed mesophytic forests. Beech forests in the wide valleys of the Hocking River system.

Source: U. S. Environmental Protection Agency (no date)

Plant and Animal Diversity

The National Forest Management Act (NFMA) requires the Forest Service to provide for diversity of plant and animal communities based on the suitability and capability of the specific land area so that overall multiple-use objectives can be met. There are over 300 aquatic and terrestrial vertebrate species, in addition to countless invertebrates and over 2,000 plant species known to inhabit the WNF sometime during their life cycle. Species viability evaluations conducted as part of the 2006 Forest Plan revision demonstrated that habitat diversity is the key to the conservation of these plants and animals (see Appendix E of this Final EIS).

Through our species viability evaluations, we found that the WNF plays a primary role in providing habitat for certain species of viability concern. One example includes the sun-loving yellow crownbeard, where 20 out of Ohio's 27 populations occur on NFS land. Another example is the Ohio lamprey which is found only in a handful of Ohio River tributaries within the Southern Unglaciated Allegheny Plateau. The Ohio lamprey appears to be declining throughout its range except for the Little Muskingum River where its population is considered stable. The WNF also plays an important role in the recovery of the Federally endangered American

burying beetle; reintroduction sites occur adjacent to the Wayne and could occur on NFS land in the future.

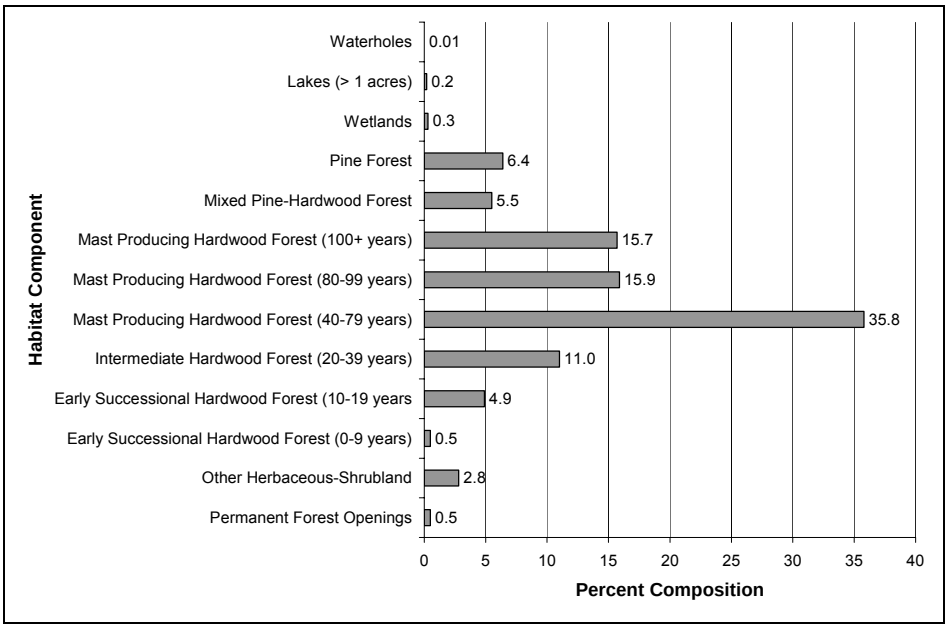
Some plant and animal species provide visitors to the WNF with a wide variety of recreational opportunities, such as hunting, fishing, and nature viewing. Major game species include the white-tailed deer, wild turkey, squirrel, and ruffed grouse. Other wildlife species hunted or trapped include the wood duck, beaver, bobwhite quail, rabbit, and mourning dove. Streams flowing through the Forest provide habitat for game fish such as smallmouth bass, channel and flathead catfish, and various sunfishes. The Little Muskingum River is one of the few remaining streams in Ohio and the Southern Unglaciated Allegheny Plateau containing a reproducing population of Ohio muskellunge. Impoundments and stripmine ponds provide habitat for largemouth bass, bluegill, and channel catfish. American ginseng, goldenseal and other plants are collected from portions of the Forest each year for medicinal purposes.

Terrestrial Habitat

The existing terrestrial habitat composition on NFS land is dominated by mature hardwood forest (Figure 3 - 8). At the time of the earliest land surveys, the area which is now the WNF was covered primarily by mixed oak forests (OBS, 1966). However, a minor component of mixed mesophytic and beech forest communities naturally occurred. Some pine was found locally on some ridges.

Mixed oak and oak-hickory communities still dominate the landscape of the Forest today. However, decreased fire occurrence over the last century has contributed to an increase in shade tolerant species in the forest understory and midstory and to a concern about maintenance of the oak component across the landscape in the future (Abrams, 1992; Abrams, 1998; Rodewald and Abrams, 2002). Oak communities support numerous plant and animal species, and their potential decline across the landscape raises concerns about how changes in forest composition will affect species over time.

Our species viability evaluations demonstrated that fire is important in the maintenance of healthy populations of fire-adapted herbaceous plants that are rare or experiencing declines, such as the juniper sedge (McCartney and Goodwin, 2003a) and yellow gentian (Larson, 2003). These plants are found in small oak barrens and prairie remnants that occur on certain ridges on the WNF.



Most of the WNF is covered with hardwood forest less than 80 years old.

Figure 3 - 8. Habitat composition on NFS land, 2003. Stream acreages are not accounted for in this chart. (Source: Analysis of the Management Situation).

Aquatic Habitat

The land ownership pattern of the WNF is scattered, but more often than not, NFS land occurs in upland areas on ridges and sideslopes. In terms of aquatic habitat, headwater streams (stream orders 1 to 3) are the dominant aquatic feature on the landscape where NFS land primarily occurs. These small streams do not necessarily support large numbers of game fish, but instead play an important ecological role for downstream waters and provide the greatest connection between the water and the land (Meyer et al., 2003).

The forested riparian corridor is a source of organic nutrients that supports the aquatic food chain, which in turn benefits a myriad of terrestrial animal species. It is also a source of large woody debris, which provides instream cover for aquatic animals, and performs channel forming functions. Thirty-seven percent of the species addressed during the species viability evaluation process were aquatic or riparian-dependant species.

Within the WNF proclamation boundary, which includes NFS land and all other ownerships, riparian corridors are generally forested (about 73%). Agricultural production is common in the riparian corridors because the land is relatively flat and fertile. About 25 percent of the lands in the riparian corridors produce hay, row crops, tobacco, or serve as pasture for livestock.

Wetlands occur in the riparian corridor. Historically, these included floodplain wetlands which were flooded seasonally, beaver-created wetlands, or shrub-scrub swamps. These different wetland types have a diversity of water regimes and plant communities. The life history of certain species that are rare or exhibiting population declines is tied to wetlands (e.g., Blanchard's cricket frog, featherbells).

Organization of the Analysis

We conducted coarse filter and fine filter analyses of biodiversity and these provided us with information about species of viability and conservation concern, as well as terrestrial and aquatic habitats, forest communities, and disturbance regimes that were important for maintaining viable populations of plants and animals in the planning area (see Appendix E). Our analyses showed that maintaining components of the oak-hickory forest and some native pine communities, and providing all successional stages of forest across the landscape are necessary in order to conserve plants and animals in the planning area. Using this information, we selected 11 habitat indicators to use in this analysis to display differences in how a diversity of plant and animal habitat is provided among the alternatives (Table 3 - 11). This approach is consistent with 36 CFR 219.14(f).

Timber harvesting and prescribed fire are two management tools considered necessary to provide habitat conditions for certain species. The amount of timber harvesting and prescribed fire projected to occur will vary by alternatives, and this analysis will display these differences.

The long-term maintenance of oak-hickory and native pine on the landscape is necessary to conserve biodiversity. Each supports plant and animal species native to the WNF, and therefore each has been termed a management indicator habitat. The degree to which oak and native pine are maintained on the landscape in the planning area over time will be based on the amount and type of timber harvesting and, to a degree, prescribed burning that is projected to occur in each alternative.

Early successional forest habitat is needed to conserve certain animal species in the planning area, however our analyses showed that this habitat has declined on NFS land since the 1988 Forest Plan was implemented (Ewing, 2003a). We have selected early successional forest as a management indicator habitat to show the degree to which habitat for a suite of species is provided among the alternatives.

Our analysis will also use eight animal species to supply supplemental information to show differences in how other forest habitats or habitat features would be provided under each alternative. These are termed management indicator species (MIS). These MIS were selected because their habitat requirements are generally the same as many other species,

i.e., their large area requirements or their use of multiple habitats. The rationale for their selection is provided in Appendix E.

Each of the 11 habitat indicators will be individually addressed in the following section. They will be introduced with general information, followed by the current condition and then a comparison of differences among alternatives.

Table 3 - 11. Habitat indicators used to display differences among alternatives in plant and animal habitat.

Indicator Number	Habitat Indicator*	Summary
1	Amount and trends in **oak-hickory forest.**	An ecological forest type.
2	Amount and trends **in pine forest** and trends in habitat and populations for the **pine warbler**.	An ecological forest type and species associated with pine or mixed pine-hardwood communities.
3	Amount and trends in **early successional habitat** and trends in habitat and populations for the **yellow-breasted chat and ruffed grouse**.	A successional habitat component and species associated with early successional forest habitat.
4	Amount and trends in habitat and populations for the **cerulean warbler**, **worm-eating warbler,** and **pileated woodpecker**.	Species associated with mature, interior forest.
5	Amount and trends in habitat and populations for the **Louisiana waterthrush**.	Species associated with mature riparian forest and healthy headwater streams.
6	Amount and trends in habitat and populations for the **Henslow's sparrow**.	Species associated with grassland habitat.
7	Species of viability concern.	Federally listed threatened and endangered species, and Regional Forester Sensitive Species.
8	Species of public interest.	Species commonly harvested including white-tailed deer and ginseng.
9	Non-native invasive species	Plants, fungi and animals which can cause extensive and rapid habitat change.
10	Amount of NFS land allocated to management areas that allow timber harvest.	Displays amount of NFS land available for habitat management using timber harvesting as a tool.
11	Amount of NFS land allocated to management areas that allow prescribed fire.	Displays amount of NFS land available for habitat management using prescribed fire as a tool.

*Management indicator species or habitats are highlighted with bold text.

Analysis Area

The analysis area for considering direct and indirect effects to aquatic and terrestrial animals and plants includes the lands managed by the WNF. The cumulative effects analysis area used to evaluate Habitat Indicators 1-11 will vary. The Partners in Flight Ohio Hills Physiographic Region, an ecological area aligned with the Southern Unglaciated Allegheny Plateau Ecological Section, will be used as the cumulative effects analysis area for Habitat Indicators 2-6, while the WNF proclamation boundary is used as the cumulative effects analysis area for Habitat Indicators 1, 7 (Regional Forester sensitive species), and 8-11. The WNF proclamation boundary

plus all lands within one mile from its edge will be used to evaluate cumulative effects on Federally listed species (Habitat Indicator 7).

Habitat Indicator 1: Amount and trends in oak-hickory forest on NFS land

A chestnut-oak forest dominated the landscape until the early 1900s, but this gave way to an oak-hickory forest after a widespread chestnut blight. The relative abundance of oaks and hickories is declining in southern Ohio, while maples, black cherry, and yellow poplar are increasing (Griffith et al., 1993). An increase of maples is occurring in the understory of oak stands of various ages, a change that many researchers attribute to the loss of disturbance processes (e.g., fire, harvesting).

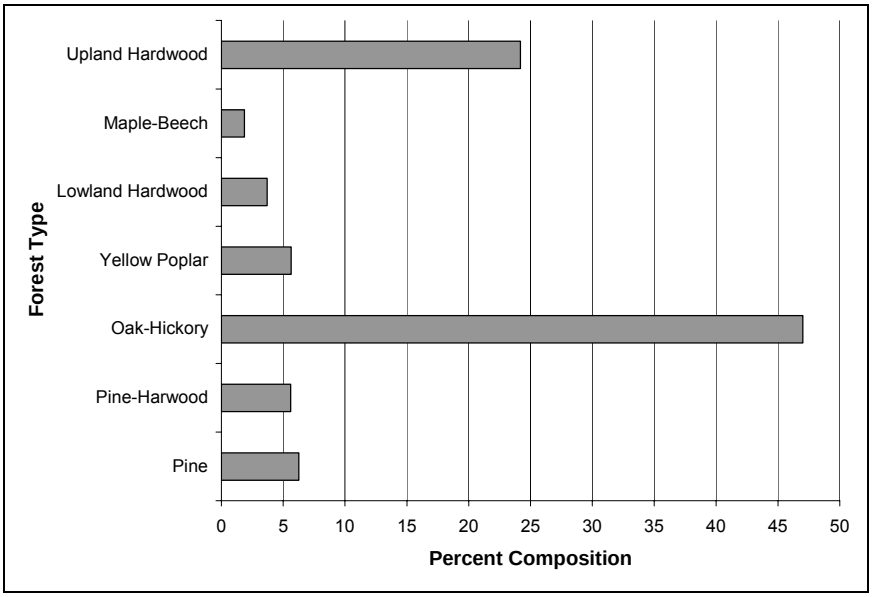
The oak-hickory forest found on the Wayne supports numerous plant and animal species. The oak-hickory forest produces an annual crop of acorns and other nuts that are a primary fall and winter food source for species like the blue jay, red-headed woodpecker, wood duck, raccoon, black bear, white-tailed deer, wild turkey, and northern bobwhite (Dickson, 2004). Acorns have a high lipid content, which serves as an energy source that becomes important for winter survival and successful reproduction. Acorn production fluctuates from year to year, which can affect natality, mortality, and movement of species like the black bear and white-footed mouse (Dickson, 2004). Studies in Appalachian oak-hickory forests suggest that fall hard mast crops may regulate ruffed grouse populations. Whitaker (2003) found ruffed grouse home ranges increased after poor mast crops, which has important consequences for predation rates and possible effects to ruffed grouse condition and reproductive success.

The furrowed bark and short-petioled leaves characteristic of oak trees also offer increased feeding opportunities to bird species that glean insects from crevices in their bark. Rodewald and Abrams (2002) study of oak-dominated and maple-dominated forest stands in Pennsylvania suggests that tree species composition influences avian community structure. They found that the majority of species and guilds that were consistently less abundant in maple than in oak stands over multiple seasons were bark-gleaning or resident species that regularly consume and cache acorns. Patterson and James (2004) found that birds foraging during the summer in closed-canopy oak-hickory forests used oaks in greater proportion than their abundance at the site, and that other tree species were used less than their abundance at the site.

The exfoliating bark of certain oak and hickory trees also provides the roosting structure needed by the Indiana bat. Fifty percent of the Indiana bat's Class I roost trees include oaks and hickories (Rommé et al., 1995).

Affected Environment

The oak-hickory forest still dominates landscape of the WNF (Figure 3 - 9). Forest stands composed primarily of oak and hickory account for 47 percent of the forest cover on NFS land. Oak is scattered, but also present in most forest stands that are categorized as upland hardwoods.



Oak-hickory is the predominant forest type on the WNF.

Figure 3 - 9. Percent composition of the different forest types on NFS land 2004.

(Source: WNF Vegetation Database)

Although oak-hickory is currently the predominant forest type on the Wayne, the relative amount of oak-hickory acreage is much less in stands younger than 70 years old, as compared to stands older than 70 years (Figure 3 - 10; Table 3 - 12). Conditions on the WNF are similar to the rest of the central hardwood region, an area that extends from New York to Georgia and from Virginia to Missouri, and encompasses the southern allegheny plateau ecological section. Forest stands that originated prior to the 1930s are predominantly oak-hickory, but the stands that originated after the institution of fire prevention are comprised to a much lesser degree of oak-hickory.

Oak regeneration problems are not confined to northern states at the margin of the range, which might otherwise be most affected by climatic change. Also, problems are occurring far outside the original range of American chestnut, as well as in areas such as the Southern Appalachian Mountains where the forest is not highly fragmented (Lorimer, 1992).

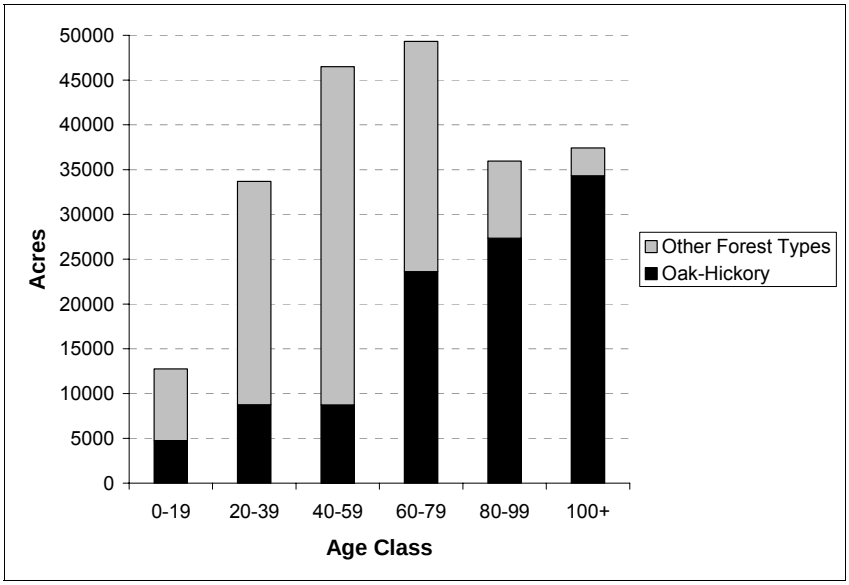


Figure 3 - 10. Acres of forest by type and age on NFS land, WNF.

(Source: WNF Vegetation Database)

The oak-hickory type is less prevalent in younger stands.

Table 3 - 12. Acres and percentage of oak-hickory forest type by age class.

Age (years)	All Forest Types (Acres)	Oak-Hickory (Acres)	Percent Oak-Hickory (by Age-Class)
0-9	1,044	110	11%
10-19	11,715	4,632	40%
20-29	12,374	4,343	34%
30-39	21,319	4,417	21%
40-49	21,309	3,024	14%
50-59	25,185	5,724	23%
60-69	26,060	10,493	40%
70-79	23,259	13,120	56%
80-89	19,194	13,722	71%
90-99	16,764	13,628	81%
100-109	15,786	14,131	90%
110-119	11,356	10,524	93%
120-129	6,926	6,625	96%
130-139	2,036	1,859	91%
140-149	1,086	988	91%
150+	240	197	82%

(Source: WNF Vegetation Database)

Factors Affecting Oak-Hickory Regeneration

Acorn Production and Predation

Because successful oak regeneration usually depends on the existence of seedlings in the understory before harvest, poor seed crops and high rates of consumption by animals can have significant impacts on the ability of oaks to compete with other species. Both unfavorable weather and insect damage can lead to poor acorn crops. Most of the eastern upland oak species have good seed crops at intervals of 3 to 5 years. Intervals between good seed years in white oak may be longer, and local factors might occasionally lead to regeneration failures from this cause.

Destruction of acorns by insects, rodents, and deer are an important factor in most areas; to lose 90 percent of an acorn crop is not uncommon. In a study in Pennsylvania, rodents removed virtually every unprotected acorn on the ground surface and 78 percent of the buried acorns. Insects destroyed 63 percent of the surface acorns protected from rodents (Lorimer, 1992).

Deer browsing is clearly a limiting factor for oak regeneration in some places, and the substantial growth of deer populations that occurred in many areas around the 1930s does coincide with the beginning of widespread oak problems. However, the occurrence of oak regeneration failures in places where deer are not especially numerous makes a number of researchers feel that deer are generally more of an aggravating factor than a primary limiting factor (Lorimer, 1992).

Shade Effects

The effect of a shaded forest floor and dense understory vegetation is one factor that explains the slow growth and high mortality of understory oak seedlings. Oak has a growth strategy in which energy from photosynthesis is directed to seedling root growth at the expense of shoot development. Seedlings can develop a substantial taproot and a seedling can persist for many years despite repeated shoot dieback if an adequate amount of sunlight is available. When an opening in the crown occurs, allowing more light into the understory, such seedlings are capable of rapid growth because of the extensive root system (Lorimer, 1992).

Shade-tolerant species such as maples often have an important advantage over oaks because they can make significant height growth under a closed canopy (in more shade than an oak can develop), and steadily increase in both size and number until a nearly continuous subcanopy or a multi-storied layer of vegetation develops. These added layers of foliage beneath a closed upper canopy intercept so much light that often less than one percent of full sunlight reaches the seedling layer. As a result, oak seedlings often die once acorn reserves are exhausted, and even among the survivors a vigorous root system doesn't ordinarily develop. The ability to persist under dense shade appears to vary among oak species. White oak

and chestnut oak, for example, are often considered to be moderately shade-tolerant. However, the shade tolerance of oaks is markedly less than that of many of its mesic competitors. The average 5-year mortality rate for large, overtopped saplings in a dry-mesic stand in southern New York was 45 percent for northern red oak and 26 percent for chestnut oak, but only 11 percent for red maple. On a dry-mesic site in central Massachusetts, overtopped red oak had a 19-year mortality rate of 90 percent compared to only 16 percent for red maple (Lorimer, 1983).

On mesic sites, advanced oak reproduction that is able to compete does not accumulate in mature stands because of the deep shade under the closed canopy. The advanced oak reproduction cannot develop into a size that would be competitive if it was released by overstory removal. Rather, it cycles in and out of the system with new seedling establishment after good acorn crops followed by mortality. Interrupting this cycle of establishment and mortality to enhance survival and growth of advance oak reproduction requires a silvicultural treatment that alters stand structure so that more light is available to the seedlings in the understory (Loftis, 2004).

Large numbers of advance oak regeneration will not necessarily assure acceptable oak regeneration even if released by complete clearcutting. One reason is that, even though the overstory is removed, the oaks may still have to compete with a dense understory of larger and usually more tolerant seedlings, saplings, and sprouts. These species usually have well-developed root systems and ample foliage, enabling them to respond faster to release than oak seedlings. If, at the time of release, the seedling does not have a large root system and adequate shoot height, shoot growth will be slow until the root system develops. Therefore, the mere presence of oak seedlings does not mean that they will become part of the future stand if released.

In summary, an oak seedling can become a dominant part of the new forest type if it has developed a strong root system, and when released to adequate sunlight, it is not encumbered by an established shade-intolerant, mesic tree seedling.

Oak Stump Sprouts

Sprouts that develop from harvested trees can contribute to the stocking of the regenerated stand of trees after harvests. Oak species vary in their capacity to sprout, but the diameter of the stump seems to have a larger factor on the number of sprouts that appear after a harvest. Table 3 - 13 shows the ability of different species to sprout, at different size classes. White oak and black oaks are not reliable sprouters after they reach a diameter approaching 16 inches and larger. So if a stand has a large number of trees larger than this for these species, then the future stand will be regenerated mostly by seedlings established before harvest, or “advanced regeneration” (Sander et al., 1976).

Table 3 - 13. Expected percentage of oak stumps that will sprout after cutting.

Diameter of Parent Tree in inches	Black Oak	Scarlet Oak	Northern Red Oak	White Oak	Chestnut Oak
2 – 5	85	100	100	80	100
6 – 11	65	85	60	50	90
12 – 16	20	50	45	15	75
17 +	5	20	30	0	50

(Source: Sander et al., 1976)

White and black oaks are not reliable sprouters after they reach a diameter of about 16 inches.

Although decay in stump sprouts has sometimes been a concern, when the sprouts originate at or below ground level, there is low probability of their becoming infected via the parent stump.

Effects of Fire

Fire has numerous functions which address some of the problems outlined above. Fire can improve oak regeneration if applied at the right time and place.

Fire removes excessive litter buildup from the forest floor, thereby preparing a favorable seedbed. Areas of thin litter are preferred by squirrels and blue jays for acorn burial. An important ecological finding is that blue jays collect and disperse only sound nuts, which implies that if these acorns escape predation they will result in well-established first-year seedlings. Seedlings from freshly germinated acorns are unable to emerge through a heavy litter cover. Germination and first-year survival are best when acorns are buried about 1.2 inches deep in the mineral soil. Although removal of thick litter may expedite germination by encouraging the caching of acorns by squirrels and blue jays, it is important that not all the humus layer be consumed. The humus layer keeps the surface of the soil porous, so that uncached acorns can more easily penetrate the soil. Humus also retains moisture and provides support for new seedlings (Van Lear and Watt, 1992).

Fire helps to control insect predators of acorns and new seedlings. Insect pests act as primary invaders, secondary invaders, parasites, or scavengers on, or in, acorns. Many of these insects spend all or part of their lives on the forest floor. Infestations, which can vary from year to year and even from tree to tree in some areas, are a major contributor to the oak regeneration problem. Annually about 50 percent of the acorn crop in Ohio is destroyed by the larvae of Curculio weevils, acorn moths, and gall wasps. However, recent studies indicate that prescribed burning may reduce populations of oak insect pests when conducted under proper conditions. A reduction in insect predation would allow more acorns to be scattered and buried by jays and squirrels, thus enhancing the probability of successful germination, and also encourage subsequent seedling

establishment. Burning may also reduce rodent habitat, eliminating another source of acorn predation (Van Lear and Watt, 1992).

A regime of frequent burning over long periods creates a more open understory. In hardwood stands, long-term burning tends to eliminate small understory stems outright and gradually reduces the midstory and overstory canopy through mortality resulting from fire wounds. Increased light reaching the forest floor in these open stands will maintain the vigor of oak advance regeneration. Frequent fires xerify the surface of forest sites by consuming some of the forest floor as well as by exposing the site to greater solar radiation through canopy reduction (Van Lear and Watt, 1992).

The absence of fire since the turn of the 20th century has allowed species that are intolerant of fire to become established and grow to a size where they, because of thicker bark associated with age, can now resist fire. At greater than 2 inches dbh, yellow-poplar becomes almost as fire resistant as oak. Suppression of fire has allowed shrubby understory species to occupy drier sites where fire was once frequent and oak more dominant. Yellow-poplar produces an abundance of seed almost annually, and although the seed has low viability, many remain viable in the litter and duff layer for several years. Yellow-poplar seeds germinate readily following burning. However, in a regime of frequent fire, small yellow-poplar seedlings would be killed and the reservoir of stored seed in the duff would be gradually depleted. Thus, frequent fires would control to a large degree this major competitor of oaks on high-quality sites (Van Lear and Watt, 1992).

Figure 3 - 11 shows mortality of hickory, oak, red maple, and yellow-poplar advanced regeneration as fire intensity increases within spring prescribed burns conducted in shelterwood stands (Van Lear and Brose, 1998). Mortality rates experienced by yellow poplar and red maple are much higher for all intensities than oak or hickory.

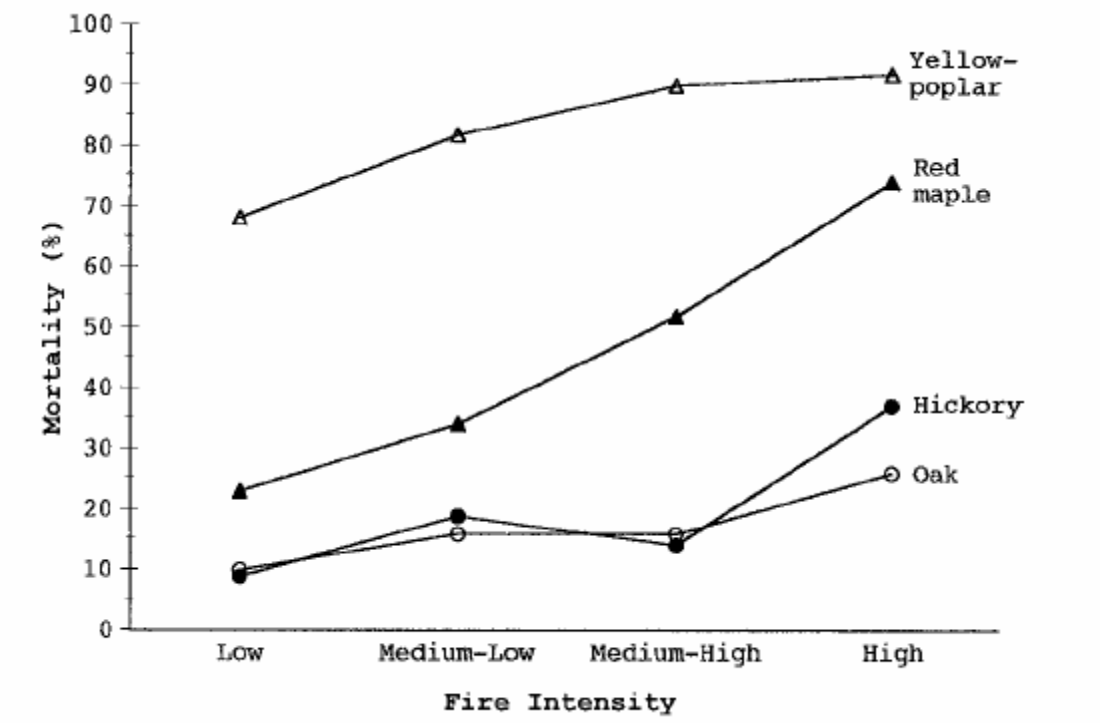


Figure 3 - 11. Morality rates of various hardwood species in shelterwood stands from prescribed fire. (Source: Van Lear and Brose, 1998)

Oaks and hickories are more tolerant of fire than maple and yellow-poplar.

When repeated burning occurs in stands with mixed advanced regeneration, oaks have an advantage over less fire-resistant vegetation which is killed by fewer fires of lower intensity. This loss usually exceeds species gain through invasion, since the frequency of the fires is as important to reduction of fire-susceptible species as the intensity of the fire.

Thus, a regime of frequent understory burns, perhaps including both growing-season and winter burns during a period of 5 to 20 years prior to harvest, should promote a favorable root/shoot ratio during oak seedling establishment (Van Lear and Watt, 1992). This fire frequency would be similar to the fire-returns that occurred in the mid–1800s to 1925 that was likely an important contributor to the mature oaks now present on much of the WNF. The harvest of the overstory would then release the established seedlings from the dense shade of the overstory, and the oak seedlings could then develop into the future oak stand.

The timing of the burns would be dependent on the observed vigor of the oak advance regeneration and its competitors. A series of burns over an

indefinite preharvest period will likely be required to favor oak regeneration. The first burn may be detrimental to oak advance regeneration in that small rootstocks may be killed. However, over the long-run, oak will be less adversely affected than competitors and will, therefore, receive a competitive advantage that will enable them to favorably respond to subsequent release (Van Lear and Watt, 1992).

Herbicides may be required to remove midstory trees that have grown too large to be killed by low-intensity fires. Herbicides provide initial selectivity of midstory stems to be eliminated prior to burning. A combination of herbicide treatment and frequent fire may be required to secure oak regeneration and allow it to maintain its vigor in mixed hardwood forests that have not been burned for decades (Van Lear and Watt, 1992). Spot treatments of herbicides are generally applied directly to the stump immediately after the tree is harvested or directly to seedlings.

Direct and Indirect Effects of the Alternatives

Short-term Effects

Certain vegetation management techniques are better able to regenerate and maintain oak-hickory than others, and analyses were conducted for each alternative to estimate how much of the WNF may be comprised of forest stands dominated over time by oak-hickory.

The charts in Figure 3 - 12 show the number of acres that would be treated by silvicultural activities in the first decade with the objective of maintaining a significant oak component in the future. The charts also show the silvicultural activities that would likely be required to maintain the oak ecosystem in the management areas.

In addition, the charts in Figure 3 - 12 show the silvicultural treatment levels that would be accomplished by alternative. These numbers depict the sum of the treatments over a 10-year period. Treatments in any one year may be higher or lower than the average.

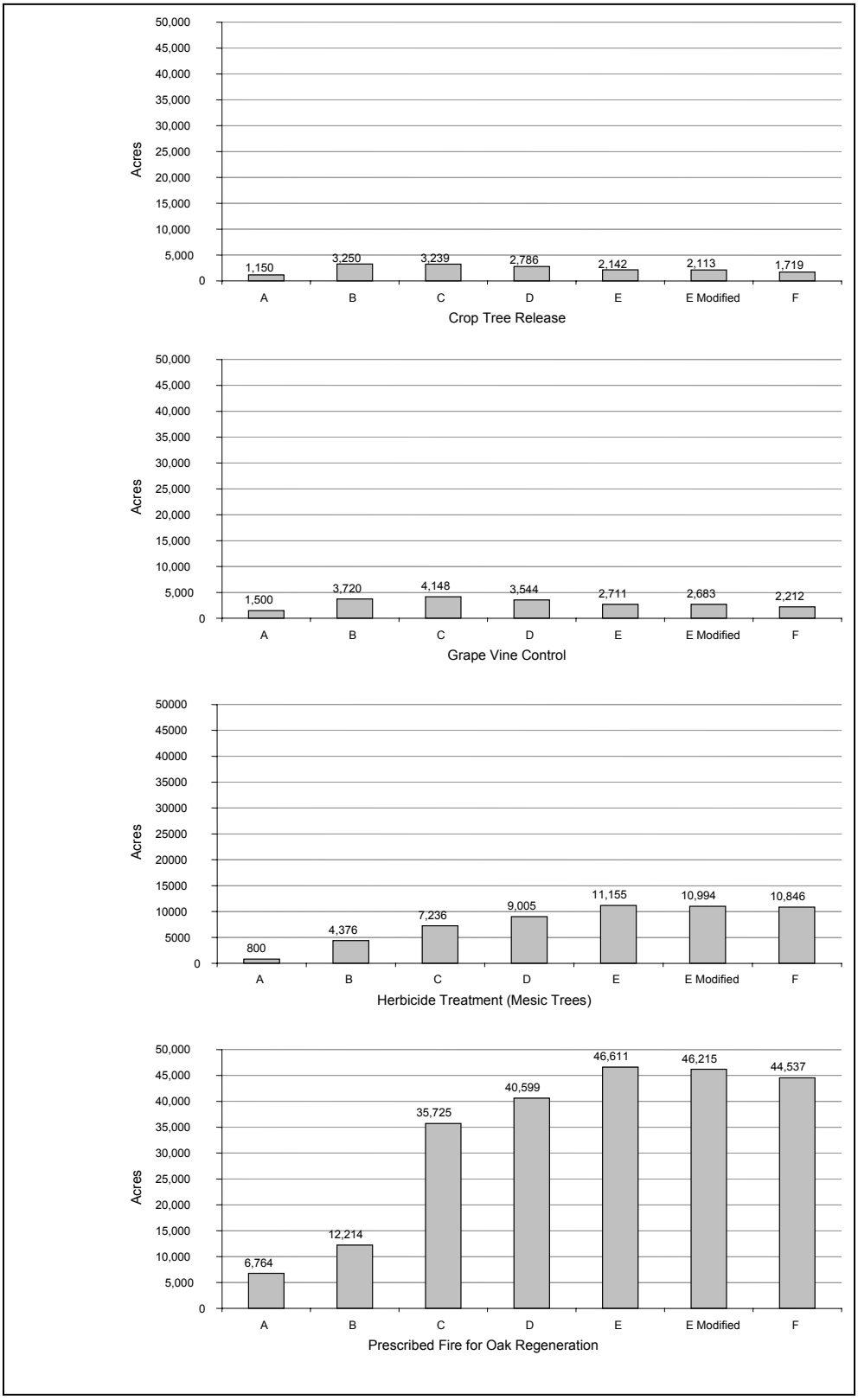


Figure 3 - 12. Acres of silvicultural activities projected for Decade #1.

Acres Where the Future Oak Component Will Likely Be Significant as a Result of Management Actions

Oak is likely to be maintained in stands regenerated with two-aged harvests, clearcut harvests, and historic forest management prescriptions that are also treated with a combination of silvicultural treatments such as prescribed fire, herbicides, crop tree release, and/or grapevine control.

Figure 3 - 13 depicts the number of acres by alternative where it is likely that the oak ecosystem would be maintained during the first decade, assuming that silvicultural treatments are implemented as needed. If these silvicultural treatments are not implemented as needed, then the regeneration would likely be composed of many more mesic and pioneer species such as maples and yellow poplar.

The regeneration method in Alternative A is predominantly single-tree selection, therefore very little oak regeneration would be expected. Alternative B would regenerate a fair amount of acreage to oak since it employs predominantly even-aged management, assuming that the other silvicultural work is performed. The oak regeneration increases from Alternatives C through E because both even-aged and Historic Forest management increases from C through E; the most significant increase is in the acres of Historic Forest implemented. Alternatives E Modified and F show a slight decrease in the number of acres regenerated to oak when compared to Alternative E, but the acreage is still higher than the other alternatives because more acres of forest would be treated under the Historic Forest prescription despite the fact that the acreage of projected even-aged management drops.

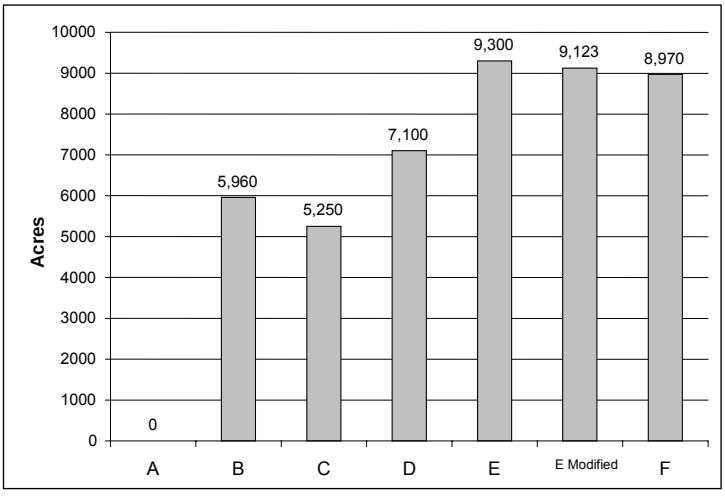


Figure 3 - 13. Acres likely to regenerate to oaks in the 1st decade in each management area by alternative.

Acres Where the Future Oak Component Will Not Likely Be Significant as a Result of Management Actions

Of those acres that may be harvested during the first decade, Figure 3 - 14 depicts the proportion of acres by alternative that would not be treated with silvicultural techniques that promote a preponderance of oak in the future. These are acres that would be treated with single-tree selection and group selection harvests (uneven-aged management).

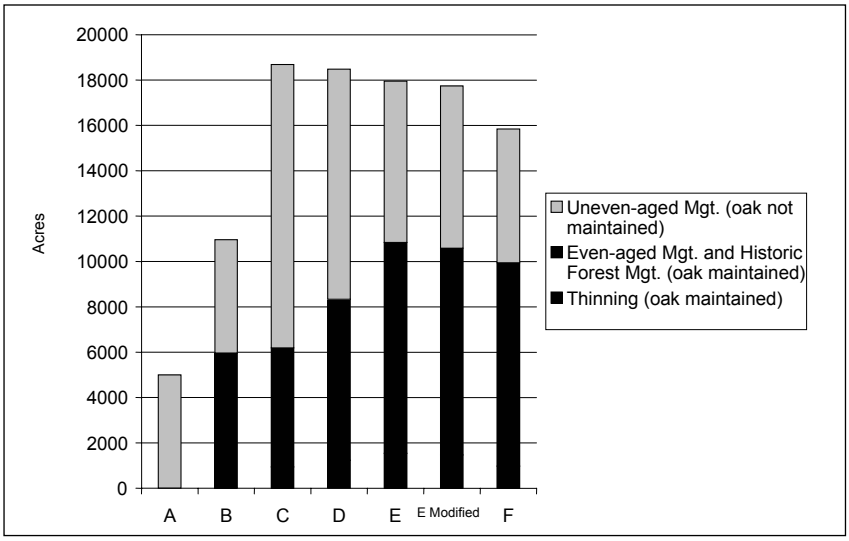


Figure 3 - 14. Acres treated in the first decade that will and will not maintain oak forest.

Alternative A allows for the smallest amount of timber harvesting during the first decade (2 percent of NFS lands), and all of the harvesting would employ uneven-aged methods. In other words, Alternative A would not aid in the maintenance of the oak component on the WNF during the first decade. Timber harvest levels increase in Alternatives B through F when compared to the no action alternative, but still accounts for only 5 to 8 percent of NFS lands. Of those acres harvested under Alternatives C and D, a greater proportion of the acres treated would not regenerate to stands with a preponderance of oak. Conversely, a greater proportion of stands treated under Alternatives B, E, E Modified, and F would regenerate to oak dominated stands.

Effects of Other Actions on Maintenance and Restoration of Oak Ecosystem

Some other projects will result in changes to the vegetation, and some areas that are currently forested becoming non-forest – at least temporarily. The overall impact that these projects will have on the restoration and maintenance of the oak ecosystem is very minimal, so that the effect will not make any discernable change in the amount of the oak ecosystem in the future. Listed below are examples of projects that fit this description.

- Oil and gas well development and maintenance
- Special use authorizations for items such as roads and utility corridors
- Permanent forest opening, wetland, and small pond creation and maintenance
- Recreation facility construction and maintenance, such as trails, picnic areas, day-use areas and campgrounds
- Wildland fire suppression
- Watershed improvement projects such as reclaiming abandoned mines and correcting erosion from past land management practices
- Road construction and reconstruction
- Non-native plant eradication

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

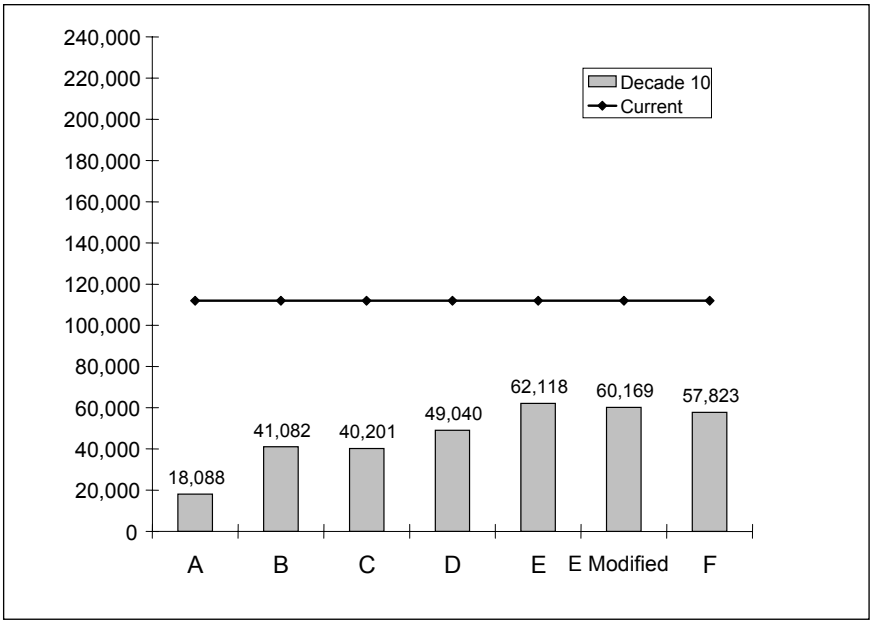
Long-term Effects

Based on regeneration methods prescribed in the various management areas and on the Spectrum model outputs, there will likely be a declining trend in forest stands dominated by oak-hickory in 100 years on NFS lands with the implementation of any of the alternatives (Figure 3 - 15). There could be an 84 percent declining trend in forest stands dominated by oak-hickory after 100 years with implementation of Alternative A where only minimal uneven-aged harvest methods would be employed. Alternative E would likely maintain the most oak-hickory on NFS land after 100 years, but there could still be a 45 percent declining trend from present amounts.

As mentioned above, researchers are concerned that a decline in oak-hickory could affect animals which rely upon these species for food or shelter. This decline could be exacerbated with the cyclical oak mast trend seen in the Appalachian region. In all alternatives, oak and hickory trees would remain scattered across the WNF as individuals, or found in small groups on ridges and southwest facing slopes. In Alternatives C through F, extensive oak and hickory communities would also be concentrated on the landscape where the HF and HFO management areas are located.

While only speculative, it is possible that in the future there could be more competition for the oak mast resource, possible declines in populations of

species that rely upon this resource for food or shelter, or altered species distributions in the planning area to coincide with oak-hickory concentrations.



Oak-hickory forest will decline from current levels under all alternatives. Alternative E would maintain the most oak-hickory forest.

Figure 3 - 15. Trend in the acres of forest stands dominated by oak-hickory by alternative after 100 years of implementation.

Cumulative Effects for Habitat Indicator 1

Oak is likely to continue its decline on NFS lands in the future, however efforts to regenerate and maintain oak communities in each of the alternatives may have beneficial cumulative effects when compared to trends in oak abundance on other lands in the cumulative effects analysis area.

In addition to NFS land, a large amount of non-industrial corporate or State ownership is present within the WNF proclamation boundary. However, most of the land is owned by private individuals. National Forest System land comprises about 28% of the WNF proclamation boundary.

State forests and wildlife management areas are generally managed by the Ohio Department of Natural Resources for game and non-game wildlife species. To manage habitat for these species, some timber is occasionally harvested within state forests or wildlife areas. Some silvicultural work may be done (e.g., prescribed burning) that will benefit oak regeneration. Most of state forests and wildlife management areas are either on the perimeter or a few miles from the WNF. Dean State Forest, Trimble

Wildlife Area and Cooper Hollow are within the WNF proclamation boundary, while Zaleski State Forest is immediately adjacent to the Wayne. Following is a listing of the areas, their size, and general location.

- Dean State Forest (near Ironton District) – 2,745 Acres
- Cooper Hollow Wildlife Area (near Ironton District) – 5,421 Acres
- Crown City Wildlife Area (near Ironton District) – 10,171 Acres
- Sunday Creek Wildlife Area (near Athens District) – 11,000 Acres
- Zaleski State Forest (near Athens District) – 28,000 Acres
- Ales Run Wildlife Area (near Marietta Unit, Athens District) – 2,905 Acres
- Trimble Wildlife Area (near Athens District) – 2,096 Acres
- Waterloo Wildlife Area – (near Athens District) – 1,522 Acres

Several state parks are also near the WNF. The vegetation within these public areas is generally managed only in and around the recreation facilities for public safety and scenery. Therefore, most of the forest land within the state parks will likely grow older and not regenerate to predominantly oak forests. Following is a listing of the state parks near the WNF, their size, and general location:

- Strouds Run State Park (near Athens District) – 2,606 Acres
- Burr Oak State Park (near Athens District) – 2,593 Acres
- Lake Hope State Park (near Athens District) – 2,983 Acres
- Jackson Lake State Park (near Ironton District) – 2,349 Acres

About 130,000 acres of corporate timber land is present in southeast Ohio. These lands that were owned by the MeadWestvaco Corporation were sold to Escanaba Timber LLC in May 2005. Not all of these 130,000 acres are adjacent to, or near, the WNF, but much of it is. These lands, plus other private and public lands, supply the paper mill in Chillicothe, Ohio, recently acquired by the NewPage Corporation. Escanaba Timber has entered into a long-term supply agreement with NewPage to ensure that the forestland owned by Escanaba Timber will remain a key source of wood supply to the mill – both hardwood pulpwood and softwood pulpwood.

On lands managed for hardwoods, MeadWestvaco had been testing ways to increase the oak component on the lands it will be harvesting, but the company did not have operational procedures in place when this Final EIS was written. The company had also been increasing the pine component with a target of approximately 23 percent of the corporate land in pine, plus encouraging private land to be stocked in pine. MeadWestvaco was also researching ways to increase the oak component of their hardwood

regeneration, but has not instituted a standard procedure; therefore, the oak component of the future stands being regenerated now will likely be less than the current oak proportions.

Other private lands in and around the WNF are managed for a wide-variety of purposes. The Forest Service Inventory and Analysis Research Unit and Northeastern Area State and Private Forestry surveyed forest landowners across the country in the early 1990s. The data were summarized in a variety of ways, including by state. The following discussion is based on the results of the Ohio survey.

As can be seen in Table 3 - 14 and Figure 3 - 16, private landowners in and around the WNF have harvested timber in the past and are likely to harvest timber in the foreseeable future. In the past, landowners have rarely implemented any special measures to improve the amount of oak regeneration when they harvest.

Table 3 - 14. The number of owners, and ownership acreage by types, who have or have not harvest trees in the past.

Form of Ownership	Number of owners who have harvested	Acres harvested by those owners	Owners who have not harvested	Acres not harvested
Individual or Joint	165,000	3,923,000	149,200	2,062,000
Partnership	2,300	165,000	1,900	77,000
Corporation	2,700	607,000	3,100	173,000,
Club/Association	200	40,000	1,900	38,000
Other	600	49,000	2,300	57,000

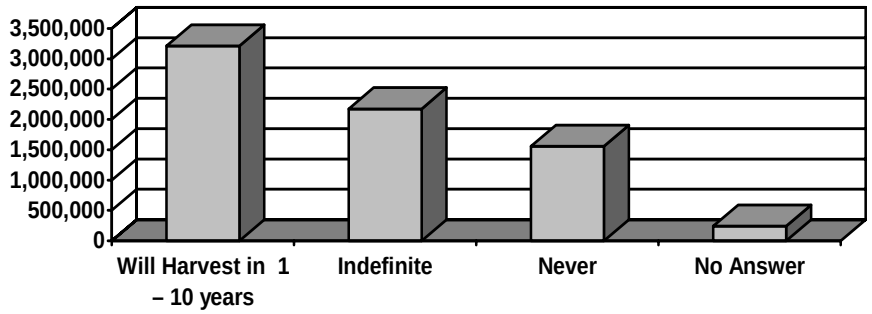


Figure 3 - 16. The acreage in Ohio that will, may, or will not be harvested in the future. (Birch 1994)

As observed by longtime residents and Forest Service employees, landowners almost never use prescribed fire or apply herbicides to the more mesic or shade intolerant tree species to encourage successful oak regeneration success. Therefore, despite the fact that the survey summarized above demonstrates that some harvesting can be expected on

private, non-corporate, lands, the regeneration will likely have a large amount of species other than oaks making-up the dominant and co-dominant trees into the future. Landowners who do not harvest their lands in the foreseeable future will not remove the existing oak stands, but overtime, these stands will convert to species that are more shade tolerant such as maples and beeches.

Habitat Indicator 2: Amount and trends of pine forest and population trend for the pine warbler.

The mixed oak forest encompassed the majority of the landscape of the WNF at the time of the earliest land surveys. Forests of white oak-black oak and chestnut oak-chestnut covered the ridges, but flowering dogwood, sassafras, Virginia pine, pitch pine, and/or shortleaf pine occurred locally (OBS, 1966). Today, pine is scattered across the landscape of the Wayne, either in plantations or in stands comprised of hardwood and pine species.

As farms were abandoned in southeastern Ohio in the 1930s, the Civilian Conservation Corps began planting various species of pine to stabilize eroding soils. Pine is relatively quick growing, which helps to stabilize the soils and build up the duff layer through their periodic needle loss. The use of pine species continued as the Forest Service acquired eroding lands, including on abandoned mine lands.

Some animals and plants use pine plantations (e.g., the sharp-shinned hawk), but some people refer to these plantations as biological deserts because the canopy of closely spaced trees keeps sunlight from reaching the ground. This, combined with the dense mat of pine needles, limits the growth of understory vegetation.

The pine warbler was selected as a management indicator species since it is closely associated with pine and pine-hardwood forests, generally occurring only where some pine component is present. It therefore is an appropriate indicator of the effects of management in maintaining a component of pine in the landscape. The pine warbler is identified as a Stewardship Species for the Eastern Avifaunal Biome in the Partners in Flight North American Landbird Conservation Plan (NALCP), with a continental objective of maintaining its population at current levels (Rich et al., 2004a).

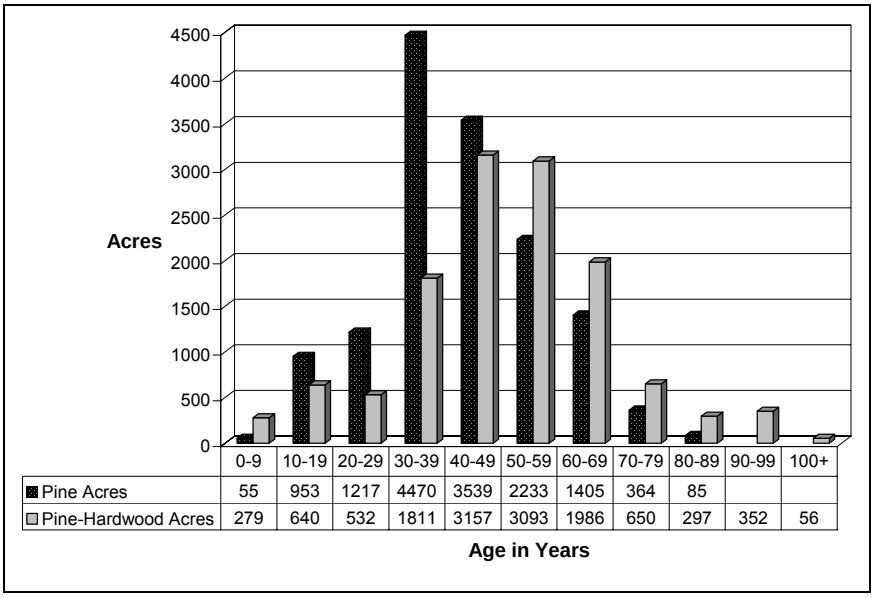
Affected Environment

Pine is a minor component of the overall forest landscape on the WNF. Stands dominated by pine species account for only six percent of the forested acres on the Wayne, and stands that consist of a hardwood-pine mix cover about five percent of forested NFS land (Figure 3 - 17).

Pine species occurring on the WNF include red pine, white pine, shortleaf pine, Virginia pine, and pitch pine. The Wayne is within the native range

of shortleaf pine (Lawson, 1990), pitch pine (Little and Garrett, 1990) and Virginia pine (Carter and Snow, 1990). The eastern part of the Marietta Unit is on the edge of the native range of the white pine (Wendel and Smith, 1990). Red pine is not native to Ohio (Rudolf, 1990). Hemlock naturally occurs in scattered groups or individuals in some Special Areas or in site-specific locations.

The pine warbler has enjoyed an increasing population trend in the Ohio Hills Physiographic Regions of about 5 percent since 1966 (Figure 3 - 18). The pine warbler has been observed on all units of the WNF, but appears to be more abundant on the Ironton Ranger District than any other unit. It was documented from 30 percent of the survey routes during the first year of the WNF Breeding Bird Survey in 2003, and was observed in areas comprised of pine, hardwoods, and mixed hardwood-pine (Ewing, 2003c).



Most pine and pine-hardwood stands on the Wayne are between 30 and 70 years old.

Figure 3 - 17. Age distribution of pine-dominated stands and pine-hardwood stands. (Source: WNF Vegetation Database)

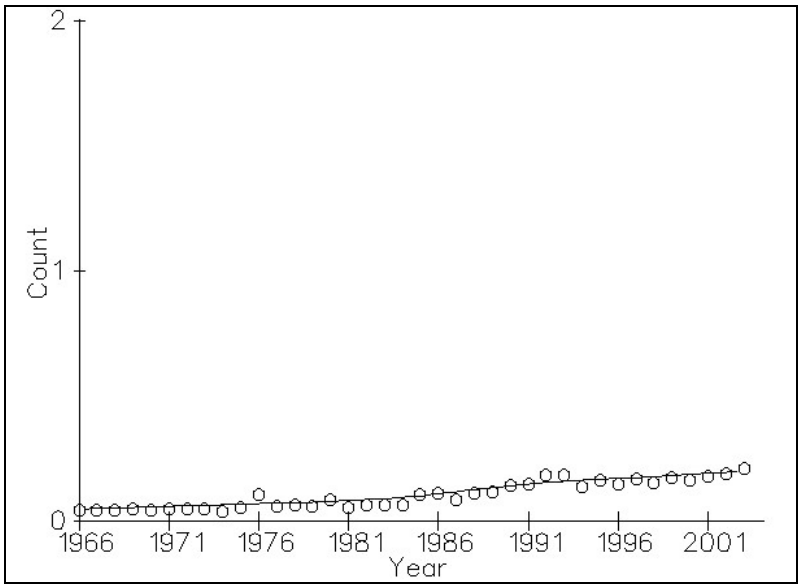


Figure 3 - 18. Pine warbler population trend for the Ohio Hills Physiographic Region 1966-2003 (Source: Sauer et al., 2004).

Direct and Indirect Effects of the Alternatives

For this analysis of effects, assumptions were made that the abundance of pine trees in existing mixed pine-hardwood stands would continue to decline over time. Pine would likely disappear from stands that are not manipulated with any form of vegetation management. The majority of pine-dominated stands are expected to convert to mixed pine-hardwood stands, and then to hardwood stands over a period of several decades. However, a combination of even-aged timber harvesting, possibly in conjunction with prescribed fire, could maintain some of these as mixed pine-hardwood stands for species like the pine warbler.

For purposes of displaying effects, only those stands where white pine, shortleaf pine, Virginia pine and/or pitch pine comprises more than 50 percent of the stems are included in this analysis of future mixed pine-hardwood stands. Queries to the WNF vegetation database show that there are a total of 14,373 acres of pine-dominated stands. Using the knowledge that even-aged timber harvesting has the potential to maintain a forest stand as a mixed pine-hardwood stand, acreages of existing pine-dominated stands were identified for each management area that prescribed even-aged management in the alternatives. This is to show the potential acreage of mixed pine-hardwood habitat that could be maintained in each alternative for the pine warbler. The potential acreages in each alternative vary because of the spatial allocation of these management areas.

This analysis suggests that there will likely be a declining trend in pine and mixed pine-hardwood communities over time (in 100 years) with implementation of any alternative (Figure 3 - 19). Pine warbler population trends would likely mirror this declining pine habitat trend on NFS land.

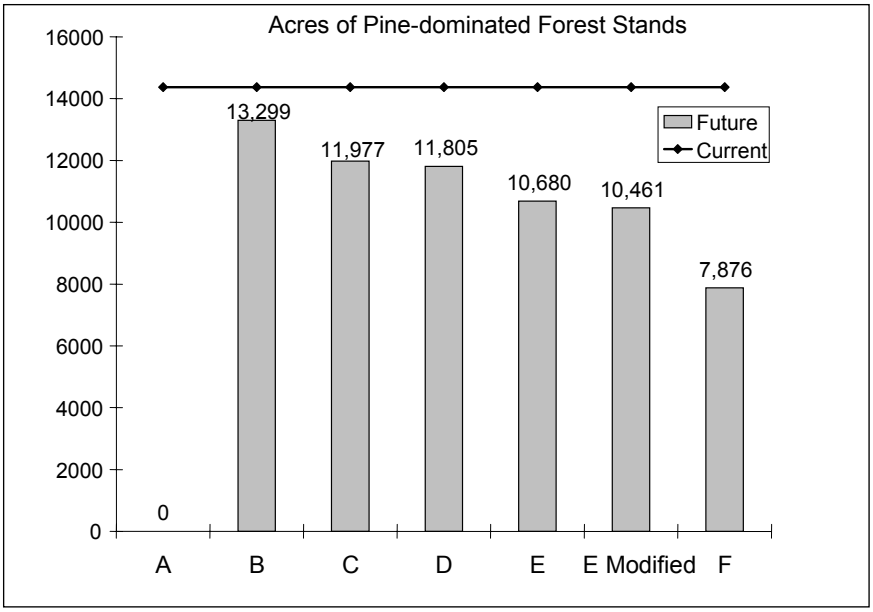


Figure 3 - 19. **Comparison of acreage of pine-dominated stands occurring in management areas which allow for use of even-aged management methods that would maintain mixed pine-hardwood communities in the landscape**.

Figure 3 - 19.

Pine and pine-hardwood forest is expected to decline from current levels under all alternatives.

In Alternative A, even-aged management is not incorporated as a plant and animal habitat management tool. Therefore, pine-dominated stands would decline in pine abundance and revert to hardwoods. White pine, which makes up the majority of these pine-dominated stands, is a longer-lived species, and therefore the decline of pine and conversion to hardwoods would be expected to take place over several decades. Pine warbler populations would likely decline the greatest with Alternative A in comparison to the other alternatives. Alternatives B through F are likely to maintain mixed pine-hardwood on the landscape, but less than exists currently. Pine warbler population trends may decline in Alternatives B through F, but may be maintained at low levels on the Forest over time.

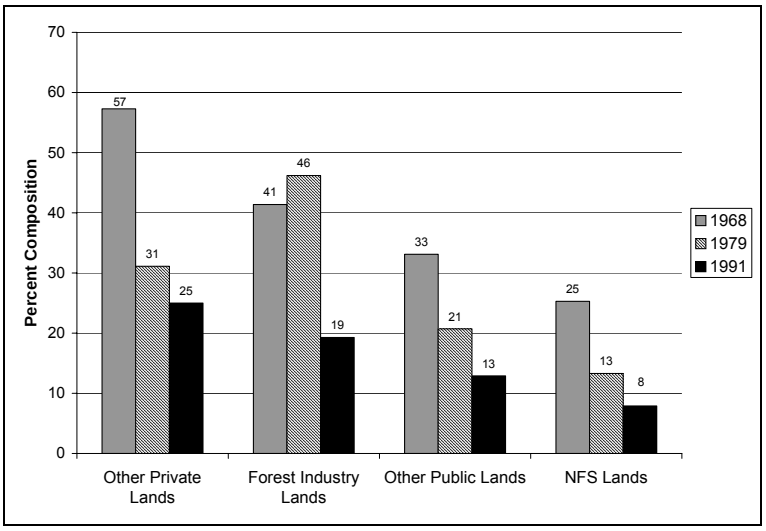
Habitat Indicator 3: Amount and trends in early successional forest and population trends for the yellow-breasted chat and ruffed grouse.

Early successional forest is an ephemeral habitat created by disturbances in the forested landscape. These disturbances may be natural or human induced and vary in size. Once the forest canopy is opened up, light is allowed to reach the ground. The result is the growth of herbaceous plants and shrubs during the first few years (generally in the first decade), followed by the establishment of tree seedlings and saplings (later in the first decade and during the second decade of growth). This early successional forest habitat is characterized by high stem densities of shrubs, seedlings, and saplings.

Approximately 35 percent of the terrestrial vertebrate species that are known to occur on the Wayne use early successional forest habitat during their life cycle. The herbaceous plants and shrubs provide dense cover that is useful for hiding from predators and produce a variety of soft mast (e.g., blackberries) that is nutritionally important.

Repeated disturbances are required to maintain early successional forest habitat. Natural disturbances created by tornadoes, ice storms, floods, windthrow, insect and disease outbreaks, and natural death, vary in size from small gaps to large-scale clearings. Timber harvesting is a tool that can create early successional forest habitat in the landscape, and the size and habitat quality of the resulting disturbance can vary, as it does with natural disturbances.

A declining trend in early successional forest habitat and the subsequent decline in population trends for some species that rely upon it, is not only a concern on the WNF, but has emerged as an issue across the eastern United States (Trani et al., 2001). Forest Inventory and Assessment data show that early successional forest habitat has been declining on all lands in Ohio since the late-1960s (Figure 3 - 20) (USDA Forest Service, 2000). This decline is in part due to maturation of forests, but also to a decline in farm abandonment.



Early successional forest habitat has declined on all ownerships in Ohio since the 1960s.

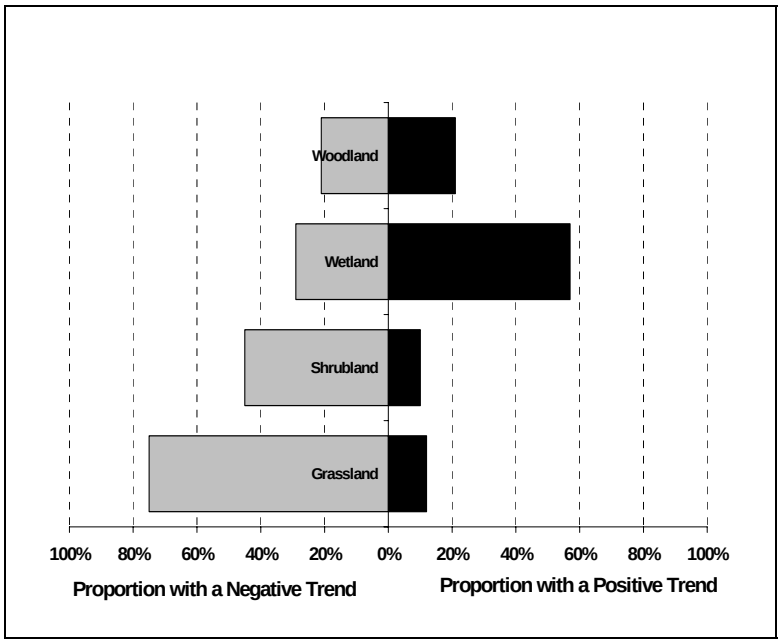
Figure 3 - 20. Percent composition of early successional forest habitat in Ohio on lands managed by four ownerships, 1968-1991 (USDA Forest Service, 2000).

The species viability evaluations identified the concern that the conservation of early successional forest-dependant species on NFS land could be at risk in the future if current management was to continue. Early successional habitat has been declining on NFS land. In 1968, 25 percent of NFS land was comprised of early successional forest habitat, whereas only 5.4 percent is covered by early successional forest today. Timber harvest (even-aged management) was last used as a tool to create early successional forest habitat on NFS land in 1994. Reforestation efforts on abandoned and reclaimed mine lands and the lands acquisition program accounts for much of the existing early successional habitat on NFS land. These individual tracts range in size from less than one acre to as much as 400 acres, but average about 16 acres in size. The tracts of early successional forest are randomly scattered across the WNF.

North American Breeding Bird Survey data show that a greater proportion of early successional forest bird species have exhibited a population decline rather than an increase in the Ohio Hills Physiographic Region since 1966, a region aligned with the Southern Unglaciated Allegheny Plateau (Sauer et al., 2003) (Figure 3 - 21). Early successional forest bird species with declining population trends in the Ohio Hills include the golden-winged warbler, northern bobwhite, prairie warbler, field sparrow, yellow-breasted chat, American goldfinch, indigo bunting, brown thrasher, common yellowthroat, eastern towhee, blue-winged warbler, and song sparrow (Sauer et al., 2003). As pointed out in the Partners in Flight Bird Conservation Plan for the Ohio Hills Physiographic Area (Rosenberg and Dettmers, 2004) and the Partners in Flight North American Landbird Conservation Plan (Rich et al., 2004), managing for a diversity of seral stages is necessary to conserve species native to the WNF and the region. Rosenberg and Dettmers (2004) suggested that three percent of the lands in the Ohio Hills Physiographic Region should be comprised of early

successional forest habitat to support a full suite of early successional forest species.

The yellow-breasted chat and ruffed grouse, management indicator species associated with early successional forest habitat, were identified as species of conservation concern on the WNF during species viability evaluation (Ewing, 2003d; 2003e). If current management continued (i.e., only uneven-aged management and thinning), early successional habitat would continue to decline until the only early successional habitat available would likely be in utility corridors that are selectively maintained or on newly acquired lands that were recently cutover.



Greater percentages of grassland and shrubland bird species have negative population trends than birds dependent on other habitats.

Figure 3 - 21. Proportion of bird species by habitat group with significant positive or negative trends in the Ohio Hills Physiographic Region 1966-2002 (Sauer et al., 2003).

Affected Environment

Forest stand data show that early successional forest habitat comprises 5.4 percent of the forest cover on the WNF. Early successional habitat less than 10 years of age, which contains a large shrub component, comprises less than 0.5 percent of forest cover on the Wayne. This habitat type occurs in various-sized patches and is randomly scattered across the planning area (WNF Vegetation Database).

The yellow-breasted chat is an open-canopy obligatory species, or in other words, a species that prefers open overstory and brushy understory. It occurs in all counties containing NFS land (Peterjohn an d Rice, 1991). Habitat becomes unsuitable after about 15-19 years (Ewing, 2003d). It has experienced a 3.1 percent declining population trend in the Ohio Hills between 1966 and 2003 (Figure 3 - 22).

A Neotropical migrant, it is considered to be an area-sensitive species that prefers larger early successional patches (i.e., 8-32 acres in size) (Dettmers, 2003; Gram et al., 2003). Studies suggest that area sensitivity could be related to predator avoidance (Woodward et al., 2001), or to loose coloniality behavior (Eckerle and Thompson, 2001). There is evidence that shrubland birds avoid habitat edges and therefore shrubby habitat found in the narrow utility corridors typically found on the WNF are not likely to provide suitable habitat for the chat (Rodewald and Vitz, 2004).

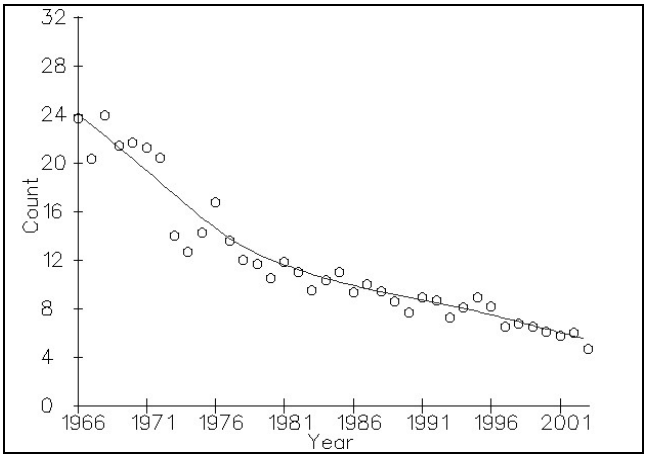


Figure 3 - 22. Yellow-breasted chat population trend for the Ohio Hills Physiographic Region, 1966-2003 (Sauer et al., 2004).

Ruffed grouse need forest less than 20 years old to survive and reproduce. Unlike the yellow-breasted chat, however, it requires contiguous patches of early successional forest habitat mixed with mid- and late-successional forests within its home range (Ewing, 2003e). In the Central Hardwoods, home ranges for grouse may be up to 250 acres (Thompson and Fritzell, 1989). Studies in southern Ohio indicate that early successional forest patches of at least 5-6 acres provide the most benefit to this species (Stoll et al., 1999).

The ruffed grouse has experienced population declines within the Southern Unglaciated Allegheny Plateau since the 1970s after farm abandonment peaked (Ewing, 2003e). These declining ruffed grouse population trends are also similar for its range in Ohio (Figures 3-24 and 3-25). Five long-term ruffed grouse drumming routes within the WNF have been monitored by the Ohio Division of Wildlife since 1971. Ruffed grouse population trends appear to be stable to declining for these WNF routes, and are similar to regional trends for southeast Ohio (Figure 3 - 25 to Figure 3 - 27). The Graysville route has continually seen slightly higher number of drumming males per stop than State or regional averages.

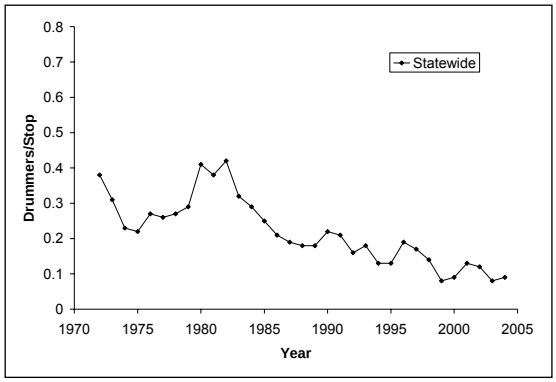


Figure 3 - 23

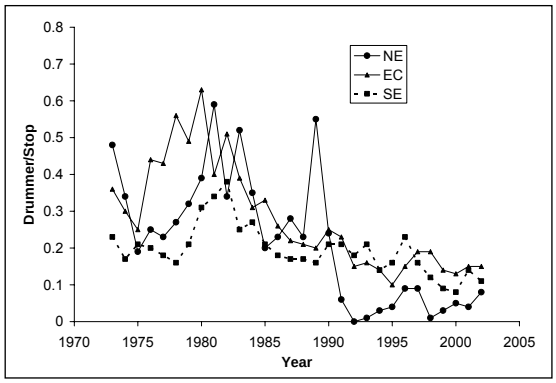


Figure 3 - 24

Figure 3 - **23** and Figure 3 - 24 show ruffed grouse population trends for Ohio (statewide and by region), 1971-2004.

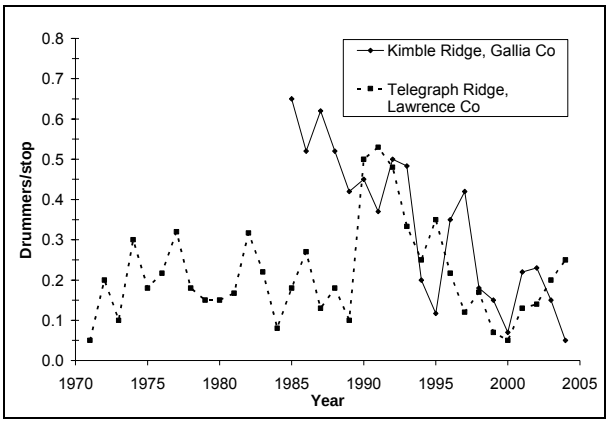


Figure 3 - 25

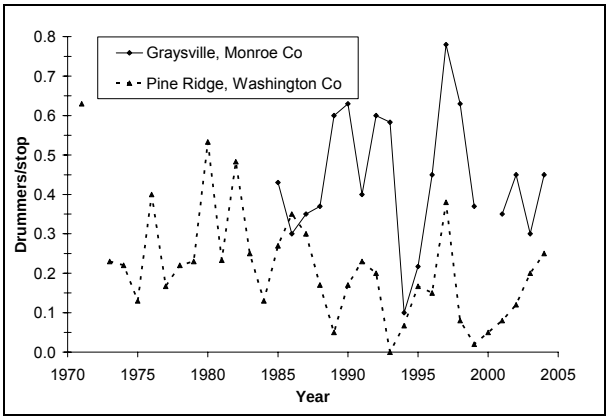


Figure 3 - 26

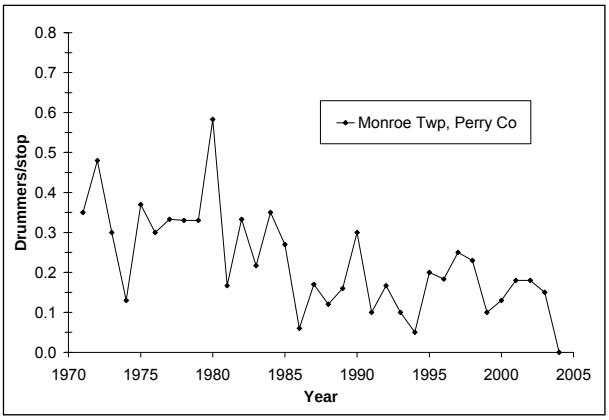


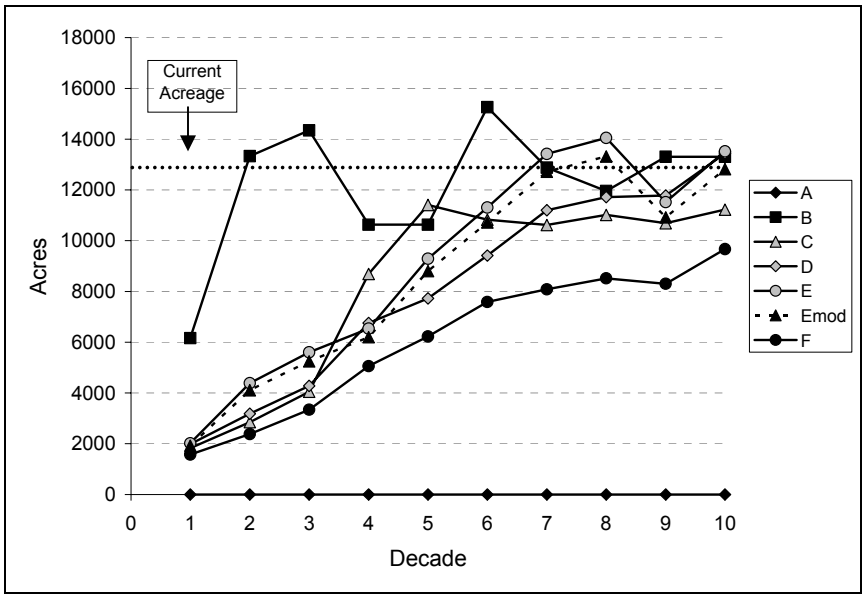
Figure 3 - 27

Figure 3 - 25 to Figure 3 - 27. Ruffed grouse population trends for WNF survey routes, 1971-2004.

Data provided by Ohio Division of Wildlife

Direct and Indirect Effects of the Alternatives

The trend in early successional forest habitat on NFS land in the next 100 years will vary among the alternatives (Figure 3 - 28). Estimated trends for the alternatives are based on Spectrum model outputs (see Appendix B for a description of the model and timber management analyses). The population trends for the yellow-breasted chat and ruffed grouse would be expected to mirror the trend in early successional habitat created in each alternative.



Over the long-term, Alternatives B, D, E, and E Modified would maintain about as much early successional habitat as is currently present on the Forest. Alternatives C and F would provide less early successional habitat, and it would be virtually absent under Alternative A.

Figure 3 - 28. Amount of early successional habitat created each decade through timber harvesting.

Alternative A does not include any prescriptions for even-aged management; therefore a drastic decline in habitat would be expected by the second decade. We cannot assume that private lands that have been cutover will be offered for acquisition in the future, therefore populations of the two management indicator species would be expected to decline for the next 20 years with continued implementation of Alternative A (no action alternative). Some yellow-breasted chats may occur on shrub covered reclaimed mine lands for a time, until they too are reforested. Over time, it is likely that the yellow-breasted chat would disappear from NFS land. The ruffed grouse may utilize mature forest on NFS land for cover and food, but the essential early successional habitat needed for brood rearing would disappear on NFS land over time. Therefore, it is unlikely that viable populations of ruffed grouse could be supported over time on the Wayne with Alternative A.

Alternative B allocates the greatest amount of the WNF to management areas that prescribe even-aged management. The trend for early successional forest habitat would likely be stable with slight decadal increases and decreases from existing levels over a period of 100 years. Population trends for the yellow-breasted chat and ruffed grouse would likely remain stable, but increasing trends could occur on NFS land. Unlike existing conditions where early successional habitat consists of small patches distributed haphazardly across the landscape, patches of early successional forest created under Alternative B would be of appropriate sizes for area-sensitive species such as the yellow-breasted chat. These patches would be distributed across the landscape, but in a manner that could contribute to reduced mortality of ruffed grouse because their habitat needs would be optimized in the FSM and FSMO, and GFM management areas and there would be less need to travel long distances to find suitable habitat. Taxonomic experts indicated that establishment of large, landscape blocks of NFS land, managed on a rotational basis would afford a continual supply of this ephemeral habitat type to plants and animals that use this habitat during some part of their life cycle (Ewing, 2003d; 2003e). This management scheme provides species like the ruffed grouse with the relative ease of travel from one habitat type to forage or escape predation.

Population trends for these two management indicator species will likely decline from present levels in Alternatives C through F during the first decade, but would

be expected to stabilize over time as even-aged management harvesting increased (at about decade 3). Even-aged prescriptions call for a 120-year rotation in hardwood stands. Forest stands that are in the 40-79 and 80-99 age classes account for just over 50 percent of the forest stands on the Wayne currently, and would be ready for harvest during decades 3 through 8, thus the increase in early successional forest habitat creation displayed in Figure 3 - 21. After a period of 10 decades, amounts of early successional forest habitat available in Alternatives D or E would likely be similar to that in Alternative B. At the end of 10 decades, there would be less habitat available for the chat and grouse in Alternatives C or F in comparison to Alternatives B, D, E, and E Modified, but more than what would be provided in Alternative A.

Habitat quantity may decline over decades 1 and 2 and then stabilize in Alternatives C through F, but habitat quality would likely be increased in these alternatives as described for Alternative B. Taxonomic experts involved in the species viability evaluation process generally believed that, at a minimum, about 5 percent-10 percent of the Forest should be managed on a 100 to 120 year even-aged management rotation. To ensure that the habitat was optimal and species were well-distributed, the taxonomic experts indicated that at least one large block of contiguous NFS land managed under this rotational scheme should occur on each administrative unit. Alternatives C through F would incorporate this landscape management scheme at varying levels in the FSM and FSMO management areas. They also would integrate even-aged management in the GFM DCF, DCFO, and RC management areas to make certain this habitat type is well-distributed across the planning area.

Habitat Indicator 4: Amount and trends in habitat and populations for the cerulean warbler, worm-eating warbler, and pileated woodpecker

The species viability evaluations demonstrated that mature forest habitat is important to many plant and animal species. However, these evaluations highlighted the fact that one-size does not fit all when it comes to mature forest habitat because species exhibit microhabitat preferences. Federally listed species like the Indiana bat and American burying beetle favor open to semi-open mature forest, whereas species like the umbrella magnolia, rock skullcap and four-toed salamander prefer shaded, closed-canopy conditions. Some mature forest animals that occur on the Wayne are area sensitive, and are referred to as interior forest species. Large tracts of mature forest habitat are needed by interior forest species to reproduce successfully, and these requirements vary by species (Robbins et al., 1989).

The 2004 Partners in Flight NALCP notes that the largest group of birds of Continental Importance inhabits mature deciduous forest, especially those oak-hickory forests in the Eastern Avifaunal Biome (Rich et al., 2004a). The cerulean warbler, worm-eating warbler, Kentucky warbler, hooded warbler and wood thrush are examples of mature forest bird species found on the WNF during the breeding season. Conservation issues for mature forest species in the Eastern Avifaunal Biome include overbrowsing by deer, loss of habitat from urban development, human population growth, mountain top mining and reduction in disturbance-generated mature forest structure (i.e., shrubby understory). The NALCP states that many declining mature forest birds are associated with dense understory conditions.

The cerulean warbler (canopy nester), worm-eating warbler (ground nester) and pileated woodpecker (cavity nester) were selected as management indicator species since they are closely associated with mature forest habitat.

The cerulean warbler is also listed as a Regional Forester sensitive species. It is identified as a Watch List Species in the Partners in Flight NALCP, with a continental population objective of increasing its population by 100 percent (Rich et al., 2004a). The taxonomic experts involved in the species viability evaluation process stated that in their experiences in Ohio, West Virginia, and Pennsylvania, the cerulean warbler is not really a riparian

species as it is in other parts of its range but rather a species associated with ridgetops and oak-hickory (Ewing, 2003f). Rosenberg and Dettmers (2004) report that it favors very large oaks, is a canopy nester and needs gaps in the canopy, or in other words a heterogeneous (or uneven-aged) forest with large trees.

The worm-eating warbler is a ground nester which forages in the understory and shrub layers. Moderate to steep slopes are common characteristics of its habitat throughout its breeding range (Ewing, 2003g). In a study conducted on the Wayne, worm-eating warblers were found to primarily use stream bottoms and ravines (Dettmers, 1997). The taxonomic experts involved in the species viability evaluation process stated that a well-developed understory and coarse woody debris on the forest floor (>10 inches dbh) are important components to the species nesting habitat (Ewing, 2003g). It is identified as a Watch List Species in the Partners in Flight NALCP with a continental population objective of maintaining or increasing its population (Rich et al., 2004a).

The pileated woodpecker favors older forests, although it will forage in younger forests. It is a primary cavity excavator, and along with other woodpeckers native to the Wayne, it is responsible for the majority of cavity starts in dead trees. Over time, non-excavating cavity dependant species use abandoned cavities, such as the prothonotary warbler, wood duck, screech owl, and white-breasted nuthatch. It favors extensive mature to overmature forests that possess snags and a relatively open forest floor littered with dying wood (NatureServe, 2004).

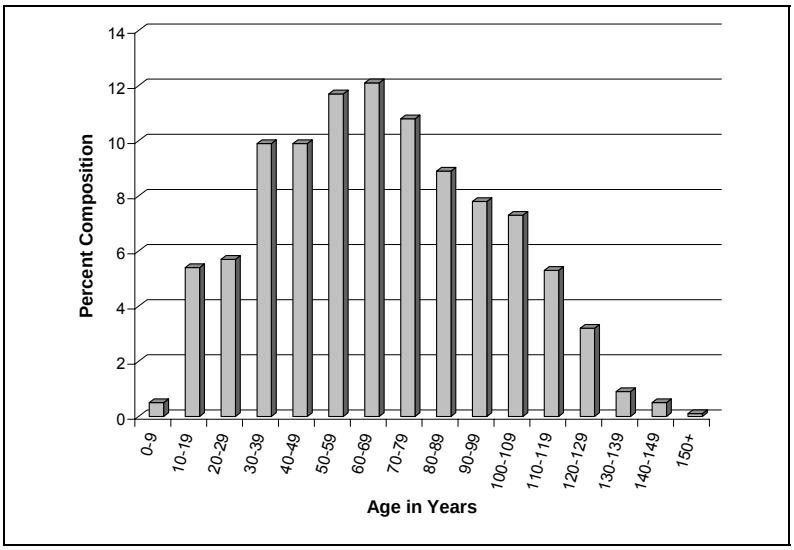
The cerulean warbler, worm-eating warbler, and pileated woodpecker are examples of forest interior species in which the likelihood of their occurrence increases with the size of the mature forest area (Robbins et al., 1989). They are considered area-sensitive species, or species whose occurrence or reproductive success is reduced in smaller habitat patches. Robbins et al. (1989) estimated the minimum area required for breeding for these three species to be: cerulean warbler (1,730 acres); worm-eating warbler (370 acres); and pileated woodpecker (408 acres). However, there are indications that nesting success of the worm-eating warbler (Gale et al., 1997) and other forest interior birds (Rosenberg et al., 1999; 2003) may not be affected in smaller tracts of interior forest when they are located in a predominately forested landscape.

Affected Environment

Ninety-four percent of the WNF is covered by forest. Of those forested lands, 34 percent is 80 years old or older and is considered to be mature forest for this analysis (Figure 3 - 29). The vertical structure of these forest stands is not very diverse, but generally exhibits one tree age class as a result of past management.

Most of the forest stands originated after the iron furnace era (after 1900) or later (i.e., after they were purchased from private landowners). A total of 15.7 percent of the Wayne is comprised of forest stands that have trees within them that are 100 years or older (Figure 3 - 29). When a forest stand is inventoried, a forester ages a statistical sample of trees. A query of the WNF vegetation database showed that there are a few scattered forest stands with trees that originated during the Civil War era and earlier. One small stand has trees in it that originated as early as 1831.

National Forest System lands are not arranged in a solid, contiguous block, but instead are arranged in blocks of different sizes that are scattered across the planning area. Private lands and other ownerships are intermixed among the NFS land. Despite this ownership pattern, there are individual interior forest areas existing on the WNF that would accommodate optimal breeding habitat size requirements by the three mature forest management indicator species. As the literature suggests, smaller forested tracts may provide habitat for these management indicator species since the WNF is within a landscape that is 80 percent forested (Landsat TM, 1994).



Most of the Wayne is forested with trees 40 to 90 years old.

Figure 3 - 29. Age distribution of forest stands on NFS land, 2004.

(Source: WNF Vegetation Database).

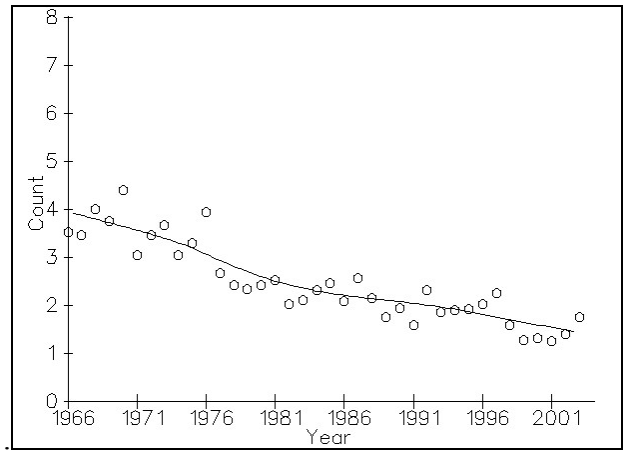
Table 3 - 15 indicates the number of individual interior forest blocks of contiguous NFS land greater than 500 acres in size within the DCF and DCFO areas of Alternative A (no action alternative), where less than 10 percent of the block is managed by someone other than the Forest Service and where NFS land was ≥90 percent forested. Prior to summarizing the data, the edges of each block were buffered by 300 feet to account for possible edge effects from management on non-NFS land. Other large interior forest blocks of NFS land can be found within the FOF, FOFM, HF, HFO, and DR management areas, but were not included in this analysis. The interior forest habitat availability in the DCF and DCFO management areas was displayed because the purpose of these two management areas is to provide mature forest habitat for forest interior species that require canopy disturbance to maintain habitat suitability.

Table 3 - 15. Number of interior blocks in DCF and DCFO.

Interior Forest Block Class (acres)	Number of Blocks
500-1,000	24
1,000-1,500	12
1,500-2,000	7
2,000-2,500	6
2,500+	8

The Wayne is in the core breeding range for both the cerulean warbler and worm-eating warbler. The cerulean warbler was observed along 61 percent of the WNF Breeding Bird Survey routes in 2003 (Ewing 2003c). It has experienced a 2.8 percent declining trend in the Ohio Hills Physiographic Region since 1966 (Sauer et al., 2004) (Figure 3 - 30). The worm-eating warbler was observed along 65 percent of the WNF Breeding Bird Survey routes in 2003 (Ewing, 2003c). It has experienced a plus-2.0 percent trend in the Ohio Hills Physiographic Region since 1966 (Sauer et al., 2004) (Figure 3 - 31). Sample size is too small for these two species to identify a population trend for the three North American Breeding Bird Survey routes found wholly within the WNF.

The pileated woodpecker is a year-round resident and is widespread in distribution on the Wayne. During the Forest's 2003 breeding bird survey, it was observed along 87 percent of the survey routes (Ewing, 2003c). It has experienced a plus-1.7 percent trend in the Ohio Hills Physiographic Region since 1966 (Sauer et al., 2004) (Figure 3 - 32).



The population trend for the cerulean warbler is declining, while trends are increasing for the pileated woodpecker and worm-eating warbler.

Figure 3 - 30. Population trends for the cerulean warbler.

(Sauer et al., 2004)

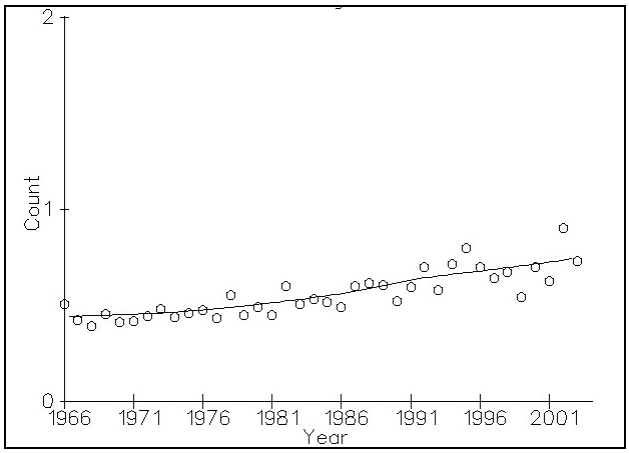


Figure 3 - 31. Population trends for the worm eating warbler.

(Sauer et al., 2004)

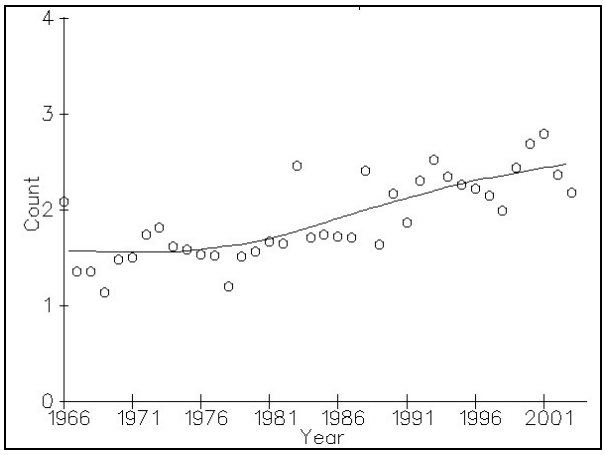


Figure 3 - 32. Population trends for the pileated woodpecker.

(Sauer et al., 2004)

Direct and Indirect Effects of the Alternatives

The Forest Service incorporated four conservation approaches into the alternatives to improve habitat quality for mature forest species like the cerulean warbler, worm-eating warbler, and pileated woodpecker. The following describes how these four conservation approaches are addressed in the alternatives.

Natural Succession

The FOF and FOFM management areas were developed, in part, for species that depended on larger and older forest communities. These management areas will serve as a long-term control when comparing how forest structure and

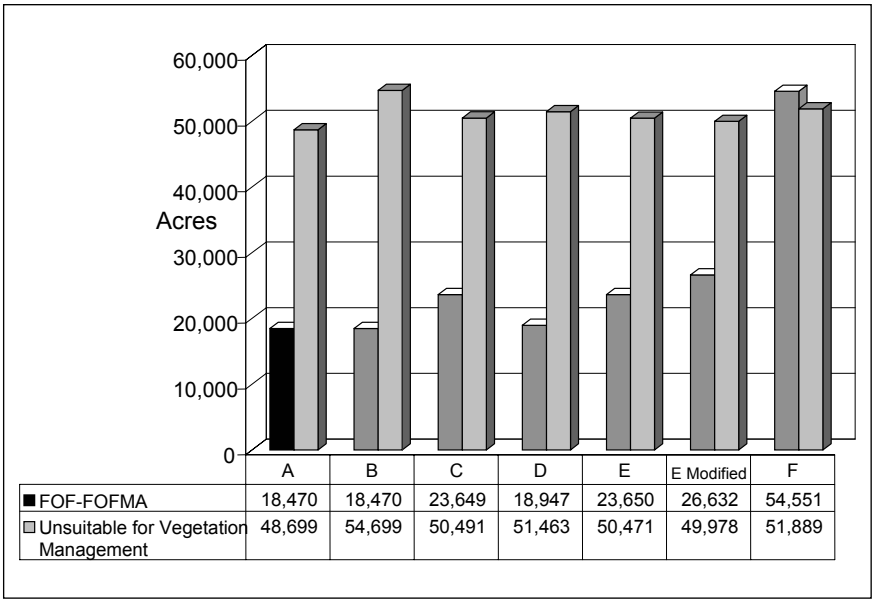
composition changes in areas with and without active land management practices. Many scientists do not know how the current influx of red maple in the woodlands will affect long-term forest animal community composition, but concerns have been raised about the possible decline of oaks on bird communities (Rodewald and Abrams, 2002). Natural succession would also be allowed to occur on lands that are defined as unsuitable for vegetation management. As an example, such lands may include land-locked tracts or steep areas, or may occur in management areas that are not suitable for timber production.

For purposes of this analysis, forest stands that are in areas projected to undergo natural succession will be assumed to have older forest characteristics within 100 years. They would possess forest trees of great age (typically 150-200 years old in southeast Ohio), diversity of canopy layers, gaps in the canopy, large woody debris on the forest floor, and a component of standing dead and dying trees (McCarthy, 1995). These characteristics may be favorable for the pileated woodpecker. The difference between a managed uneven-aged forest and one undergoing natural succession is that trees within the natural succession prescriptions will continue to grow older until they die, and then will become snags and finally coarse woody debris on the forest floor. Trees in uneven-aged management prescriptions will likely be harvested and removed from the stand at some point in their life cycle, with the exception of hickory trees and those trees identified for retention to ensure long-term Indiana bat roosting habitat.

The alternatives vary in how much acreage would be allotted to natural succession (Figure 3 - 33). Alternative F has the most acreage of forest that would undergo natural succession, followed by (in decreasing order): Alternatives E Modified → C → E → B → D → A. Large-sized tracts of interior forest that would undergo natural succession would occur on each administrative unit.

To give an indication of the trend for older habitat in these forest stands after a period of 100 years, results from a simplified analysis are presented in Figure 3 - 34. The assumptions used for this analysis were (1) existing age distribution of forest stands was uniform across the forest and therefore existing age distributions for the FOF, FOFM and areas unsuitable for vegetation management would mirror the age distributions shown in Figure 3 - 29; and (2) at least some of the trees in the stand today would still be

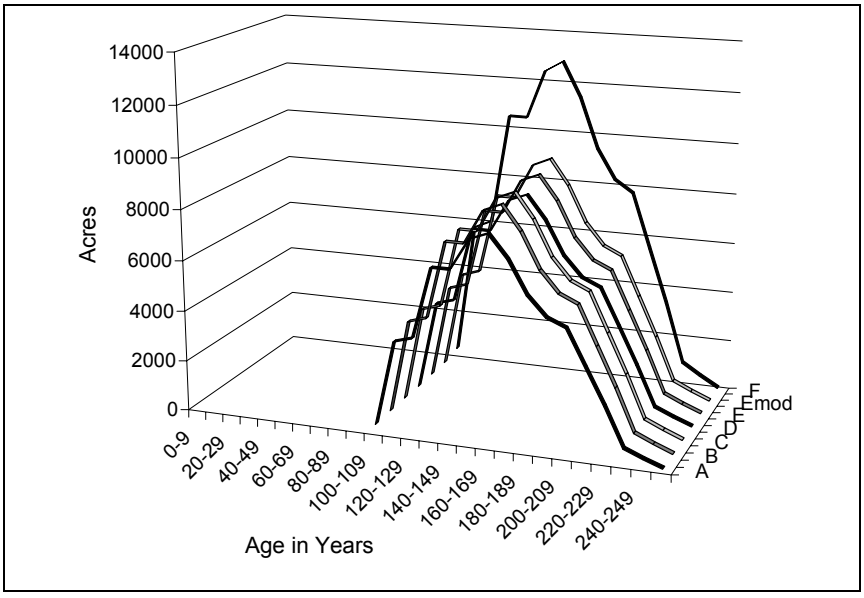
alive in 100 years. Based on this analysis, there could be individual or groups of trees within these forest stands that could range in age from 100 years to more than 250 years of age.



	A	B	C	D	E	E Modified	F
FOF-FOFMA	18,470	18,470	23,649	18,947	23,650	26,632	54,551
Unsuitable for Vegetation Management	48,699	54,699	50,491	51,463	50,471	49,978	51,889

Alternative F would provide the most unmanaged (or natural succession controlled) mature or all-aged forest habitat. Shade-tolerant and fire-intolerant species would increase, while oaks and hickories would decline in these areas.

Figure 3 - 33. Acres of mature forest that would result from natural succession of present day forest stands.



The age class distribution of unmanaged forest areas would be similar under all alternatives, but there is more of this type of habitat in Alternative F.

Figure 3 - 34. Age distribution of forest stands (after 100 years) for areas where natural succession is allowed to occur.

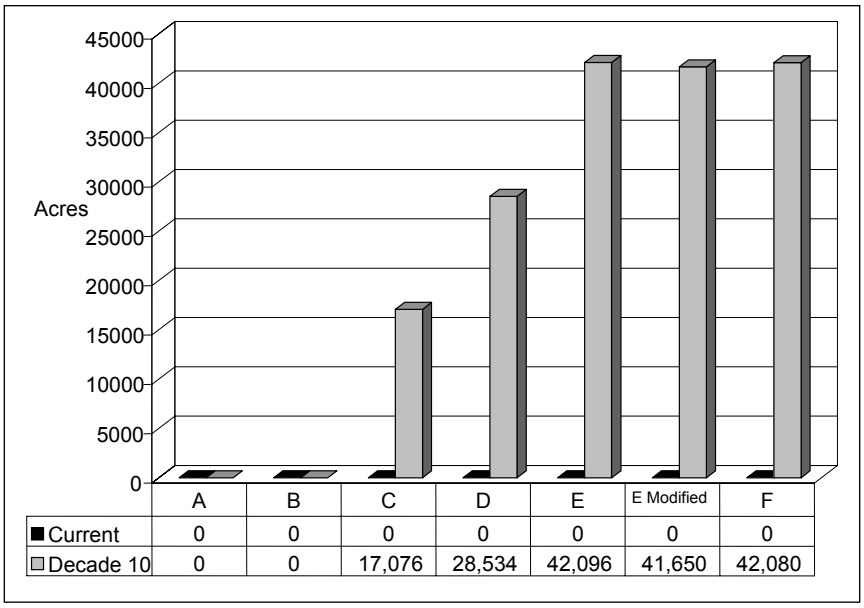
Historic Forest Management Prescriptions

The HF and HFO management areas are expected to provide mature forest habitat dominated by oak and hickory species. The open to semi-open character of the forest stands resulting from combinations of thinning, prescribed fire and herbicide application may be optimal for the cerulean warbler and pileated woodpecker. In addition to a high abundance of oak and hickory species, the forest stands will likely develop gaps in the canopy over time, which experts consider important for the cerulean warbler (Ewing, 2003). Each HF or HFO management area represents an extensive tract of interior forest habitat ranging in size from 7,500-17,000 acres in size. Therefore, one block of about 17,000 acres (Alternative C) or two blocks of interior forest totaling about 31,000 acres (Alternatives D through F) would be located on the Ironton Ranger District. Two blocks, totaling about 16,000 acres, would be located on the Athens Unit (Alternatives E, E Modified, and F).

Prescribed fire may negatively affect worm-eating warbler nesting and foraging habitat, and therefore, mature forest derived through Historic Forest management prescriptions may be less optimal for this ground nesting bird. Artman et al. (2001) found that worm-eating warbler population levels did not change in southeastern Ohio study sites after initial, low intensity prescribed fire. However, significant population declines occurred in units that burned hotter and in a more uniform pattern, and in units that were frequently burned. Artman et al. (2001) concluded that worm-eating warbler nest site requirements and habitat preferences appeared to mitigate the effects of initial, low intensity fires, but microclimate changes to the forest floor (i.e., warmer and drier) may reduce suitability for this species. Furthermore, the use of prescribed fire in the HF and HFO management areas is for the purpose of opening the understory so oak can regenerate with less competition from shade intolerant trees. Rodewald and Smith (1998) suggested that removal of the understory structure may affect species like the worm-eating warbler. Prescribed fire in mesic areas (i.e., preferred habitat) is more likely to be of a low intensity and more likely to burn in a mosaic pattern because of the moist conditions. A quarter to one-third of the Forest landscape is mesic in nature (USDA Forest Service, 1999), therefore some mature forest-dense understory habitat for the worm-eating warbler may be

available in portions of the HF and HFO management areas.

At present, there are no forest stands that exhibit the structure and composition desired for the HF and HFO management areas in the future. Alternatives A or B would not allocate any lands to these management areas, so no forest stands would be expected to have mature forest in this condition after 100 years. Over time, it is estimated that Alternative E would provide the greatest amount of mature forest through the HF or HFO prescriptions, followed by (in decreasing order): Alternatives F, E Modified, D, then C (Figure 3 - 35). Estimates for this figure are based on those acres where vegetation management is considered suitable.



	A	B	C	D	E	E Modified	F
Current	0	0	0	0	0	0	0
Decade 10	0	0	17,076	28,534	42,096	41,650	42,080

Figure 3 - 35. Acres, by alternative, of potential mature forest resulting from HF and HFO prescriptions.

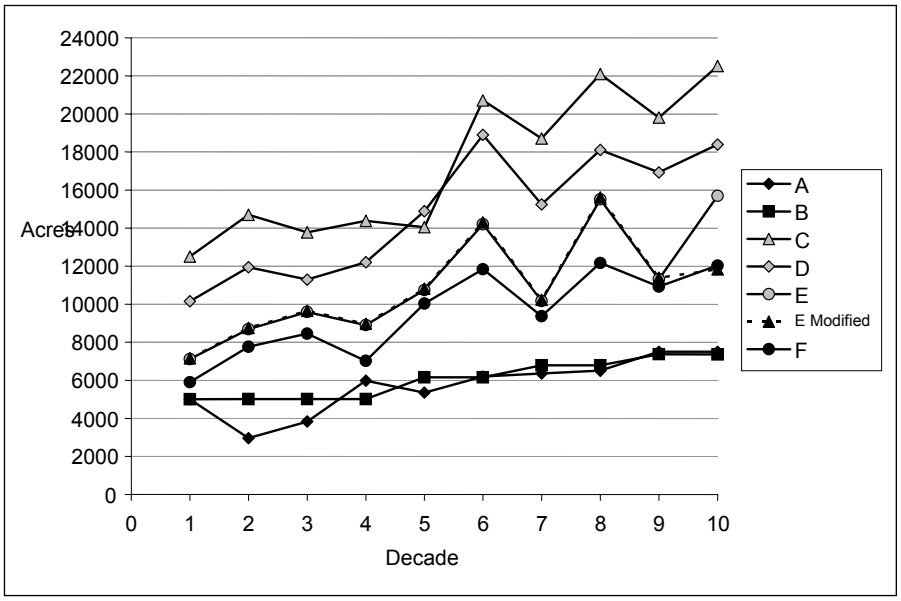
Uneven-aged Management

Implementation of uneven-aged management methods could provide optimal structural habitat conditions for the cerulean warbler (Ewing, 2003f) and worm-eating warbler (Hengeveld, 1991; TNC, 1998). Each entry opens gaps in the canopy and encourages dense growth in the understory where the gap occurred. Uneven-aged forest stands are those which have three or more age classes of trees. When using uneven-aged timber harvest methods, every entry into

the stand results in the formation of a new tree age class. For example, a forest stand may consist of only one tree age class because it originated from an even-aged timber harvest 60 or more years ago. The new growth resulting from the first single-tree selection or group selection harvest creates a second tree age class. The second entry, which may happen at least every third decade creates a third age class of trees, and so on over time.

The abundance of oak-hickory in forest communities treated with uneven-aged methods is likely to decline over time, which is not favorable for the cerulean warbler. For this reason, some prescribed fire is likely to be used in stands managed with uneven-aged management methods to aid in oak regeneration at the local scale. Prescribed fire in uneven-aged management areas will generally occur once per decade and only in association with certain timber harvest treatments or projects designed to reduce hazardous fuels, unlike in the HF and HFO management areas where it may occur more frequently. Prescribed fire in uneven-aged management areas is more likely to occur on drier sites where oak is more likely to regenerate, rather than in mesic areas where the success of oak regeneration would be expected to be low. Any prescribed fire that would occur in mesic sites (i.e., worm-eating warbler preferred habitat) is more likely to be of a low intensity and more likely to burn in a mosaic pattern because of the moist conditions.

Data from the Spectrum model were plotted to show the acres of habitat which could be improved each decade by applying uneven-aged vegetation management techniques (Figure 3 - 36). These habitat improvements would be emphasized in the DCF and DCFO management areas, but would also occur to a lesser degree across the planning landscape in the FSM, FSMO, GFM, and RC management areas. Uneven-aged management may optimize the forest structure for these species. Averaged across the decades, Alternative C would employ the most uneven-aged management to the landscape (17,324 acres/decade), followed by (in decreasing order): Alternatives D (14,804 acres/decade) → E (11,193 acres/decade) → E Modified (10,872) → F (9,548 acres/decade) → B (6,063 acres/decade) → A (5,717 acres/decade).



Alternatives A and B provide the least improved habitat (open canopy mature or all-aged forest) for the cerulean warbler and worm-eating warbler, while Alternatives F, E, E Modified, D and C provide progressively more improved habitat for these species.

Figure 3 - 36. Acres of cerulean warbler and worm-eating warbler habitat improved each decade, by alternative.

Interior forest habitat managed with uneven-aged management methods would be distributed across the planning area. Table 3 - 16 compares the amount of interior forest blocks of NFS land available in the DCF and DCFO management areas in each alternative. The same methods described under Current Condition were used for this analysis. Smaller tracts of NFS land would be managed primarily with uneven-aged management in the RC management area.

Table 3 - 16. Number of interior blocks in DCF and DCFO by alternative.

Interior Forest Block Class (acres)	A	B	C	D	E	E Modified	F
500-1,000	24	3	15	18	15	15	8
1,000-1,500	12	4	9	7	3	3	5
1,500-2,000	7	1	3	1	1	1	2
2,000-2,500	6	1	4	3	2	2	2
2,500+	8	2	7	4	2	2	3

Even-aged Management Prescriptions

Today's forest communities were primarily derived from forest communities that were harvested primarily with clearcut techniques in the past century. Mature forest communities that originate from clearcut, clearcut with reserves, shelterwood and two-aged timber harvesting

techniques can provide habitat for a diversity of species, including mature forest species. Even-aged management also promotes the regeneration of oak and hickory species which is favorable for the cerulean warbler.

In the Missouri Ozarks, there were greater densities of worm-eating warblers in the pole-sawtimber forests that had been managed by clearcutting than in forests with no harvest (Thompson et al., 1992), and Annand and Thompson (1997) observed the worm-eating warbler using mature even-aged stands of at least 50 years of age, as well as 3-to-5-year-old stands regenerated by the shelterwood method. There are indications that they may start using clearcut areas that are as young as 7 years of age where several hardwood trees have been left (Bushman and Therres, 1988 *in* Hanners and Patton 1998). The cerulean warbler uses mature second-growth forest, including that which was once cleared for agriculture (Oliarnyk, 1996, *in* Hamel, 2000). However, stands managed on short rotational regimes do not mature enough to benefit this species. Because of this, even-aged management conducted in any alternative on the WNF would use a longer 120-year rotation regime to provide mature even-aged forest habitat for the cerulean warbler.

Even-aged harvests on the WNF would likely retain several to many trees per acre to provide habitat for species like the Indiana bat, or to improve oak regeneration. Retention of trees could provide habitat components for certain mature forest bird species during the breeding season; however, abundance of brown-headed cowbirds could increase in such stands thereby leading to the potential for reduced nest success (Rodewald and Yahner, 2000). As suggested by research (Rodewald and Yahner, 2000), small-sized even-aged harvests (generally 5 to 30 acres) would be used to provide habitat for early successional forest species and to reduce the likelihood of parasitism effects on mature forest species.

Research in southeast Ohio suggests that mature forest interior species, like the cerulean warbler and worm-eating warbler, move into early successional forest habitats during the post-breeding season until they begin their fall migration (Vitz, 2003). Even-aged management provides shrubby habitat and/or fruit and invertebrate food sources for mature forest interior bird species at a critical time when they may be susceptible to predators and when they may need abundant nutritional resources in preparation for

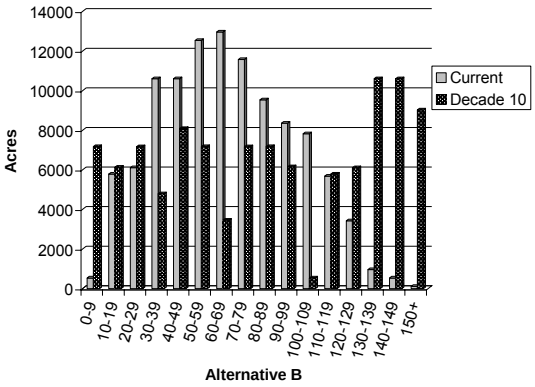
migration. Vitz (2003) found that overall capture rates for mature forest birds during the post-breeding season were higher in early successional forest stands less than 22 acres in size than in those greater than 32 acres. Each of the alternatives incorporates management area guidance to limit even-aged timber harvests to under 20 acres in the DCF and DCFO management areas to provide favorable post-breeding habitat for interior forest species.

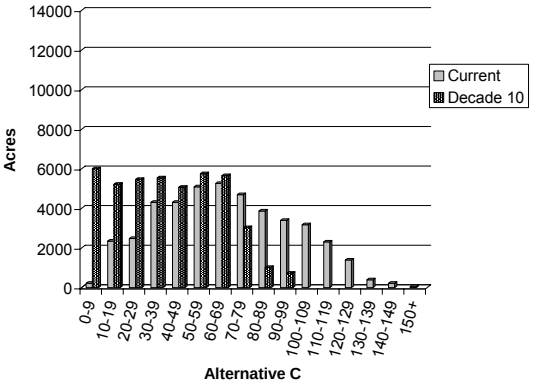
Even-aged management could fragment interior mature forest habitat. The DCF and DCFO management areas were developed to emphasize habitat for interior forest species. Management area guidance is included in each alternative for even-aged harvests to occur on the periphery of the DCF and DCFO management areas or on the periphery of large blocks of interior forest habitat found within these management areas.

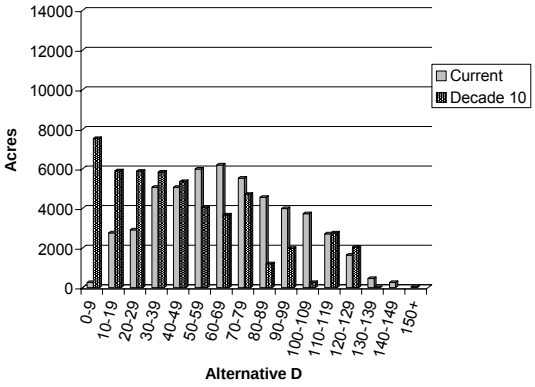
To give an indication of the trend for suitable even-aged mature forest habitat that may be available in 100 years, results from a simplified analysis are presented in Figure 3 - 37. The assumption used for this analysis was that the existing age distribution of forest stands was uniform across the forest and therefore current age distributions for areas managed with even-aged methods would mirror the age distributions shown in Figure 3 - 22. The alternatives vary by how much mature forest habitat would be provided through even-aged management at the end of Decade 10. Alternative B would provide the most acreage (56,012 acres), followed by (in decreasing order): Alternatives E (9,561 acres) → E Modified (8,740 acres) → D (8,246 acres) → F (6,453 acres) → C (1,745 acres) → A (0 acres). Alternative A does not prescribe any even-aged management.

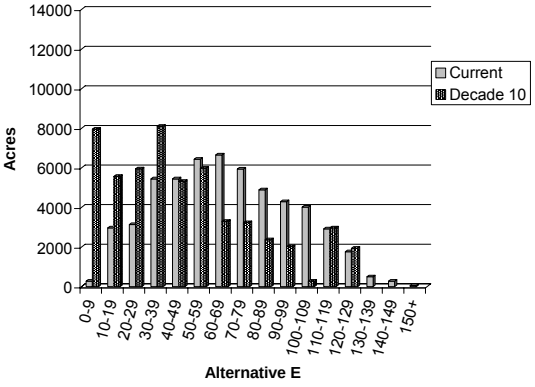
Large, interior forest blocks of NFS land managed with even-aged management methods would be distributed across the planning area, but concentrated in the FSM and FSMO management areas. Unlike the other three conservation approaches, mature forest habitat managed with even-aged methods would be interspersed with younger forest stands, and its spatial location on the ground would change as the rotational management regime is implemented over time.

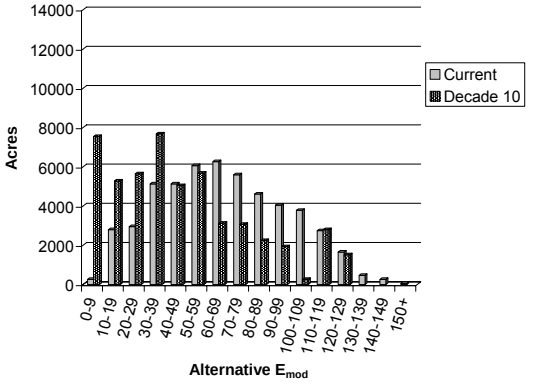
No even-aged management in Alternative A











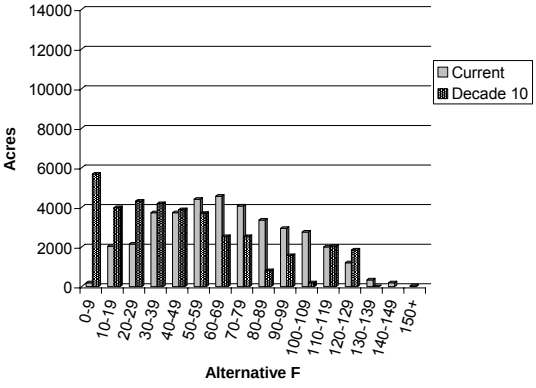


Figure 3 - 37. Trend in mature forest habitat (in 100 years) resulting from even-aged management prescriptions.

Summary of Mature Forest Conservation Approaches

About 34 percent of the Wayne is currently comprised of mature forest habitat (forest stands 80+ years old). Mature forest habitat on the Forest would likely increase after 100 years with implementation of any alternative (Table 3 - 17; Figure 3 - 38).

Alternative A would allocate all of the WNF to uneven-aged management and to natural succession prescriptions. Under that alternative, 100 percent of currently forested lands would likely be covered by mature forest at some future point. The majority of forest cover on the Wayne would also be categorized as mature forest habitat under the remaining alternatives (in order of decreasing percent composition): F (86.8%) → C (82.4%) → D (81.9%) → E Modified (81.2%) → E (80.9%) → B (78.5%).

Table 3 - 17. Summary of mature forest habitat trends for each alternative.

		Estimated Acreage of Mature Forest Habitat Produced after 100 Years of Implementing the Four Mature Forest Conservation Approaches					
Alternative	Current Acreage of Mature Forest Habitat	(a) Natural Succession	(b) Historic Forest	(c) Managed Uneven-aged Management	(d) Even-aged Management (80+ years)	Total*	Change from Current Levels
A	73,388	67,169	0	170,884	0	238,053	+324%
B	73,388	73,169	0	57,715	56,012	186,896	+255%
C	73,388	74,140	17,076	103,344	1,745	196,305	+267%
D	73,388	70,410	28,534	87,920	8,246	195,110	+266%
E	73,388	74,121	42,096	66,867	9,561	192,645	+263%
E Modified	73,388	76,610	41,650	66,358	8,740	193,358	+263%
F	73,388	106,440	42,080	51,803	6,453	206,776	+282%

* A small percentage of the WNF (<1%) that is comprised of water or non-forest was not included in estimates of future mature forest habitat for this analysis.

Habitat for interior forest species would increase under all alternatives, as the Wayne's predominately young forest grows older.

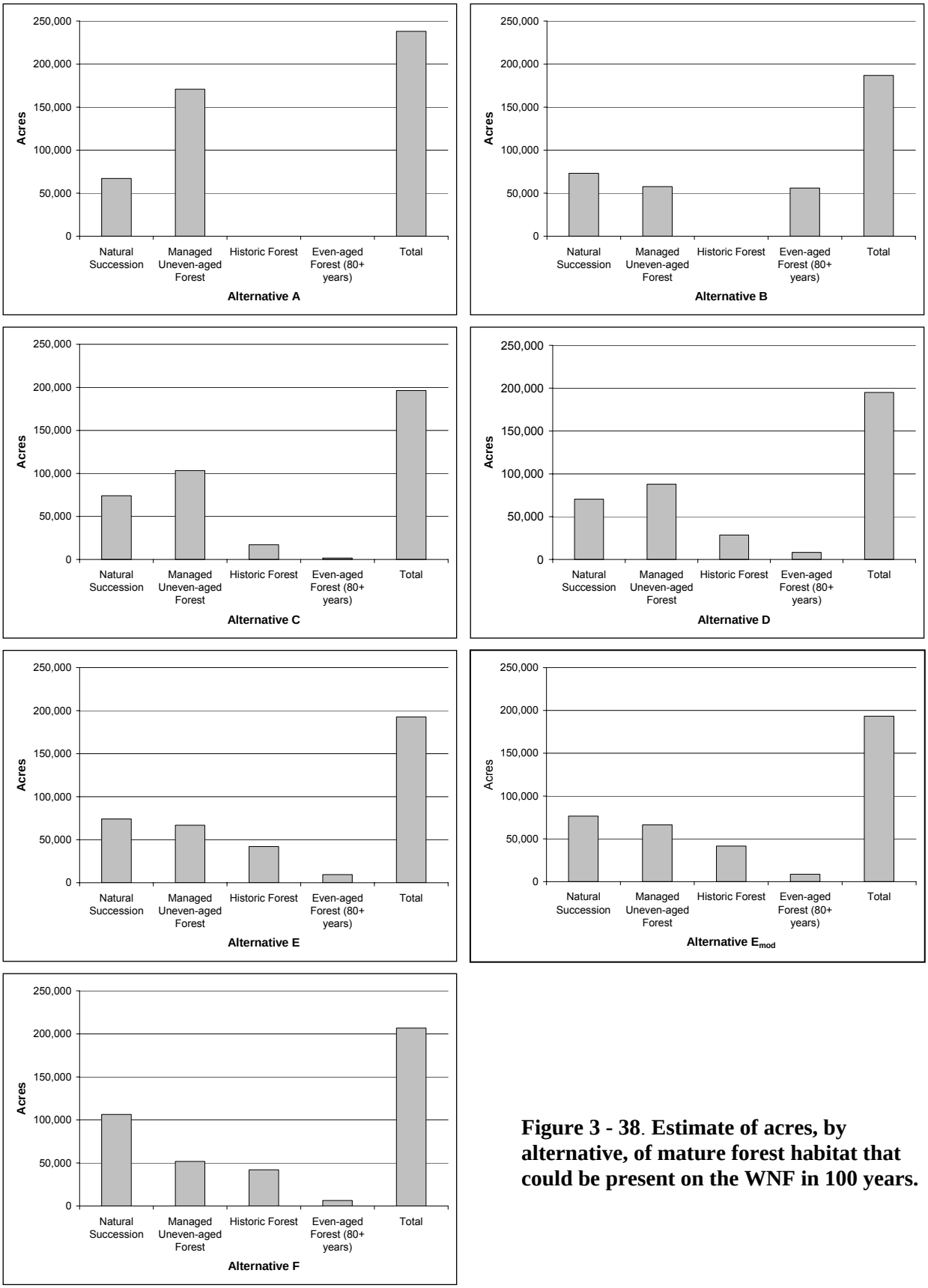


Figure 3 - 38. Estimate of acres, by alternative, of mature forest habitat that could be present on the WNF in 100 years.

As stated previously, one size does not fit all when it comes to mature forest habitat, as evidenced by the diverse habitat structure and composition needs of the three mature forest management indicator species. To determine how each alternative integrated the four mature forest habitat conservation approaches, the alternatives were organized using a simple ranking scheme. For example, even-aged management could provide suitable mature forest habitat after a period of time. A score of 6 was given to the alternative with the highest amount of even-aged mature forest habitat on the landscape after 100 years, a 5 for the alternative with the second highest amount, and so on until the alternative with the least amount received a score of 1. When alternatives had the same score, the rankings would be averaged and an adjusted score would be used.

These scores do not indicate which alternative is best for management indicator species, but is provided only as a means to reflect the diversity of mature forest habitat that could be provided in each alternative. Alternatives with a higher score (C through F) are presumed to have the potential to provide more mature forest habitat diversity than lower scoring alternatives (A or B) (Table 3 - 18).

Table 3 - 18. Index of the integration of the four mature forest conservation approaches into the alternatives.

	A	B	C	D	E	E_{Mod}	F
(a) Natural Succession	1	3	5	2	4	6	7
(b) Historic Forest	1.5	1.5	3	4	6.5	5	6.5
(c) Managed Uneven-aged Forest	7	2	6	5	4	3	1
(d) Even-aged Mature Forest	1	7	2	4	6	5	3
Total Score	10.5	13.5	16	15	20.5	19	17.5

The population trend for the cerulean warbler, worm-eating warbler, and pileated woodpecker is expected to mirror the trend in mature forest habitat quantity and quality. Many factors enter into the equation when it comes to predicting future population trends for species, especially when they include migratory species like the cerulean warbler and worm-eating warbler. The estimates of future population trends take into account only the habitat quantity and quality that could be provided on the WNF over time. However, when considering future population trends for these species, it is important to note that microhabitat preferences may limit their distribution in the planning area to a smaller acreage of mature forest habitat than what is portrayed as potentially being available over time.

Population trends for these three management indicator species would likely remain stable or increase slightly with implementation of Alternative A since there would be a trend for increasing abundance of

mature forest. How long-term declines in oak abundance would affect cerulean warbler population trends is unknown.

Population trends for the cerulean warbler could increase under Alternatives C through F because Historic Forest management prescriptions and uneven-aged management could create the forest structure favored by this species. The Historic Forest prescriptions and moderate levels of even-aged management would also increase the likelihood of maintaining oak and hickory communities in the landscape, which this bird is associated with in the Southern Unglaciated Allegheny Plateau.

Population trends for the worm-eating warbler could increase in Alternatives C through F because these alternatives combine the most area that is likely to provide dense understory habitat over the short-term (uneven-aged management) and the long-term (uneven-aged and even-aged management and natural succession). Increases in population trends could be lessened by the fact that these alternatives include Historic Forest management prescriptions that utilize frequent prescribed fire, an activity which may reduce habitat quality for this species. However, some habitat is still expected to be available for this species in the mesic portions of the HF and HFO management areas.

The pileated woodpecker population could increase under Alternatives C through F. These two alternatives combine the most area that would undergo natural succession and fall within the HF and HFO management areas. Both HF and HFO would provide sources of dead wood and could have open, to semi-open, understories.

In 100 years, almost 79 percent of the Forest may be covered by mature forest habitat in Alternative B, but more of the WNF is allocated to even-aged management in this alternative. Approximately 6,500 acres would be harvested by even-aged methods each decade. Even-aged management can temporarily fragment mature, contiguous forest until the stand once again reaches a successional stage that is no longer an ecological barrier to forest-interior species (Rosenberg et al., 2003). Even-aged management can create edge habitat that increases local diversity while reducing habitat quality and quantity for certain species, including Neotropical migratory forest-interior songbirds. It is possible that population trends for these three species could remain stable or decline based upon the potential for periodic habitat fragmentation of extensive interior forest lands on a landscape scale.

Researchers have noted the apparent importance of early successional forest habitat to mature forest interior birds, like the cerulean warbler and worm-eating warbler, during the post-breeding season (Vitz, 2003). However, research is only beginning to try and determine how spatial

allocation of even-aged harvest in mature forest habitat affects interior forest species.

Alternatives C through F differ from Alternative B in that even-aged management would be less intense (i.e., amount) and focused in the FSM and FSMO management areas, with scattered harvests occurring in the DCF, DCFO, RC, and GFM management areas. Furthermore, even-aged harvests would be concentrated on the periphery of the DCF and DCFO management areas, or on the periphery of large blocks of interior forest in the DCF and DCFO management areas.

Habitat Indicator 5: Amount and trends in habitat and populations for the Louisiana waterthrush.

Riparian corridors include the riparian area, wetlands, and lands that extend away from the bank or the 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 tiny, headwater streams to the larger, mainstem tributaries of the Ohio River. Riparian corridors help reduce peak floods, improve water quality, and recharge ground water. They provide key resources that support biological diversity both in riparian areas and the aquatic ecosystem (Vannote et al., 1980; Dolloff, 1994; Crow et al., 2000).

Riparian corridors serve as links between the headwaters and the lowlands for animal and plant dispersal and migration. Plant dispersal occurs when seeds are dropped into the aquatic system and carried downstream and onto floodplains during high flows. Several species of salamanders migrate between stream and terrestrial areas for purpose of breeding. The woodland salamanders will generally disperse into the uplands, but some of the Plethodontids will disperse only a few feet from the stream. Some pond-breeding species can travel quite a distance into the uplands (e.g., up to 0.4 miles) and Gibbons (2003) concluded that adjacent terrestrial areas and corridors are important to species dependent on small, isolated wetlands or ponds.

The diverse vegetation and microclimates found in riparian corridors provide good cover and food for a variety of species. Shading and water temperature are regulated by the amount of forest canopy in the riparian corridor and stream channel size. The fertile soils deposited in the riparian areas after high water events provide high density forage and cover. Many animals depend on riparian or wetland habitat for at least part of their life cycle. On the WNF this would include most frogs, toads, salamanders, and turtles. Others include the northern watersnake, river otter, beaver, muskrat, mink, and birds such as the great blue heron, wood duck, and belted kingfisher. Other animals may not be dependent on riparian areas but use them frequently for hunting or foraging. This would include the

opossum, raccoon, deer, garter snakes, ruby-throated hummingbird and wild turkey. Owen et al. (2004) suggested that high levels of bat activity in riparian areas compared to upland areas may relate to increased foraging efficiency in areas where insect abundance is greater.

Allocthanous material, composed of leaves, needles, grasses and woody material, is processed by aquatic invertebrates in the headwater streams. As it is processed by the invertebrates, it is passed downstream for use by other animals. Large woody debris is an integral part of the channel forming process, often helping to form pools in the streams or sometimes helping to create a narrower and deeper channel. Stable woody debris helps to catch and hold organic matter that is utilized by aquatic organisms for food (Allen, 1995). Wood also provides cover and spawning habitat for certain species of fish and aquatic invertebrates. Woody debris makes up the dominant food source for some aquatic flies, beetles, and caddisflies (Merritt and Cummins, 1984).

Riparian corridors have been affected by past land uses: wetlands have been tiled or ditched; riparian forests have been cleared for agricultural production; and streams have been modified through channelization, construction of mills, and by a transportation system that includes roads, railroads, and even barge traffic.

Potential natural vegetative communities on WNF riparian corridors differ slightly across the three administrative units (USDA Forest Service, 1999). On the Marietta Unit, yellow poplar, beech, sycamore, and basswood are likely to dominate the overstory. Honewort, wood nettle, clearweed, and blue phlox would be commonly found in the understory. On the Athens Unit and Ironton Ranger District, riparian corridor vegetation on the south-facing or north-facing sides of the valley will vary. South-facing riparian corridors generally would have an overstory of white oak, yellow poplar, musclewood, yellow poplar and sugar maple with an understory comprised of species like heart-leaved groundseal, upright carrion flower, southern arrowwood, and whorled yam. White oak, green ash, yellow buckeye, beech, basswood, and sycamore are more likely to occur in riparian corridors on north-facing sides of the valley. Understory plants would typically include basil bee balm, Virginia knotweed, black snakeroot, stonecrop, wingstem, and creamy violet.

The Louisiana waterthrush was selected as a management indicator species because the taxonomic experts involved in our species viability evaluations indicated this species could reflect stream quality because it relies on aquatic invertebrates for food, and thus may also be an indicator of riparian forest condition. The Louisiana waterthrush is sensitive to declining stream quality and loss of riparian forest, and is listed as a Stewardship Species in the Partners in Flight North American Land Conservation Plan with a continental objective of maintaining its population at its current level (Rich et al., 2004a).

During the breeding season, the Louisiana waterthrush utilizes moist forest, woodland, and ravines along small fast-flowing streams; mature deciduous and mixed floodplain and swamp forests. It prefers a landscape component composed of large blocks of interior forest where herbaceous cover is sparse and shrub cover is moderate to sparse, and where fallen trees with exposed root masses and riparian banks with abundant crevices are present.

Affected Environment

Riparian corridors account for 32,194 acres of the Wayne (NLCD, 1992). NFS lands within riparian corridors are primarily forested (Figure 3 - 39). Other than water or wetlands, there is some agricultural land (i.e., hayfield and grazing permits) and roads found in the riparian corridors.

The Louisiana waterthrush was observed along 35 percent of the WNF Breeding Bird Survey routes in 2003. Of the three North American Breeding Bird Survey routes wholly within the Forest, there were no data for the Louisiana waterthrush for the Wilgus and WNF routes (Sauer et al., 2004). It had been observed along the Dell route, but at such low numbers that a trend estimate could not be made. It has experienced a declining trend (1.5 percent) in the Ohio Hills Physiographic Region since 1966 (Sauer et al., 2004) (Figure 3 - 40). Taxonomic experts involved in the species viability evaluation process considered it to be a stable species on the Wayne (Grove, 2003).

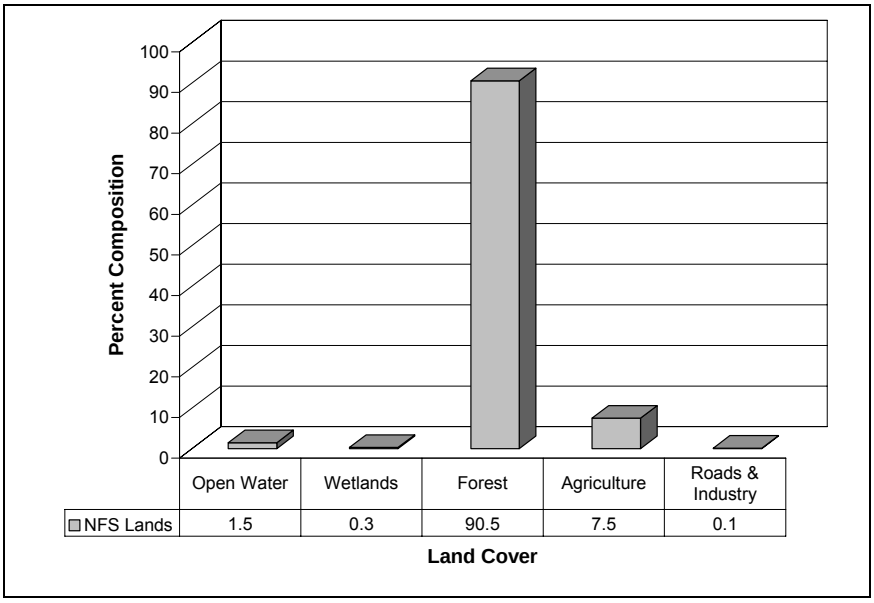


Figure 3 - 39. Composition of riparian corridors on NFS land.

(Source: National Landcover Database, 1992).

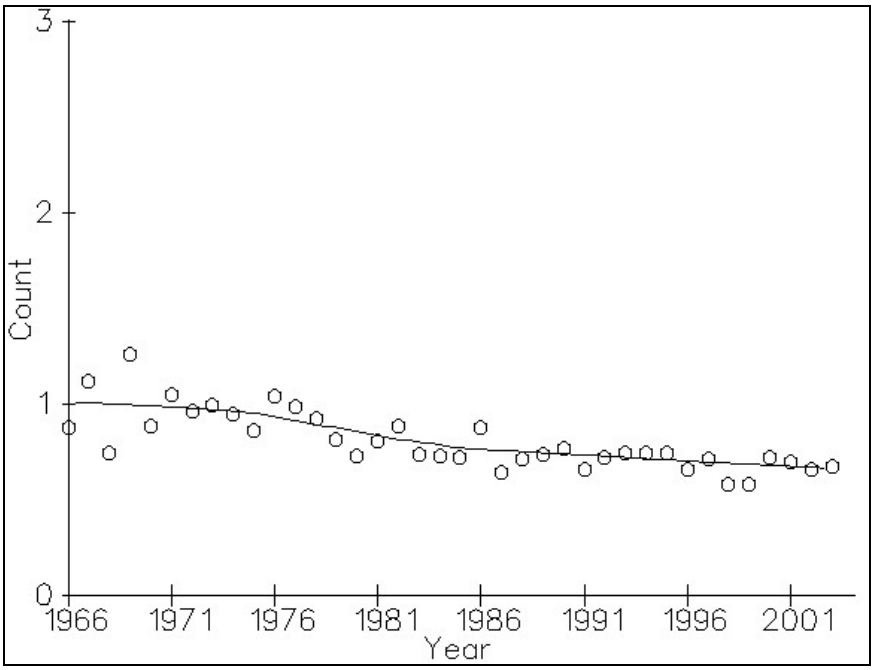


Figure 3 - 40. Population trend for the Louisiana waterthrush in the Ohio Hills Physiographic Region 1966-2003. (Source: Sauer et al., 2004)

General Effects Common to all Alternatives

Each alternative incorporates measures to restore, maintain and improve riparian corridor condition on NFS land.

A Forest-wide goal would directly benefit the Louisiana waterthrush by promoting healthy riparian and aquatic ecosystems that sustain ecological processes and functions and a variety of plant and animal communities, including viable populations of native and desired non-native species.

Forest-wide objectives would indirectly benefit the Louisiana waterthrush by calling for the improvement of habitat along streams for aquatic and riparian-dependant species and the reduction of sedimentation and improvement of passage for aquatic and semi-aquatic organisms at road and trail crossings. A Forest-wide objective calls for the Forest Service to provide adequate habitat to support viable populations of management indicator species.

Several Forest-wide standards and guidelines would protect Louisiana waterthrush habitat as site-specific projects are implemented. These measures target activities that could occur within the riparian corridor, which includes at a minimum, the riparian area and upland areas within the floodprone area or within 100 feet of the edge of the aquatic ecosystem or wetland (whichever is greater). These measures include guidance for filterstrips, potential earth-disturbing activities that could occur in the

riparian area or filterstrip, stream crossings and their design, and removal of materials from streams.

Prescribed fire is projected to be used in all alternatives to regenerate oak-hickory, reduce hazardous fuels, to control non-native invasive species and to improve or maintain herbaceous wildlife habitat. The Louisiana waterthrush is an early ground nester (initiates nesting in March). Prescribed fire that occurs during the spring after March could have an adverse effect on individuals and/or their reproductive success. However, prescribed fire would not be concentrated in riparian corridors, but would occur in various habitats across the planning area annually. All of the alternatives contain measures to minimize adverse impacts to riparian species like the Louisiana waterthrush. For an example, mosaic pattern burning is encouraged during implementation of prescribed burns.

Direct and Indirect Effects of the Alternatives

The alternatives do not vary in the amount of riparian corridor habitat that would be available on the WNF. However, the habitat quality of the riparian corridors would likely vary between the alternatives. The Forest Service incorporated three conservation approaches into the alternatives to improve habitat for riparian-dependent species like the Louisiana waterthrush. The following describes how these three conservation approaches are addressed in the alternatives.

Natural Succession

According to the taxonomic experts that were involved in the species viability evaluation process, the Louisiana waterthrush is a species which responds positively in mature forest areas where little disturbance occurs along headwater streams. Each alternative includes NFS lands which will undergo natural succession. Some of these lands are within FOF and FOFM management areas, but additional areas are in areas defined as unsuitable for vegetation management. There would be no vegetation management in these areas, unless related to energy mineral development in the FOFM management area or in areas that retain a surface occupancy stipulation. These disturbances would be minimal since only 121 acres are projected to be disturbed as a result of oil and gas activities across the entire Forest in the next 10 years, and very little disturbance associated with oil and gas activities would occur in riparian areas. In terms of areas where natural succession would be allowed to occur, there is the potential for Louisiana waterthrush habitat to be most plentiful with the implementation of Alternative F, followed by (in decreasing order) Alternatives E Modified → C → E → B → D→ A.

River Corridor Management Area

This management area emphasizes retaining, restoring, and enhancing the inherent ecological processes and functions associated with specific riverine systems. The boundaries of the management area extend upstream

a short distance on mainstem tributaries and often include ravines and small streams that flow directly into the mainstem. Based on the allocation of this management area across the alternatives, Alternatives C through F would likely provide more quality habitat for the Louisiana waterthrush than would Alternatives A and B ().

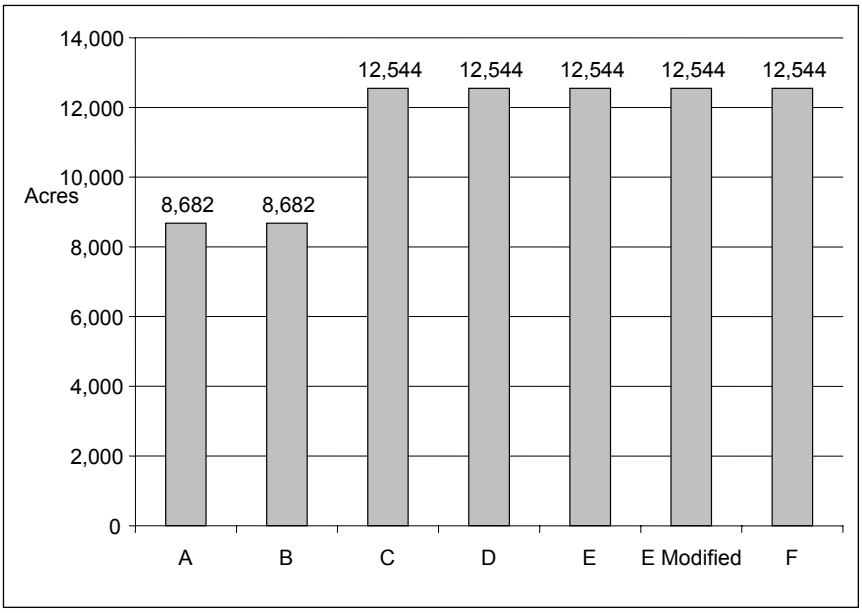


Figure 3 - 41. Allocation of NFS land to the River Corridor Management Area.

Uneven-aged Management along Headwater Streams

The Louisiana waterthrush may be adversely affected by activities that reduce forest canopy cover. Taxonomic experts involved in the species viability evaluation process stated that even-aged management should be avoided in riparian corridors in mature forest management areas since it is a forest interior species that requires closed-canopy conditions (Grove, 2003). The DCF and DCFO management areas were developed to emphasize mature habitat for conservation of forest interior species. Habitat management prescriptions primarily depend upon uneven-aged management methods to improve mature forest habitat for a variety of species, but even-aged management is allowed in up to 25 percent of the management area. The Forest Service developed specific management area guidance which encourages the use of only uneven-aged vegetation management within 100 feet of all headwater streams in the DCF and DCFO management areas, unless it is determined at the site-specific level that Federally listed species or Regional Forester sensitive species require some other form of management to maintain viability. Alternative A

allocates the most acreage to DCF and DCFO management areas, followed by (in decreasing order): Alternative C → D → E Modified → E → F → B.

The alternatives were sorted by how well they integrated the three conservation approaches [(a) natural succession, (b) River Corridor Management Area, and (c) uneven-aged management in riparian corridors]. For example, a score of 6 was given to the alternative with the highest amount of River Corridor, a 5 for the alternative with the second highest amount, etc., until the alternative with the least amount of RC received a score of 1. When alternatives had the same amounts of acreage, the rankings would be averaged and an adjusted score would be used. Scores for the three conservation approach categories were totaled. The scores show that Alternatives C through F integrate higher amounts of the combined conservation approaches than do Alternatives A and B (Table 3 - 19).

All alternatives – except B – provide for improved habitat for the Louisiana waterthrush, as the Wayne's currently relatively young forest matures.

Table 3 - 19. Comparison of the integration of conservation approaches for the Louisiana waterthrush into the alternatives.

	A	B	C	D	E	E Modified	F
(a) Natural Succession	1	3	5	2	4	6	7
(b) RC	1.5	1.5	5	5	5	5	5
(c) Uneven-aged Management in Riparian Corridors	7	1	6	5	3	4	2
Total	9.5	5.5	16	12	12	15	14

Because the Louisiana waterthrush is considered to have stable population trends on the Wayne (Grove, 2003), estimates are that stable to increasing populations would be seen over time with the implementation of Alternatives A, C, D, E, or F. Mature riparian forest will be available and distributed across the planning area, based on allocations of the RC, DCF, DCFO, FOF, and FOFM management areas. Furthermore, habitat quality in these mature forest riparian areas will likely be enhanced because Forest-wide direction for riparian corridor management has been improved from that which was found in the 1988 Forest Plan. In addition to providing adequate filterstrip guidance, which was the focus of the 1988 Forest Plan, all alternatives incorporate goals and objectives designed to

address the ecological processes that sustain riparian and aquatic plant and animal communities.

A decreasing population trend could occur in Alternative B over time. In 100 years, almost 79 percent of the WNF may be covered by mature forest habitat, but more of the Forest is allocated to even-aged management. Approximately 6,500 acres would be harvested by even-aged methods each decade, and because of the Wayne's topography and large headwater stream network, there is a high likelihood that even-aged management would occur within close proximity to headwater streams. In such instances, individual Louisiana waterthrush may be affected until the forest stands regenerate to mature age classes. This species is highly sensitive to impacts to the riparian area (Grove, 2003).

Habitat Indicator 6: Amount and trends in habitat and populations for the Henslow's sparrow.

Small prairie remnants exist on the WNF, but extensive grasslands did not naturally occur in southeastern Ohio. However, extensive grassland areas have been created within the planning area, and in the Midwest and Appalachian coal mining region by surface mining reclamation since 1977.

Both obligate and facultative grassland bird species have been documented using these reclaimed coal mine areas (McCormac, 2001). Obligate grassland species are those that require habitat almost completely dominated by grasses and notably lacking woody vegetation. Some of these include the northern harrier, savannah sparrow, grasshopper sparrow, and Henslow's sparrow. Facultative grassland species often occur in grasslands and depend on them for habitat, but frequently exploit other habitats such as hayfields dominated by legumes, old successional fields with asters and goldenrods or weedy edges and borders of agricultural lands. Examples of such species include the northern bobwhite, horned lark, field sparrow, blue grosbeak, and eastern meadowlark.

The Henslow's sparrow is a Regional Forester sensitive species that was used to help guide the development of alternatives during the 2006 Forest Plan revision. It is considered an area-sensitive species that successfully nests in larger grassland fields. Preferred field sizes vary across its range (e.g., from 30 acres to greater than 250 acres) (Ewing, 2003b).

The Henslow's sparrow is a species whose distribution has been dictated by human alterations to the landscape (Pruitt, 1996). After European settlement, most prairies suitable for these breeding birds were converted for agricultural use. The species is considered to have adapted to many of these conditions, but more intensive farming with the production of specialized crops has lead to further population declines (INHS, 1983).

Habitat has also been lost to urban development (The Nature Conservancy, 1999). Henslow's sparrow distributions followed the availability of suitable habitat, and therefore, expansions of the historic range occurred as agricultural landscapes replaced forested ones (Pruitt, 1996). As Henslow's sparrow populations began to decline in northern and central Ohio during the 1940s, and disappeared from most of this range by the 1960s, their numbers increased in the unglaciated portion of the state (Swanson, 1996).

Henslow's sparrows have colonized coal mine grasslands in Indiana (Bajema et al., 2001), Ohio (McCormac, 2001), and Pennsylvania (The Nature Conservancy, 1999). Reclaimed coal mines are likely to be productive nesting habitats (not population sinks), perhaps because of low rates of brood parasitism (Bajema et al., 2001), and may therefore be important in conservation of the Henslow's sparrow.

The Forest Service is required to maintain viable populations of native and desired non-native species in the planning area. The Henslow's sparrow represents other obligate and facultative grassland species which have moved into the planning area and are utilizing these extensive reclaimed mine lands.

The 1988 Forest Plan guidance for reclaimed stripmines focused on planting these extensive grassland areas, with designated permanent openings interspersed among the reforested areas. However, not all the tree plantings attempted have been successful. The taxonomic experts involved in the species viability evaluation have found, through their field studies that mining and reclamation processes compact the soil, adversely affect or destroy the aquifer and soil biota, and leave a layer of slag under the topsoil (Ewing, 2003b). We identified the need to change management Forest Plan direction because our reforestation efforts were resulting in the encroachment of woody vegetation, which makes these grassland areas unsuitable for obligate grassland species (Ewing, 2003a).

Affected Environment

There are 6,177 acres of openland habitat dominated by grasses, on NFS land. Of these acres, 1,303 are reclaimed mine lands that remain in an open and primarily grassy condition. The remaining openland includes pastures, hayfields, and utility corridors. Some of these open, grassy areas are extremely small in size (i.e., as small as 0.05 acres), and do not provide habitat for the Henslow's sparrow or other area sensitive species.

There are three general areas with a high abundance of grassland habitat on the WNF: Brady Run area (Ironton Ranger District), Shawnee area and Peabody area (Athens Unit). Of the 1,303 acres of reclaimed mine lands that remain in an open and grassy condition, 973 acres occur in these three areas. The grassland habitat is generally surrounded by a ring of shrubby-herbaceous habitat and then forest.

The Henslow's sparrow was observed along nine percent of the WNF Breeding Bird Survey routes in 2003 (i.e., the Brady Run and Peabody routes) (Ewing, 2003c). Of the three North American Breeding Bird Survey routes wholly within the Forest, there were no data for this species (Sauer et al., 2004). It has experienced a minus-5.1 percent trend in the Ohio Hills Physiographic Region since 1966 (Sauer et al., 2004) (Figure 3 - 42).

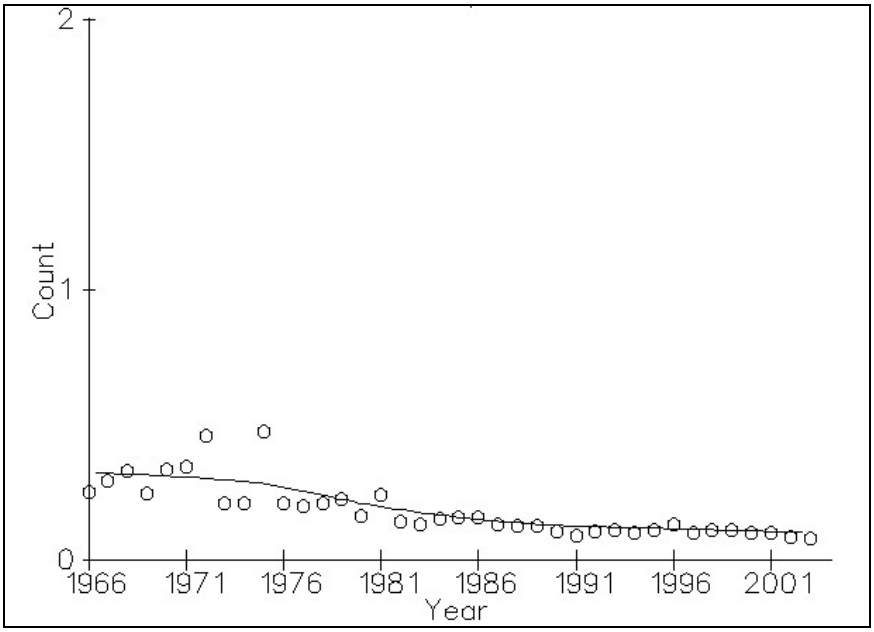


Figure 3 - 42. Population trend for the Henslow's sparrow in the Ohio Hills Physiographic Region 1966-2003 (Sauer et al., 2004)

Direct and Indirect Effects of the Alternatives

The GFM (Grassland-Forest Mosaic) Management Area was developed to accommodate the needs of obligate grassland species using these reclaimed mine lands. Maintaining and improving grassland habitat, as prescribed in the GFM Management Area, would reduce the amount of NFS land that would be forested. Certain plants and animals that are forest-dependant would not find this type of habitat suitable.

Mowing, prescribed fire and light grazing may be used to stop encroachment of woody vegetation and to maintain appropriate vegetation structure (e.g., amounts of thatch) and composition (e.g., native legumes and grasses vs. non-native plant species). These activities can affect the structure of the herbaceous vegetation and make it unsuitable for a season, but they improve vegetation structure over the long-term. Each alternative incorporates management area guidance to conduct these activities would

be done on a rotational basis to ensure the majority of the grasslands are in a suitable condition for species that use such habitat.

Alternatives C through F would each allocate 5,334 acres of NFS land to the GFM Management Area, while Alternatives A or B would not allocate any NFS land to this management area (Figure 3 - 43). These 5,334 acres includes 973 acres of open, grassy reclaimed mine habitat; the remainder of the management area is in a shrubby or forested condition.

In Alternative A, the 973 acres of open grassy habitat existing in the Brady Run, Shawnee and Peabody areas would be located within the DCF and DCFO management areas. In Alternative B, these 973 acres would occur in the FSM and DCFO management areas. These open, grassy acres may or may not be maintained in Alternatives A or B because habitat composition objectives for these management areas call for only so much herbaceous or herbaceous-shrub habitat to be maintained (3- 6% in FSM; 2 -4% in DCF and DCFO). In other words, the amount of existing open, grassy habitat could decline or become non-existent in Alternatives A and B, depending on how much herbaceous or herbaceous-shrubland habitat is needed elsewhere in these management areas for other species.

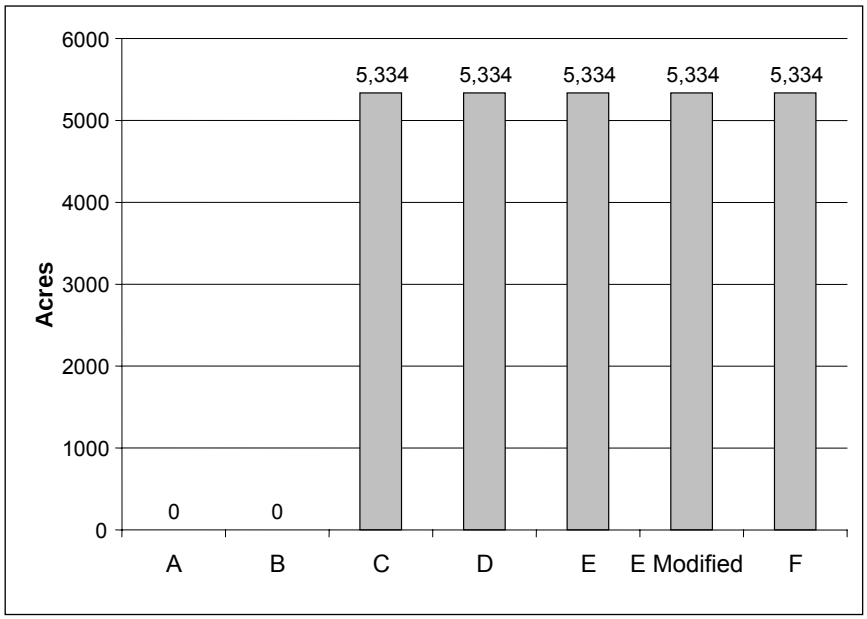


Figure 3 - 43. Allocation of NFS land to the Grassland and Forest Mosaic Management Area.

If population trends for Henslow's sparrow were assumed to be similar to suitable habitat trends, it is likely that the Henslow's sparrow population trends would remain stable or could increase slightly on NFS land in Alternatives C through F. The existing acreage of open, grassy habitat (973 acres) would be maintained or improved for obligate, grassland species. In addition, any open, grassy habitat acquired in future lands

acquisition projects within the GFM management area could be managed to provide suitable habitat for Henslow's sparrow and other grassland species. The GFM management area allows up to 40 percent of its land to be retained in a herbaceous condition (i.e., 2,134 acres).

Population trends for the Henslow's sparrow could remain stable or decline on NFS land in Alternatives A and B. As stated above, habitat composition objectives for herbaceous and herbaceous-shrubland habitat in the FSM, DCF, and DCFO management areas accounts for only a small part of the habitat mix. Henslow's sparrow population trends could remain stable if these specific open, grassy lands were identified as priority for maintenance in consideration of all other herbaceous or herbaceous-shrubland acres in these management areas at the project-level. Population trends for the Henslow's sparrow could decline if the need for herbaceous or herbaceous-shrubland habitat in other geographical locations of the management areas was deemed a priority at the project-level.

Summary of Habitat Indicators 1 to 6, 10 and 11

Table 3 - 20 provides an overview of the habitat that could be available in each alternative after 100 years of Forest Plan implementation. A prediction of habitat and population trends is provided. The following are highlights from the analysis of direct and indirect effects of the issue indicators.

- Oak-hickory is expected to decline from present levels in all alternatives. Many species rely on these tree species for food and shelter. Historic Forest management prescriptions and even-aged management will help retain oak-hickory in the landscape.
- Abundance of pine in the landscape was naturally low, but has increased with the planting efforts started by the CCC in the 1930s. Pine is expected to decline in all alternatives, or convert to mixed-pine hardwood stands. Therefore, it is expected that the pine warbler could experience population declines on NFS land.
- The yellow-breasted chat and ruffed grouse are likely to experience drastic population declines after the first decade in Alternative A because it would not create any early successional forest habitat. Alternative C would include what taxonomic experts consider the minimum management prescription and allocation to conserve these species on NFS lands. Alternatives B or D through F would increase the amount of early successional habitat that could be created above the minimum amount in Alternative C.
- Habitat quantity and quality for the cerulean warbler, worm-eating warbler, pileated woodpecker, and Louisiana waterthrush is higher in Alternatives C through F than in Alternatives A or B. Any of the alternatives would result in an increase of mature forest habitat, but

the combination of management prescriptions in Alternatives C through F would provide more diverse mature forest structure and composition.

- Alternatives C through F would allocate grassland habitat to maintain populations of the Henslow's sparrow. Its populations would likely decline or could even disappear from NFS land under Alternatives A of B.

Table 3 - 20. Summary of habitat indicators 1 - 6, 10 and 11.

Issue Indicator	Amount or Trend* Estimate (after 100 years)	A	B	C	D	E	E Modified	F
NFS land allocated to management areas that allow timber harvesting	Amount (acres)	210,939	210,939	205,760	210,462	205,759	202,777	174,858
NFS land allocated to management areas that allow prescribed fire	Amount (acres)	210,939	210,939	205,760	210,462	205,759	202,777	174,858
Oak-hickory Forest	Amount (acres)	18,088	41,082	40,201	49,040	62,118	60,169	57,823
	Trend	↓↓↓	↓↓	↓↓	↓↓	↓	↓	↓
Pine Forest: Pine Warbler	Amount (acres)	**	13,299	11,977	11,805	10,680	10,461	7,876
	Habitat and Population Trends	↓↓↓	↓	↓	↓	↓	↓	↓↓
Early successional forest: Yellow-breasted Chat Ruffed Grouse	Habitat Amount (acres)	0	13,308	11,224	13,434	13,520	12,820	9,664
	Habitat and Population Trends	↓↓↓	− or ↑	↓	− or ↑	− or ↑	− or ↑	↓↓
Mature Forest Habitat: Cerulean Warbler Worm-eating Warbler Pileated Woodpecker	Habitat Amount (acres)	238,053	186,896	196,305	195,110	192,645	193,358	206,776
	Population Trend	− or ↑	− or ↓	− or ↑	− or ↑	− or ↑	− or ↑	− or ↑
Mature Riparian Forest Habitat: Louisiana Waterthrush	Habitat amount (acres)	29,623	29,623	29,623	29,623	29,623	29,623	29,623
	Population Trend	− or ↑	− or ↓	− or ↑	− or ↑	− or ↑	− or ↑	− or ↑
Grassland Habitat: Henslow's Sparrow	Habitat Amount (acres)	973	973	2,134	2,134	2,134	2,134	2,134
	Trend in population	− or↓	− or↓	− or↑	− or↑	− or↑	− or↑	− or↑

* Estimates of population trends for management indicator species are based on habitat trends on the WNF, and do not take into account how environmental conditions or factors related to wintering habitat could affect their population trends.

**No even-aged management prescribed; therefore pine would disappear over time on WNF.

↓ Slight decline from present levels; ↓↓ Moderate decline from present levels; ↓↓↓ Major decline from present levels

− Stable or no change from present levels

↑ Slight increase from present levels; ↑↑ Moderate increase from present levels; ↑↑↑ Major increase from present levels

Cumulative Effects for Habitat Indicators 2 - 6

The previous analysis of direct and indirect effects on each of the management indicator species or habitats could be considered a relatively detailed cumulative effects analysis, however this section will attempt to summarize the effects of the alternatives on these indicators in relation to other past, present, and reasonably foreseeable future actions on all lands in the Southern Unglaciated Allegheny Plateau Ecological Section. This area was chosen as the cumulative effects analysis area because it corresponds to the boundaries of the Partners in Flight Ohio Hills Physiographic Region, an area that is considered one of the highest priorities for conservation attention in the Northeastern Unites States due to its high concentration of high priority and declining species, some of which include the management indicator species (e.g., cerulean warbler, worm-eating warbler, Louisiana waterthrush, Henslow's sparrow). The WNF accounts for about one percent of the lands in this cumulative effects analysis area, but still has the potential to contribute to the conservation of plant and animal species in this physiographic region.

About 54 percent of the area is covered by oak-hickory forests with some northern hardwoods occurring on north-facing hillsides near the edges of the Allegheny Mountains in West Virginia and in the Western Allegheny Plateau in Ohio; 40 percent of the area includes agricultural production or urban development, but most of that is in the northern parts of the cumulative effects analysis area (Rosenberg and Dettmers, 2004). Urban development could increase over time. A policy of fire suppression has been in place in this area since the early to mid-1900s. Forest cover within the cumulative effects analysis area has increased over time, largely due to the abandonment of farms and old fields that have reverted to forest. In Ohio, forest cover (sapling, pole, and sawtimber size classes) has increased by about 41 percent since 1952 (USDA Forest Service, 1991). Increases in forest cover have also been seen in Kentucky (8% since 1952) (University of Kentucky 2003), West Virginia (4% during 1975-1988) (USDA Forest Service 2000) and Pennsylvania (less than 1% since 1978) (USDA Forest Service, 1989).

As described in the cumulative effects analysis for oak-hickory habitat, timber harvesting is expected to occur in the future on private and state-owned lands in Ohio, and will continue to occur on lands in Kentucky, West Virginia, and Pennsylvania. Timber harvesting methods vary on these other lands and are based on the landowner's desired future condition for their land. If current trends continue into the future it is likely that harvests on other lands will occur and some habitat for early successional forest species may be provided, but this habitat will likely occur in a random pattern across the landscape. Maintenance of oak and hickory forest will be subject to the type of timber harvests that occur on other lands. Little prescribed fire is used to treat habitat, with the exception of some minimal fire used to improve habitat for certain plants or animals on lands

managed by State or Federal agencies, or by conservation organizations such as The Nature Conservancy.

Alternative A (No Action Alternative)

Pine Habitat

Species that depend on pine habitat (e.g., pine warbler) will likely decline over time on NFS land as pine declines or becomes a minor component in hardwood stands. However, pine planting occurs on private lands and on industrial forest lands and will likely continue to occur on these lands in the future. For example, Escanaba Timber LLC has purchased 130,000 acres of forest land from the MeadWestvaco Corporation in southeast Ohio. It manages its land in a variety of ways to meet different goals, but its main objective is to supply fiber to the NewPage paper mill in Chillicothe in two forms – hardwood pulpwood and softwood pulpwood. To supply the softwood pulpwood, the company has a goal of establishing pine on 30,000 of its 130,000 acres. Most of this pine will be grown on land that was, or is, currently hardwoods, most likely dominated by oak. Prior to its sale, MeadWestvaco distributed free pine seedlings to individuals to plant on their own land; since 1985 MeadWestvaco had distributed an average of 600,000 pine trees per year. Also, MeadWestvaco entered into leasing contracts with private individuals and the company will plant pines on private land; there are approximately 10,000 acres in this program in southeast Ohio. The decline of pine on the WNF is not likely to affect the conservation of the pine warbler in this cumulative effects analysis area.

Early Successional Habitat

The Partners in Flight Conservation Plan for the Ohio Hills estimates that shrub-scrub habitat should comprise about three percent of the cumulative effects area in order to conserve an entire early successional forest suite of species (Rosenberg and Dettmers, 2004). Alternative A would not prescribe any even-aged management and therefore would not contribute to the long-term conservation of species which rely on a continual supply of early successional forest habitat (e.g., ruffed grouse, yellow-breasted chat).

Mature Deciduous Forest Habitat

Almost 5.2 million acres of mature deciduous forest habitat are needed within the Ohio Hills Physiographic Region to support an entire mature forest-species suite (Rosenberg and Dettmers, 2004). In 100 years, the WNF would trend toward all mature forest habitat, possibly with some small isolated pockets of brushy habitat that developed after natural storm events or small group selection harvests. The cumulative effect of Alternative A is that over the long-term the WNF would contribute about 4.5% of the needed mature forest habitat for species which favor relatively closed-canopy forest (e.g. Louisiana waterthrush, pileated woodpecker).

Approximately 192,000 acres are needed to support 32,000 pairs of worm-eating warblers, a species that depends on understory disturbances. Approximately 5,700 acres of uneven-aged management would be implemented each decade in

Alternative A (i.e., 3 percent of the cumulative effects analysis area), a silvicultural treatment which would result in favorable habitat for this species.

Nearly 50 percent of the global cerulean warbler population breeds in the Ohio Hills Physiographic Region. This species favors very large oaks on ridgetops and bottomlands. Oak will likely decline on NFS lands over the long-term (by about 84%), as it probably will on other lands in the Ohio Hills Region. Therefore oak maintenance on NFS land, even at minimal levels under Alternative A, would result in beneficial cumulative effects for this species.

Grassland Habitat

About 74,000 acres are estimated to be needed to conserve a full suite of grassland bird species in the Ohio Hills Physiographic Region (Rosenberg and Dettmers, 2004). Alternative A would not provide for a GFM Management Area, making it is unlikely that existing grassland habitat would be available over time to contribute to the conservation of species that require grassland habitat (e.g., Henslow's sparrow).

Alternative B

Pine Habitat

Alternative B would incorporate the highest amount of even-aged management, likely resulting in more pine communities being maintained than in Alternative A. However, the cumulative contribution to pine habitat management and pine warbler conservation in the cumulative effects analysis area would remain minimal.

Early Successional Habitat

Of all the alternatives, Alternative B would make the largest cumulative contribution to early successional forest species habitat (e.g., ruffed grouse, yellow-breasted chat) in the cumulative effects analysis area. On the average, about 12,000 acres of NFS land would be in an early successional forest age class each decade, or about 2 percent of what is required to support an entire suite of early successional forest species in the cumulative effects analysis area.

Mature Deciduous Forest Habitat

After 100 years, an estimated 78.5 percent of the WNF would likely be covered by mature forest habitat, with the remainder being comprised of early and mid-successional forest communities. Mature forest habitat would occur partially from natural succession (39%) and from active forest management (61%). Mature deciduous forest habitat on the WNF could account for about 3.6 percent of that needed to support an entire mature forest suite of species in the Ohio Hills.

Alternative B would contribute about the same amount of uneven-aged mature forest habitat to conservation efforts for the worm-eating warbler as Alternative A. There is concern about fragmentation and edge effects of urbanization, mountain top mining and increasing abundance of chip mills on interior mature

forest habitat in this cumulative effects analysis area (PIF, 2004; Rich et al., 2004). Because of its higher amount of even-aged management, Alternative B could have minimal cumulative habitat fragmentation and edge effects on interior forest species that require large tracts of forest with a relatively closed canopy (e.g., Louisiana waterthrush, worm-eating warbler, cerulean warbler, pileated woodpecker).

The amount of oak-hickory would decline in abundance on NFS lands over the long-term (by about 63%), but not as much as under Alternative A. The cumulative effects to the cerulean warbler and to oak-hickory habitat would be the same as described for Alternative A.

Grassland Habitat

Alternative B would have the same cumulative effects on the Henslow's sparrow as Alternative A.

Alternative C

Pine Habitat

Alternative C would prescribe a minimal amount of even-aged management, therefore pine could be retained to a greater degree than under Alternative A. Still, it will decline from present levels, but the cumulative effects of this on pine warbler conservation would be the same as described in Alternative A.

Early Successional Habitat

An average of 8,300 acres of early successional forest habitat would be available on NFS land each decade for species like the ruffed grouse and yellow-breasted chat. Alternative C would contribute to early successional species conservation in the cumulative effects analysis area by providing about 1.3 percent of the shrub-scrub habitat needed in the Ohio Hills each decade.

Mature Deciduous Forest Habitat

About 82 percent of the WNF would be covered by mature forest habitat in 100 years, with the remainder being covered by early and mid-successional forest communities. Mature forest habitat would occur partially from natural succession (38%) and from active forest management (62%). Mature deciduous forest habitat on the WNF could account for about 3.8 percent of that needed to support an entire mature forest suite of species in the Ohio Hills. Alternative C would provide habitat for species which need relatively closed-canopy forest (e.g. Louisiana waterthrush, pileated woodpecker).

Of all the alternatives, Alternative C would make the largest cumulative contribution to conservation efforts for species like the worm-eating warbler that depends upon uneven-aged forest with dense understory structure. An average of almost 17,300 acres of NFS land would be treated by uneven-aged management methods each decade, or about nine percent of that needed in the Ohio Hills Physiographic Region to support this species.

The amount of oak-hickory would decline in abundance on NFS lands over the long-term (by about 64 percent), but not as much as with Alternative A. Alternative C incorporates the Historic Forest management prescription for the purpose of maintaining oak-hickory for species like the cerulean warbler and ruffed grouse. This management prescription would be focused in one of the eighteen matrix-forming landscapes identified in the Western Allegheny Plateau (a geographical area with similar boundaries as the cumulative effects analysis area) (TNC 2003). Beneficial cumulative effects to cerulean warbler conservation could result from these efforts on NFS land.

Grassland Habitat

This alternative allocates a little over 5,300 acres to the GFM Mosaic Management Area, of which up to 40 percent could be managed for the Henslow's sparrow. This represents a significant contribution to the conservation of the species in the cumulative effects analysis area. Rosenberg and Dettmers (2004) estimated it would need 7,400 acres of grassland habitat to support 2,600 pairs of Henslow's sparrows; the WNF could provide as much as 29 percent of this habitat to the Ohio Hills conservation effort.

Alternative D

Pine Habitat

The cumulative effects on the conservation of the pine warbler and pine habitat would be similar to Alternative C. Alternative D would call for more even-aged management than Alternative C, thereby providing more opportunity to maintain a component of pine in some forest stands.

Early Successional Habitat

An average of 8,500 acres of early successional forest habitat would be available each decade for species like the ruffed grouse and yellow-breasted chat. Alternative C would contribute to early successional species conservation by providing about 1.4 percent of the shrub-scrub habitat needed in the Ohio Hills each decade.

Mature Deciduous Forest Habitat

About 81.9 percent of the WNF would be covered by mature forest habitat in 100 years, with the remainder being covered by early and mid-successional forest communities. Mature forest habitat would occur partially from natural succession (36%) and from active forest management (64%). Mature deciduous forest habitat on the WNF could account for about 3.8 percent of that needed to support an entire mature forest suite of species in the Ohio Hills. Alternative D would provide habitat for species which need relatively closed-canopy forest (e.g. Louisiana waterthrush, woodpecker),

Alternative D would make a cumulative contribution to conservation efforts for the worm-eating warbler. An average of almost 14,800 acres of NFS land would

be treated by uneven-aged management methods each decade, about 7.7 percent of that needed in the Ohio Hills Physiographic Region to support this species.

The amount of oak-hickory would decline in abundance on NFS lands (by about 56%), but not as much as in Alternative A. Alternative D incorporates the Historic Forest management prescription for the purpose of maintaining oak-hickory for species like the cerulean warbler. This management prescription would be focused in two of the eighteen matrix-forming landscapes identified in the Western Allegheny Plateau (TNC 2003). Beneficial cumulative effects to cerulean warbler conservation would be greater than in Alternatives A through C.

Grassland Habitat

Cumulative effects on the conservation the Henslow's sparrow would be the same as those described in Alternative C.

Alternative E

Pine Habitat

The cumulative effects on the conservation of the pine warbler and pine habitat would be similar to Alternative C and D. Alternative E uses more even-aged management than Alternative C and D, thereby providing more opportunity to maintain a component of pine in some forest stands.

Early Successional Habitat

An average of 9,200 acres of early successional forest habitat would be available each decade for species like the ruffed grouse and yellow-breasted chat. Alternative C would contribute to early successional species conservation by providing about 1.5 percent of the shrub-scrub habitat needed in the Ohio Hills each decade.

Mature Deciduous Forest Habitat

About 80.9 percent of the WNF would be covered by mature forest habitat in 100 years, with the remainder being covered by early and mid-successional forest communities. Mature forest habitat would occur partially from natural succession (38%) and from active forest management (62%). Mature deciduous forest habitat on the WNF could account for about 3.7 percent of that needed to support an entire mature forest suite of species in the Ohio Hills.

Alternative E would provide habitat for species which need relatively closed-canopy forest (e.g. Louisiana waterthrush, woodpecker), but would make a cumulative contribution to conservation efforts for the worm-eating warbler. An average of almost 11,200 acres of NFS land would be treated by uneven-aged management methods each decade, or about 5.8 percent of that needed in the Ohio Hills Physiographic Region to support this species.

The amount of oak-hickory would decline in abundance on NFS lands (by about 45%), but not as much as in Alternative A. Alternative E incorporates the Historic Forest management prescription for the purpose of maintaining oak-hickory for

species like the cerulean warbler. This management prescription would be focused in two of the eighteen matrix-forming landscapes identified in the Western Allegheny (TNC, 2003), and in one other area with a large contiguous block of NFS land. Beneficial cumulative effects to cerulean warbler conservation would be greater than Alternatives A through D.

Grassland Habitat

Cumulative effects on the conservation the Henslow's sparrow would be the same as those described in Alternative C and D.

Alternative E Modified

Pine Habitat

The cumulative effects on the conservation of the pine warbler and pine habitat would be similar to Alternative C, D, or E.

Early Successional Habitat

An average of 8,700 acres of early successional forest habitat would be available each decade for species like the ruffed grouse and yellow-breasted chat. Alternative C would contribute to early successional species conservation by providing about 1.4 percent of the shrub-scrub habitat needed in the Ohio Hills each decade.

Mature Deciduous Forest Habitat

About 81.2 percent of the WNF would be covered by mature forest habitat in 100 years, with the remainder being covered by early and mid-successional forest communities. Mature forest habitat would occur partially from natural succession (40%) and from active forest management (60%). Mature deciduous forest habitat on the WNF could account for about 3.7 percent of that needed to support an entire mature forest suite of species in the Ohio Hills.

Alternative E would provide habitat for species which need relatively closed-canopy forest (e.g. Louisiana waterthrush, woodpecker), but would make a cumulative contribution to conservation efforts for the worm-eating warbler. An average of almost 10,900 acres of NFS land would be treated by uneven-aged management methods each decade, or about 5.7 percent of that needed in the Ohio Hills Physiographic Region to support this species.

The amount of oak-hickory would decline in abundance on NFS lands (about minus-46 percent), but not as much as in Alternative A. Alternative E incorporates the Historic Forest management prescription for the purpose of maintaining oak-hickory for species like the cerulean warbler. This management prescription would be focused in two of the eighteen matrix-forming landscapes identified in the Western Allegheny (TNC, 2003), and in one other area with a large contiguous block of NFS land. Beneficial cumulative effects to cerulean warbler conservation would be greater than Alternatives A through D.

Grassland Habitat

Cumulative effects on the conservation the Henslow's sparrow would be the same as those described in Alternative C, D, and E.

Alternative F

Pine Habitat

Pine is likely to decline in this alternative, but because a minimal amount of even-aged management is prescribed, pine could be retained to a greater degree than in Alternative A. The cumulative effects on the conservation of the pine warbler and pine habitat would be similar to Alternative C through E.

Early Successional Habitat

An average of 6,100 acres of early successional forest habitat would be available each decade for species like the ruffed grouse and yellow-breasted chat. Alternative F would contribute to early successional species conservation by providing about 0.9 percent of the shrub-scrub habitat needed in the Ohio Hills each decade.

Mature Deciduous Forest Habitat

About 86.8 percent of the WNF would be covered by mature forest habitat in 100 years, with the remainder being covered by early and mid-successional forest communities. Mature forest habitat would occur partially from natural succession (51%) and from active forest management (49%). Mature deciduous forest habitat on the WNF could account for about 4.0 percent of that needed to support an entire mature forest suite of species in the Ohio Hills.

Alternative F would provide habitat for species which need relatively closed-canopy forest (e.g. Louisiana waterthrush, pileated woodpecker), but would make a cumulative contribution to conservation efforts for the worm-eating warbler. An average of almost 9,500 acres of NFS land would be treated by uneven-aged management methods each decade or about 5.0 percent of that needed in the Ohio Hills Physiographic Region to support this species.

The amount of oak-hickory would decline in abundance on NFS lands (about minus-48 percent), but not as much as in Alternative A. Alternative F incorporates the Historic Forest management prescription for the purpose of maintaining oak-hickory for species like the cerulean warbler. This management prescription would be focused in the same areas as described in Alternative E. Beneficial cumulative effects to cerulean warbler conservation would be the same as described for Alternative E.

Grassland Habitat

Cumulative effects on the conservation the Henslow's sparrow would be the same as those described in Alternative C, D, E, and E Modified.

Habitat Indicator 7 – Federally Listed and Regional Forester Sensitive Species (T&E and RFSS)

Federally Listed Species

The U.S. Fish and Wildlife Service identified nine Federally listed plant and animal species as occurring within or near the Wayne National Forest (USFWS, 2004). Of these nine, only three are known to occur within the WNF proclamation boundary (Table 3 - 21). The differing effects of the alternatives on these nine species are analyzed in detail in the Biological Assessment (Appendix F). The effects analysis focuses on threats to viability pertinent to the planning area.

Table 3 - 21. Federally listed species occurring within or near the WNF.

Species	Documented on the WNF	Determination of Effect
Northern Monkshood	No	May Affect, Not Likely to Adversely Affect
Running Buffalo Clover	Yes	May Affect, Not Likely to Adversely Affect
Small Whorled Pogonia	No	May Affect, Not Likely to Adversely Affect
Virginia Spiraea	No	May Affect, Not Likely to Adversely Affect
Fanshell	No	May Affect, Not Likely to Adversely Affect
Pink Mucket Pearly Mussel	No	May Affect, Not Likely to Adversely Affect
American Burying Beetle	No	May Affect, Not Likely to Adversely Affect
Bald Eagle	Yes	May Affect, Not Likely to Adversely Affect
Indiana Bat	Yes	May Affect, Likely to Adversely Affect

Federally listed species not present within the Wayne National Forest

A summary of the rationale for the determination of effects for those species which are not present on the Wayne National Forest is provided in this section.

American Burying Beetle (Insect)

The American burying beetle uses carrion, both birds and mammals of 3 to 7 ounces in weight, on which to raise their broods. A pair of beetles will stake a claim to a carcass and defend it against congeneric beetles and other competitors such as flies. After the pair buries the carcass, the female lays eggs in a side chamber near the carcass. The eggs hatch in 6 days; then the larvae requires 12 to 16 days to develop. Both parents initially defend and guard the eggs, but the female usually will remain with and feed the larvae until pupation. The male typically leaves within 10 to 15 days (USFWS, 1991).

A **No Effect** determination is made for the American burying beetle (ABB) for all alternatives because no populations of the beetle have been found on NFS land within the WNF. A reintroduction effort is ongoing at the Ohio Division of Wildlife's Waterloo Wildlife Research Station, located near the Athens Unit. The Forest Service is currently working on a proposal to reintroduce the ABB to NFS land on the Athens Unit in the next 1 to 2 years. If the beetle is reintroduced or discovered on NFS land, consultation would be reinitiated.

A **May Affect, Not Likely to Adversely Affect** determination is made for ABB habitat across all alternatives. The Forest Service is actively contributing to the recovery of the ABB. In addition to proposed reintroduction efforts for the future (Forest-wide Goal 5.1.3), efforts were made to ensure suitable ABB foraging and breeding habitat would be available and well-distributed in all alternatives, both in the short-term and in the future. Timber harvesting and prescribed fire activities integrated into the alternatives may have short-term adverse effects on habitat quality, but over time these activities could improve forest stand conditions, making them more suitable for the American burying beetle.

Roads, trails, and other activities that compact soils would occur on about one percent of NFS land in all alternatives. Conservation measures have been integrated into each alternative to reduce impacts to potentially suitable ABB habitat during implementation of such management (see Forest-wide standards and guidelines TES-21 through TES-26).

Fanshell and Pink Mucket Pearly Mussel (Freshwater Mussels)

A **No Effect** determination is made for the fanshell and pink mucket pearly mussel across all alternatives. These are large river species found in the Ohio River, downstream of the WNF. Their populations are threatened by aquatic habitat degradation and modification. While there is no suitable habitat for the fanshell or pink mucket pearly mussel within the Forest, some of their host fish species occur within watersheds containing NFS land. These host fish would not likely contribute to the colonization of sites within the Forest since habitat is not suitable for these mussels. However, these host fish could play a role in the life cycle of these mussels in the Ohio River.

A **May Affect, Not Likely to Adversely Affect** determination is made for fanshell and pink mucket pearly mussel habitat across all alternatives. Each alternative affords special attention to the restoration and improvement of watershed health and aquatic and riparian habitats (see Forest-wide Goals 2.1 and 3.1, and their associated objectives). In addition, all alternatives incorporate the River Corridor Management Area, a management area which emphasizes retaining, restoring, and enhancing the inherent ecological processes and functions associated with riverine systems. An additional River Corridor management area is allocated along the Ohio River on the Marietta Unit in Alternatives C through F.

Forest-wide standards and guidelines integrated into all alternatives are expected to minimize adverse effects to water quality where take would not be expected to occur (see Forest-wide standards and guidelines in the Watershed Health and Aquatic and Riparian Resources sections). In addition to minimizing or reducing sedimentation and modification of aquatic habitat, protective measures in the Revised Forest Plan would promote management activities that protect or restore structure and function of riparian corridors.

Northern Monkshood, Small Whorled Pogonia, and Virginia Spiraea (Terrestrial Plants)

A **No Effect** determination is made for the northern monkshood, small whorled pogonia and Virginia spiraea across all alternatives. This determination is based on the fact that there are currently no known populations of these plants on NFS land or within the Wayne National Forest proclamation boundary. However, populations of these three species occur in neighboring counties.

A **Not Likely to Adversely Affect** determination is made for northern monkshood, small whorled pogonia and Virginia spiraea habitat across all alternatives. While these species are not known to occur within the planning area, suitable habitat does occur. Each alternative integrates a Forest-wide goal (1.1) to collaborate with conservation partners, such as the U. S. Fish and Wildlife Service, to search for these species and to promote sustainable ecological management practices. Each alternative also includes conservation measures that protect potentially suitable habitat during project-level implementation:

- All alternatives include Forest-wide standards and guidelines to manage non-native invasive plant species and ensure proper pesticide use (WSH-6, WSH-7 and Forest-wide goal 7.2 and its associated objectives, standards and guidelines).
- While ground disturbance could occur during implementation of some management activities, Forest-wide standards and guidelines are incorporated into all alternatives to minimize soil erosion and stabilize disturbed areas (see Goal 2.1, its objectives and standards and guidelines).

  Plant surveys would be conducted on all lands affected by land exchange, ground-disturbing activities, or vegetation removal. Analysis at the project level would identify necessary site-specific mitigation to reduce potentially adverse effects on suitable habitat.

Maintaining potentially suitable habitat on the Forest for these plants is important in the event they naturally disperse from neighboring areas onto NFS land or are reintroduced as part of a recovery project. The Forest Service has ensured potentially suitable habitat is available for the four plants in each alternative.

Northern Monkshood

Northern monkshood is a plant typically found on shaded to partially shaded cliffs, algific talus slopes, or on cool streamside sites. These areas have a microclimate with cool soil conditions, cold air drainage, or cold groundwater flowage. The northern monkshood can also occur in partially-shaded, high-elevation seepage springs and in streamside crevices. Thus, a common characteristic of the preferred habitat of the species is that there is either continuous cold air drainage or cold groundwater flow from neighboring bedrock. These habitats tend to have constant high relative humidity. There are many underground mines on the WNF with a constant flow of cold air or water escaping to the surface, some of which possess potentially suitable habitat near the entrance to the mines. The Forest Service has integrated the FOF and FOFM management areas into each alternative for species such as the northern monkshood which prefer shaded, undisturbed habitat for this species. The allocation of FOF and

FOFM management areas varies between alternatives, with Alternative F have the greatest amount. Recognizing the importance of springs, rock shelters, and rock faces to several animal and plant species, the Forest Service has incorporated Forest-wide direction for protection of these unique habitats during project-level implementation (TES-33 and TES-34).

Small Whorled Pogonia

The small whorled pogonia occurs in a diversity of mixed hardwood or mixed pine-hardwood forests, which tend to be in second- to third-growth successional stages. The plant grows in somewhat young forests as well as in maturing stands that vary in composition. Decaying wood litter or other decaying vegetative matter, including fallen tree trunks and limbs, leaf litter, stumps, and roots of dead trees, is almost always present at small whorled pogonia sites. Sparse to moderate groundcover is often present, except when in association with ferns. There is also a fairly open understory canopy. Proximity to logging roads, streams, or other physical features, which tend to create long semi-permanent breaks in the forest canopy, encourages the growth of this species. Providing a diversity of habitats and managing occupied sites are the key to conserving this species. Each alternative provides a mix of habitats; however the diversity of habitats that may be provided would be greater in Alternatives C through F.

Virginia Spiraea

Virginia spiraea is usually found in riverine and riparian habitats, along the banks of high gradient streams, or along lower stream reaches, sandbars, natural levees, or flatrock habitat with crevices. Virginia spiraea prefers disturbed or geologically active areas where erosion, deposition, and scouring inhibit competition of other woody plant species. Disturbance, usually by flooding and scouring, is essential to the survival of the plant. Over a third of the plant and animal species on the Wayne that are rare or exhibiting range-wide population declines are riparian-dependant species. Each alternative affords special attention to the restoration and improvement of watershed health and riparian habitats (Forest-wide Goals 2.1 and 3.1 and their associated objectives, standards and guidelines).

Federally listed species that occur within the WNF

A summary of the effects of the alternatives and rationale for the determination of effects for the two species which occur on the WNF is provided in this section.

Running Buffalo Clover

The running buffalo clover was discovered on the WNF (Lawrence County) in June 2005. The population is located along a 20 foot section of an old ATV/skid trail. There are 34 rooted plants (ramets) in this area. The total population may be higher because individuals of non-stoloniferus *Trifolium* spp. were present that could not be positively identified. Of the 34 individuals, 27 are located on an old road, and 7 are located on the edge of the old road. The habitat is fairly open with scattered trees. Two large trees, an American elm and a bitternut hickory, provide dappled shading.

There is a second population of running buffalo clover in Lawrence County, but it is outside the proclamation boundary about 8 miles north-northeast of the city of Proctorville, Ohio.

Running buffalo clover occurs in mesic habitats in partial to filtered sunlight, where there is a pattern of moderate periodic disturbance for a prolonged period, such as mowing, trampling or grazing, and is often found in areas underlain by limestone or other calcareous bedrock (S. Selbo, pers. comm.). The plant is not found in mature habitats or in areas of severe disturbance (Cusick, 1989).

The original range of the running buffalo clover is believed to have been areas of rich soils located in the edge between open forest and prairie (USFWS, 1992c). Such areas probably were maintained by American bison disturbance. Most of the recently discovered populations are in areas experiencing at least some disturbance, such as that caused by grazing and mowing. The preferred habitats for running buffalo clover are old trails, traces, and roads; grazed bottomlands; low moist forests; successional areas in mesic forests; streambanks; lawns; shoals; and cemeteries with native vegetation, with well-drained and mesic soils and filtered to partial light (West Virginia Natural Heritage Program, 1990).

Threats

Habitat loss, alteration and degradation are primary threats to this species. This species appears to have been dependent upon woodland disturbance, soil enrichment, seed dispersal, and seed scarification provided by large ungulates such as the American bison (*Bison bison*) (USFWS 1992c; S. Selbo, pers. comm.). Without some level of disturbance, a site will become too shaded to provide enough sunlight for the species. Appropriate grazing intensity at the Bluegrass Army Depot in Kentucky appears to be suitable for maintaining populations of this species, as does uneven-aged timber harvest treatments on the Fernow Experimental Forest in West Virginia (S. Selbo, pers. comm.).

Non-native invasive species, including white clover, Japanese stilt grass, garlic mustard, Japanese honeysuckle, amur honeysuckle, wintercreeper, and periwinkle pose risks to this species and its habitat (S. Selbo, pers. comm.).

Direct and Indirect Effects

Activities conducted on the WNF that have the potential to protect, promote, or introduce suitable habitat for running buffalo clover include those which would result in a moderate amount of sunlight reaching the ground and light to moderate, periodic soil disturbance.

Conservation approaches or measures to proactively protect and conserve existing running buffalo clover populations and suitable habitat have been incorporated into the alternatives. A Conservation Plan for Federally Listed species was developed and included in the revised Forest Plan. The Conservation Plan summarizes the strategy the Forest Service will use during revised Forest Plan implementation to aid in the recovery of this species. The WNF Conservation Plan addresses the following recovery objectives in the Agency Draft recovery

plan (USFWS, 2005b): (1) invasive species control; (2) reducing habitat succession; (3) ensuring viability of protected populations; and (4) promoting public understanding of the species.

Each alternative incorporates a mix of management areas that promote a diversity of habitats, from closed-canopy to brushy young forest. Running buffalo clover occurs in mesic habitats in partial to filtered sunlight, where there is a pattern of moderate periodic disturbance for a prolonged period, such as mowing, trampling, or grazing. It is often found in areas underlain by limestone or other calcareous bedrock. The plant is not found in mature habitats or in areas of severe disturbance (Cusick, 1989). Uneven-aged management promotes filtered light conditions and is a tool available to manage plant and animal habitat in each alternative. Table 3 - 22 shows that there is a range of acreages that could be managed with uneven-aged timber harvest methods across the alternatives. These acreages were based on desired management area habitat compositions shown in Chapter 3 of the revised Forest Plan.

Table 3 - 22. Acreages or percent of WNF that could be managed to provide filtered or dappled sunlight conditions for the running buffalo clover.

	A	B	C	D	E	E Modified	F
Acreage of WNF available for uneven-aged timber harvesting treatments	136,707	57,716	120,093	108,363	108,636	108,008	93,554
Percent of NFS land	57	24	50	46	46	45	39

Forest-wide direction has been incorporated into the alternatives to ensure known populations are protected. A Forest-wide goal (5.1.4) encourages active management of the occupied habitat, with an objective to maintain partial to filtered sunlight (5.1.4a). Forest-wide standards and guidelines protect individuals from prescribed fire activities (SFW-TES-27 and SFW-TES-28), herbicide application (GFW-TES-29), and road and trail management (SFW-TES-30). Surveys for populations in potentially suitable habitat would be implemented prior to any ground or canopy disturbing activity (TES-31).

Activities which may directly or indirectly affect the running buffalo clover and its habitat would likely be distributed across the landscape and over time, such as road construction or prescribed fire. Second-level project analysis would occur and at that time, any additional protective measures needed to minimize or eliminate adverse effects to discovered populations or habitat would be identified.

Cumulative Effects

Partial or filtered light is important to this species. Researchers believe that the southeast Ohio area was primarily forested, but about 10 percent of the area was disturbed each decade by weather-related events or by forest pests and diseases (Runkle, 1982). These disturbances ranged in size from canopy gaps to larger blowdowns, and were scattered across the landscape. In the central hardwood forest, the climate warmed and became drier 5,000 to 8,000 years ago, and an increase in fire occurred. Based on written accounts of early settlers in the Ohio River valley, the forest was described as being park-like with large, widely spaced trees and relatively little undergrowth of woody vegetation.

Forest cover has increased across Ohio from about 15 percent in 1940 to almost 30 percent today (Ohio Division of Forestry, 2004). Almost 80 percent of the lands (public and private) within southeast Ohio are forested (Ohio Land Use Cover, based on Landsat TM 1994). Riparian corridors within are primarily forested (i.e., 72.5%) (National Landcover Database, 1992).

These reforestation trends are beneficial to the running buffalo clover, however researchers suggest that today's forest is denser than that reported for old growth hickory forests and for presettlement forests (Sutherland et al., 2003; Yaussy et al. 2003).

Activities that occur on non-Federal lands within the WNF proclamation boundary include private oil and gas development, surface mining of coal, clay, and limestone, construction of buildings and other structures, road construction and maintenance, and timber harvest. There is a chance that any of these activities may impact suitable habitat, or existing populations of the running buffalo clover. Management of non-Federal lands are under the discretion of the landowner and conservation measures applied on NFS lands may not be used on these other ownerships.

Forest-wide standards and guidelines will protect all known populations, however various management projects are projected to occur on the WNF over the next ten years, including projects that could affect running buffalo clover habitat or undiscovered populations. Cumulatively, the Forest Service could implement about 74,000 acres of projects that could adversely affect the species or its habitat (i.e., prescribed fire, road and trail construction, even-aged management). These disturbances would be distributed across the WNF and over the decade. The actual disturbance would be less since many activities would occur on the same acreage of land, however that would be analyzed in detail at the project-level. In comparison, the no action alternative could affect 71,564 acres.

Any potential adverse cumulative effects would be minimized through the implementation of Forest-wide standards and guidelines. Prescribed fire accounts for the largest acreage; it may result in short-term adverse effects that can be mitigated, but can offer long-term benefits to the species. Prescribed fire is a tool that can be used to create open understories, much like that which was present historically.

Surface mining is an activity which could adversely affect the second largest acreage of land. The Forest Service can use the project-level planning process to consider in detail whether or not this activity will affect the specie or its habitat. When prescribed fire and surface coal mining are eliminated from the equation, only 3,769 acres could be adversely affected, or 0.3 percent of the cumulative effects analysis area.

Effects Determination

A **Likely to Adversely Affect** determination is made for the running buffalo clover. The running buffalo clover was discovered on the Wayne National Forest in June 2005. Although some management activities associated with the alternatives could potentially cause adverse impacts to the clover or its habitat, implementing any of the alternatives is not likely to impede recovery of this species. The Forest Service has incorporated both proactive conservation actions as well as protective measures into the alternatives to aid in the recovery of this species.

The alternatives incorporate conservation approaches or measures to proactively protect and conserve existing running buffalo clover populations and suitable habitat. A Conservation Plan for Federally Listed species was developed which summarizes the strategy the Forest service will use during revised Forest Plan implementation to aid in the recovery of this species. The WNF Conservation Plan addresses the following recovery objectives in the Agency Draft recovery plan (USFWS, 2005b): (1) invasive species control; (2) reducing habitat succession; (3) ensuring viability of protected populations; and (4) promoting public understanding of the species.

Forest-wide direction has been incorporated into the alternatives to ensure known populations are protected. A Forest-wide goal (5.1.4) encourages active management of the occupied habitat, with an objective to maintain partial to filtered sunlight (5.1.4a). Forest-wide standards and guidelines protect individuals from prescribed fire activities (SFW-TES-27 and SFW-TES-28), herbicide application (GFW-TES-29), and road and trail management (SFW-TES-30). Surveys for populations in potentially suitable habitat would be implemented prior to any ground or canopy disturbing activity (TES-31).

Activities which may directly or indirectly affect the running buffalo clover and its habitat would likely be distributed across the landscape and over time. Second-level project analysis would occur and at that time, any additional protective measures needed to minimize or eliminate adverse effects would be identified.

Bald Eagle

Bald eagles have been occasionally sighted on or near the Forest, mostly in the winter: along the Ohio River and the Hocking River, around Burr Oak Lake and Lake Vesuvius. During summer months, bald eagles are occasionally sighted along the Ohio River near the Ironton and Marietta units. No nests have been

found within the Wayne, and mid-winter bald eagle surveys have failed to identify any winter roost sites on NFS land to date.

Eagles select areas with low human disturbance, suitable forest structure, and abundant prey for nesting sites. They will usually nest near large bodies of water, although they will occasionally nest in upland areas where there is good access to food. Bald eagles tend to return to the same breeding area and often the same nest sites each year. Most eagles build their nests in supercanopy trees with large diameters and canopies. Suitable nesting site characteristics are found in parts of the WNF, specifically along larger rivers such as the Hocking or near reservoirs such as Burr Oak Lake, Timbre Ridge Lake, and Lake Vesuvius.

Eagles forage along rivers, streams, lakes, and marshes. Suitable foraging habitat exists along the larger river systems and lakes in the Forest. Wetlands on the Wayne are not managed to maintain populations of fish and, therefore, offer limited foraging opportunities for eagles. Daytime roosts are usually located near foraging areas (within 100 feet of shorelines) and are used for eating, resting, and hunting. Tall dead trees or mature trees with strong branches are the eagle's preference. During winter, night roost trees may be used by an individual or group of eagles for protection from wind and harsh weather. These trees are also thought to aid in mate location and communication of food sources. Night roosts most likely to be used include trees in ravines, on the leeward side of hills, or in other wind-protected areas. Suitable roosting habitat may be found with the WNF near larger watercourses or waterbodies.

Threats

Habitat degradation resulting from the removal of supercanopy trees along larger streams and lakes has been identified as a threat, as has contamination of aquatic ecosystems from point source and non-point sources of pollution. Human disturbance of occupied sites could be a threat if individuals became established on the WNF in the future.

Direct and Indirect Effects

The River Corridor and Timbre Ridge Lake management areas should provide long-term benefits to the bald eagle as it expands its range in Ohio. The Forest Service developed the River Corridor Management Area to retain, restore, and enhance the inherent ecological processes and functions associated with riverine systems. The desired future condition of the Timbre Ridge Lake Management Area is to maintain the wooded character around this 100-acre lake and maintain its water quality to encourage the maintenance of a self-sustaining bass-bluegill fishery. Both management areas would provide feeding opportunities as well as suitable roosting or nesting habitat.

All alternatives incorporate the River Corridor Management Area, but more area is allocated to it in Alternatives C through F because an additional corridor was added along the Ohio River along the Marietta Unit. Alternatives C through F also incorporate the Timbre Ridge Lake Management Area, but Alternatives A and B

do not. Timbre Ridge Lake would continue to be managed to provide a quality fishery in all of the alternatives, but a primary difference is that potential disturbance of eagles may be less in Alternatives C-F because a No Surface Occupancy stipulation for development of Federal oil and gas leases is placed on the Timbre Ridge Lake Management Area in these alternatives.

Conservation measures are integrated into each alternative to ensure potentially suitable roosting or nesting habitat is protected. If discovered in the future, bald eagle nests, roosts or concentration sites would be protected during site-specific project implementation (TES-16). Similarly, any supercanopy trees that could provide suitable roosting or nesting habitat along large rivers and lakes would be protected (TES-18). If eagles were to occupy sites in the Wayne National Forest in the future, each alternative contains measures to minimize disturbance to individuals during prescribed fire activities (TES-19).

Cumulative Effects

Forest cover has increased across Ohio from about 15 percent in 1940 to almost 30 percent today. Eighty percent of all the lands within the WNF proclamation boundary are forested, as are 70 percent of lands that occur in riparian corridors. The bald eagle has benefited from these reforestation trends because potentially suitable roosting or nesting habitat has increased in abundance. Water quality has also improved. Eagle populations continue to increase in Ohio, and observations of eagles are occurring within counties containing NFS land. In 2004, eagles were observed in Scioto and Gallia counties during mid-winter eagle searches.

Few NFS lands occur along the Ohio River, and development of private land along the Ohio River will likely continue as it is a major transportation route for industry. Inland, within the WNF, riparian corridors on private lands may remain in their existing condition (i.e., forested or under agricultural production) or could be affected by an increasing trend for development of private residences “out in the country”. Impacts from this may be minimal, however, because floodplain development is discouraged by local zoning commissions. Such impacts could be further reduced since any activities that could affect streams or wetlands would be regulated by the Ohio EPA and possibly by the U.S. Army Corps of Engineers.

Any potential adverse cumulative effects that may occur as a result of implementing any of the alternatives would be minimized through the implementation of the Forest-wide standards and guidelines incorporated into each of the alternatives. Furthermore, the Forest Service is taking an active role in bald eagle recovery in each of the alternatives by incorporating objectives for annual mid-winter bald eagle searches, by allocating NFS land to the River Corridor and Timbre Ridge Lake management areas, and by promoting watershed health goals and objectives.

Determination of Effect

A **Not Likely to Adversely Affect** determination is made for the bald eagle across all alternatives. Loss of habitat (i.e., removal of suitable nesting or roosting trees) or disturbance could occur as a result of timber harvesting activities, prescribed fire, development of oil and gas wells, surface mining activities, road construction and maintenance, road reconstruction, trail construction and maintenance, or construction of facilities. However, conservation measures integrated into the alternatives would not only protect occupied roosts or nesting sites if they were discovered (Goal 5.1.2; TES-16, TES-17, TES-19, TES-20, they would ensure potentially suitable habitat would be available on NFS land in the future (TES-18). Each alternative carries with it goals and objectives for promoting watershed restoration, as well as the protection and restoration or riparian and aquatic ecological structure and function (Forest-wide Goal 2.1 and 3.1).

Indiana Bat

The Indiana bat is present year round on the WNF. A large part of the Forest has been surveyed for the presence of the Indiana bat during the summer and fall seasons, and surveys completed to date suggest that two areas on the Wayne are especially important. The southwestern part of the Athens Unit (an area bounded by Haydenville, Dorr Run, Snake Hollow, and Monkey Hollow) and the Bear Run area of the Ironton Ranger District include foraging habitat and either fall swarming sites or a known hibernaculum. Lactating or post-lactating females have been captured in both areas, indicating maternity colonies may be in or near these two areas. Winter surveys have identified one abandoned limestone mine on the Ironton Ranger District as an Indiana bat hibernaculum.

The Indiana bat is a forest-dwelling bat that hibernates in caves and abandoned mines. Females, and sometimes males, travel to summer roosting habitat after emerging from the hibernacula in the spring. Researchers believe females will travel to the same roosting and foraging areas each year, where they will give birth to a single pup. The females and pups form a maternity colony where they roost in snags or living trees with loose or exfoliating bark, cavities, or broken trunks or limbs. Larger diameter trees are preferred by the maternity colony, but smaller diameter trees may be used by individuals or by some males. Sunlight, and the warmth it provides, aids in the development of the young. Some roost trees, therefore, may be found in forest canopy gaps or in the open, but other roost trees may be located in the forest interior. Researchers speculate that interior trees may provide roosting habitat during inclement weather.

The Indiana bat is an insectivore and conducts nightly foraging trips from the daytime roost sites. Using radio telemetry, researchers have tracked individuals and have found that they generally forage within one mile of their roosts, but individuals have been known to travel up to about 2.5 miles to feed. Optimal foraging habitat is generally characterized as semi-open forest, in the uplands or bottomlands, but they will forage around open water and open land.

Threats

Causes of the Indiana bat population decline have yet to be determined. Disturbance of winter habitat and loss of foraging and roosting habitat have been identified as potential threats to this species on the WNF.

Direct and Indirect Effects

Winter Habitat

Human disturbance and modifications of hibernacula has been attributed to the decline of the rangewide Indiana bat population. Management activities that promote human activity in proximity to open portals that lead to mines with suitable winter habitat characteristics could lead to disturbance of these sites.

To prevent human disturbance of wintering individuals, there is a Forest-wide goal to protect all known Indiana bat hibernacula (5.1.1) and a Forest-wide objective incorporated into each alternative that calls for the installation of bat-friendly gates at mine entrances where this species is known to be hibernating (5.1.1a). In addition to that, conservation measures to reduce disturbance outside known hibernacula are integrated into each alternative. These measures deter human use of areas around known hibernacula by closing or relocating trails that lead to or pass within easy viewing distance of the site, and prohibit new road and trail construction and surface occupancy for exploration or development of Federal minerals within one-quarter mile of known hibernacula (TES-2 and MIN-10).

In order to protect individuals roosting within known hibernacula, all alternatives specify that prescribed fire burn plans specify weather conditions that would prevent smoke dispersal into known hibernacula (TES-4).

Known fall swarming sites associated with underground coal mines may indicate the presence of hibernacula. Surveys to verify the presence of wintering Indiana bats in these underground coal mines cannot be accomplished for safety reasons, but guidance has been incorporated into all alternatives to minimize disturbance of these sites. Within a quarter-mile of any known fall swarming site where hibernating Indiana bats cannot be verified for mine safety reasons, guidance calls for the reduction or elimination of human disturbance (TES-3).

Foraging and Roosting Habitat

The Forest Service incorporated four conservation approaches into the alternatives to improve short-term and long-term foraging and roosting habitat for the Indiana bat. These four approaches (described below) would result in the development or maintenance of mature hardwood forest communities with diverse forest structure and composition. Potentially suitable habitat would be widely distributed across the planning area. Over the long-term (decade 10), mature hardwood forest habitat would likely dominate the landscape of the Forest with implementation of any alternative (Table 3 - 23).

Table 3 - 23. Summary of mature hardwood forest habitat trends for each alternative.

		Estimated Acreage of Mature Forest Habitat Produced after 100 Years of Implementing the Four Mature Forest Conservation Approaches					
Alternative	Current Acreage of Mature Forest Habitat	(a) Natural Succession	(b) Historic Forest	(c) Managed Uneven-aged Management	(d) Even-aged Management (80+ years)	Total*	Change from Current Levels
A	73,388	67,169	0	170,884	0	238,053	+324%
B	73,388	73,169	0	57,715	56,012	186,896	+255%
C	73,388	74,140	17,076	103,344	1,745	196,305	+267%
D	73,388	70,410	28,534	87,920	8,246	195,110	+266%
E	73,388	74,121	42,096	66,867	9,561	192,645	+263%
E Modifed	73,388	76,610	41,650	66,358	8,740	193,358	+263%
F	73,388	106,440	42,080	51,803	6,453	206,776	+282%

* A small percentage of the WNF (<1%) that is comprised of water or non-forest was not included in estimates of future mature forest habitat for this analysis.

Natural succession would occur on lands that are defined as unsuitable for vegetation management. As an example, these may include land-locked tracts or steep areas or management areas categorized as not suitable for timber production (e.g., FOF, FOFM). These forest stands would likely have older forest characteristics within 100 years. They may possess trees of great age (typically 150-200 years old), diversity of canopy layers, gaps in the canopy, large woody debris on the forest floor, and a component of standing dead and dying trees (McCarthy, 1995). In the long-term, the abundance of oak-hickory in forest communities treated with uneven-aged methods is likely to decline, an unfavorable development for the Indiana bat. Many species of oak and hickory possess exfoliating bark, a structural characteristic that makes trees suitable for Indiana bat roosting. Areas that that undergo natural succession would occur in all alternatives.

Uneven-aged timber harvesting opens gaps in the canopy, which may directly benefit the Indiana bat. This harvesting method increases the degree of exposure of suitable maternity roost trees to solar radiation, thereby providing improved thermal conditions for raising young during a wide range of weather conditions. Male Indiana bats may also benefit from an uneven-aged management regime that creates gaps in the canopy. A radio telemetry study on the WNF found roost trees used by male Indiana bats were more likely to be located in a canopy gap than in shaded locations (Schultes, 2002). Opening the canopy via uneven-aged harvest methods could also improve Indiana bat foraging habitat. It forages among the tree canopy, but foraging habitat declines as canopy cover approaches 100 percent. Canopy cover of 50 to 70 percent is considered optimal for bat foraging (Rommé et al., 1995). In the long-term, the abundance of oak-hickory in forest communities treated with uneven-aged methods is likely to decline, which may

not favorable for the Indiana bat. Uneven-aged timber harvesting would occur in each alternative, but in varying amounts.

The Historic Forest management prescriptions call primarily for the use of uneven-aged vegetation management combined with prescribed fire to create forest communities with more open understory and which are dominated by oak and hickory species. This forest structure would be similar to that which occurred in southeast Ohio in the late-1700s and early-1800s (Hutchinson et al., 2003). In addition to a high abundance of oak and hickory species, trees would likely be widely spaced with relatively open understory. Historic Forest prescriptions occur only in Alternatives C through F.

Even-aged management removes a major part of the canopy, allowing sunlight to reach the forest floor and encourage sprouting and growth of oak-hickory. Optimal foraging habitat may be reduced in the short-term, but as the regenerated stand matures, it would again be capable of providing potentially suitable roosting and foraging habitat. Today's forest communities were primarily derived from forest stands that were harvested with clearcut or shelterwood harvests in the past century. Fifty percent of all Class I Indiana bat roost trees are comprised of oak and hickory species, therefore maintaining mixed oak communities across the landscape with long-term benefits to this species.

The vegetation management and prescribed fire projected to occur during the first decade would contribute to the long-term goal of retaining or developing Indiana bat roosting and foraging habitat (Forest-wide Goal 5.1.1). However, implementing such activities may alter roosting or foraging habitat for a short time. Other activities, not associated with Indiana bat conservation, may also occur during the first decade and could temporarily alter potentially suitable Indiana bat habitat for a period of time (Table 3 - 24). The acreages that may be affected vary somewhat for each alternative and may seem substantial, but the following must be considered:

- Established Forest-wide standards would be in place in each alternative to minimize the potential for removal of any currently suitable roost tree (TES-10). Measures are also in place to ensure trees are available to recruit into roost trees out into the future (TES-12 and TES-13). In addition, shagbark and shellbark hickories are retained, unless removal is needed to ensure long-term resource protection important to the Indiana bat (TES-9).
- Uneven-aged timber harvest, thinning, crop tree release, and prescribed fire are designed to improve short-term and long-term foraging habitat for the Indiana bat. These activities account for the majority of the activities that could potentially alter suitable Indiana bat habitat. These types of activities are distributed across the National Forest and across the first decade, so these activities would not be directed at one particular spot nor would they be conducted in a short amount of time.

- Care would be taken to avoid impacts to young Indiana bats from prescribed fire activities while they are unable to fly (TES-11).
- Maintenance of oak and hickory on the landscape is important for a variety of wildlife species, but the structural characteristics these trees have makes their maintenance in the landscape important for long-term Indiana bat roosting habitat. Even-aged management, while it reduces foraging habitat for a time (i.e., not permanently), plays a role in regenerating oak species and their retention in the landscape over the longer term. The amount of even-aged management would vary across the alternatives from none (Alternative A) to about 6,000 acres planned in Alternative B during the first decade, or about 2.5 percent of NFS land. Even-aged management is focused within the FSM, FSMO, and GFM management areas, but can occur in small amounts in other management areas.
- Approximately 316 acres (Alternative A) to 893 acres (Alternative C) would be affected by construction of temporary roads, skid trails, and log landings. Habitat impacts should be minimal since the acreage of individual projects would be small and spread out across the landscape. The forest canopy is generally intact after construction, and the area is revegetated and allowed to return to forest after the project is completed. These features could provide travel corridors or could open up the canopy to a more optimal level for foraging.
- Treatment of hazardous fuels by mechanical means does not alter foraging habitat since treatment is primarily confined to fallen trees and woody debris. Most of the treatments would be emphasized in pine stands. It is considered an activity which could alter habitat because there is a potential for removal of an undetermined roost tree. However, as stated above, this potential is minimized by established conservation measures integrated into the alternatives.
- Forest openings are small, and development of these areas should have a minimal effect on foraging habitat. They are generally developed from areas already in an open condition, and are kept to the periphery of large tracts of interior forest (WLF-5). Based on studies in the various parts of the Indiana bat's range, these sites may provide foraging opportunities for the bat.
- Utility corridors are narrow and linear. Those located in road rights-of-way would not change the habitat condition existing along a road. Corridors that occur through forest areas remain in some vegetated condition, thereby offering a potential foraging site.
- Closure of open mine portals and subsidence features for the purpose of protecting public safety or to eliminate sources of acid mine drainage would occur only after biologists have reviewed the sites for potentially

suitable habitat characteristics, and then conducted fall-swarming surveys (TES-5).

- Individual trees with Indiana bat roosting characteristics may need to be felled during implementation of site-specific projects to protect human safety. Management of hazard trees is usually accomplished during the hibernation season. A short-term increase in the amount of hazard trees that need to be removed is expected to increase for the next 2 to 4 years as a result of the 2003 ice storm. About 71,000 acres on the Ironton Ranger District were affected, and trees damaged by the storm continue to die and pose threats to human safety. During implementation of projected management activities in each alternative, many of which would be of long-term benefit to the Indiana bat and its habitat, some hickory trees may need to be removed to enable a project to proceed without causing adverse effects to other resources important to the Indiana bat and its habitat. When possible, removal of such trees would be done during the hibernation season.

Table 3 - 24. Projected management activities that could result in the alteration of potentially suitable Indiana bat habitat.

	A	B	C	D	E	E Modified	F
Timber Harvest	5,000	11,160	18,890	18,680	18,150	17,941	16,040
Crop Tree Release	1,150	3,250	3,239	2,786	2,142	2,113	1,719
Prescribed Fire	69,819	69,819	69,819	69,819	69,819	69,819	69,819
Temporary Roads, Skid Trails and Log Landings	316	571	893	885	863	886	774
Hazardous Fuels Reduction – Mechanical Methods	10,181	10,181	10,181	10,181	10,181	10,181	10,181
Development of Permanent Openings	500	500	500	500	500	500	500
Utility Corridor Development	50	50	50	50	50	50	50
Closure of mine features	232	232	232	232	232	232	232
AMD Treatments	270	270	270	270	270	270	270
Total (Acres)	**87,518**	**96,033**	**104,074**	**103,403**	**102,207**	**101,992**	**99,585**
Percent NFS land Affected	**36.7**	**40.3**	**43.7**	**43.4**	**42.9**	**42.8**	**41.8**
Percent Cumulative Effects Analysis Area Affected	**7.9**	**8.7**	**9.4**	**9.3**	**9.2**	**9.2**	**9.0**
Hazard Tree Removal	2,550	2,550	2,550	2,550	2,550	2,550	2,550
Hickory Tree Removal	320	692	1,160	1,148	1,115	1,142	987

To accomplish vegetation management and prescribed fire activities, access to sites must be provided. One or more entries may be made in each forest stand over a certain period (e.g., 100 years) depending upon the management prescription. Initially, permanent roads would need to be constructed to some areas, but road reconstruction would most likely occur to a larger degree in the short-term and long-term. Over time, the road footprint would remain unchanged because existing roads would be reconstructed when access to an area is needed.

Roads reduce forest cover and are, therefore, an activity that may permanently affect suitable Indiana bat habitat. Other activities, not associated with Indiana bat conservation, may also occur during the first decade and could permanently affect forest cover (Table 3 - 25). Less than one percent of potentially suitable Indiana bat habitat on the WNF could be permanently affected in any of the alternatives during the first decade. Any permanent loss of habitat is of concern, but the following must be considered:

- Established Forest-wide standards are in place in each alternative to minimize the potential for removal of any currently suitable roost tree. Measures are also in place to ensure trees are available to recruit into roost trees out into the future. Suitable roost trees are avoided when possible.
- Approximately 500 acres (Alternative A) to 693 acres (Alternative D) would be affected by construction of permanent roads, trails, and reconstruction of roads. Habitat impacts should be minimal since the acreage of individual projects would be generally small and spread out across the landscape. Reconstruction acreages are limited to existing road footprints and would not add to the on-the-ground acreage affected. The forest canopy is generally intact after the construction or reconstruction of these transportation features. Past mist net surveys on the Wayne National Forest have shown that Indiana bats will use recreational trails as flight corridors while foraging, especially where water sources are located nearby or on the trail itself. Kiser and Elliot (1996) documented individuals roosting within 160 feet of narrow, one-lane dirt roads and suggested they may use road corridors for travel ways. The likelihood of this occurring is greater if forest canopy is maintained over the road corridor.
- Construction of recreation facilities are generally small in scope, and result in a park-like or savannah-like setting. An established Forest-wide guideline encourages the retention of larger mast-producing trees when developing campgrounds to enhance wildlife viewing opportunities (REC-11). These could provide roost habitat since they would be located in a more open setting. Indiana bats have been found foraging in open areas and forested areas with less than 50 percent canopy, so it is possible they could use such areas for foraging.
- Projected surface mining activities hold the greatest potential for habitat loss during the first decade. From 61 to 65 percent of the habitat acreage that could be lost permanently could be affected by surface mining. The potential for the 1,200 acre surface mine at the Ironton Ranger District is uncertain.
- Development of oil and gas wells converts forest land into non-forest land, marking the landscape in a fashion similar to roads and trails. Access roads could serve as travel corridors, and the small canopy gaps created by well pads could alter forest canopy conditions to a range more suitable for Indiana bat foraging. No surface occupancy stipulations for Federal

minerals occur within ¼-mile of all known hibernacula. In addition, timing-controlled surface occupancy stipulations are placed on Federal mineral leases to reduce impacts to potentially suitable roost trees during the non-hibernation season.

Table 3 - 25. Projected management activities that could result in the permanent loss or alteration of potentially suitable Indiana bat habitat.

	A	B	C	D	E	E Modified	F
Permanent Road Construct. and Reconstruct. (acres)	197	291	394	391	385	392	355
Recreation Trails (acres)	303.5	303.5	265	302	265	265	225
Recreation Facility & Parking Lot Construct. (acres)	60	60	60	60	60	60	60
Surface Mining (acres)	1,250	1,250	1,250	1,250	1,250	1,250	1,250
Oil & Gas Well Development (acres)	121	121	121	121	121	121	121
Total (acres)	**1,931.5**	**2,025.5**	**2,090**	**2,124**	**2,081**	**2,088**	**2,011**
Percent of NFS land	**0.81**	**0.85**	**0.88**	**0.89**	**0.87**	**0.87**	**0.84**
Percent of Cumulative Effects Analysis Area	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**

Cumulative Effects

Winter Habitat

No adverse cumulative effects are expected to occur to Indiana bat winter habitat within the WNF proclamation boundary as a result of implementing any of the alternatives. The majority of open underground mines are located on NFS land, and protective measures are in place to prevent disturbance of known hibernacula and fall swarming sites.

Roosting and Foraging Habitat (Alteration of Habitat)

Potential adverse cumulative effects to roosting and foraging habitat in Alternative A resulting from temporary alteration of habitat are expected to be short-term in nature and would be mitigated through protective Forest-wide standards and guidelines incorporated into each alternative. Forest cover has increased within the WNF proclamation boundary since the 1940s, but it has a different structure and composition than what occurred prior to 1800 and the coming of European settlers. An analysis of the structure, composition, and condition of overstory trees in research plots located in southeastern Ohio suggests that the today's forest is denser than that reported for old growth oak-hickory forests and for pre-1800 forests (Sutherland et al., 2003; Yaussy et al., 2003). Changes in disturbance patterns over the past 75 years have been suggested as reasons why an increase in shade tolerant species (e.g., red maple) is occurring in the forest understory and midstory (Abrams, 1992; Abrams, 1998). However, no available scientific information can ascertain whether the increasing density of forest communities is a contributing factor to the Indiana bat's decline.

Timber harvesting and prescribed fire would be used under Alternative A to provide short-term and long-term Indiana bat habitat improvements to some of these forest communities.

In Alternative A, the no-action alternative, foraging and/or roosting habitat could be temporarily altered on 87,248 acres of NFS land, or on about 8 percent of the cumulative effects analysis area (Table 3 - 24). Some suitable Indiana bat habitat could be altered on other ownerships in the planning area, primarily through timber harvesting since little to no prescribed fire occurs on private lands. Construction of utility corridors and temporary roads may occur to some degree on other ownerships, but are not likely to increase over current levels. Timber harvesting projects that occur on other ownerships generally involve small-sized harvests. Approximately 98 percent of the acres of potentially suitable habitat that could be altered on NFS land accounts for management activities designed to provide long-term benefits to this species. These activities would open dense understories and could reduce canopy cover to levels thought to be more optimal for Indiana bat foraging.

Cumulative effects of Alternatives B through F on foraging and roosting habitat resulting from alteration of habitat are expected to be similar to those described for Alternative A (Table 3 - 24). The alternatives do vary in the amount and type of timber harvesting and acreage of temporary roads, but any adverse cumulative effects are expected to be short-term in nature (0-50 years) and would be mitigated to the degree possible through protective Forest-wide standards and guidelines. Cumulative beneficial effects to Indiana bat roosting and foraging habitat are expected to occur over the long-term.

Cumulative impacts of these activities in spatial relationship to the Nelsonville Bypass will warrant further consideration at the project-level. Any cumulative adverse effects resulting from the spatial allocation of management areas in Alternatives C through F are expected to be short-lived but beneficial in the long-term. The potential for cumulative adverse effects on amount and spatial allocation of foraging and roosting habitat in the southwestern part of the Athens Unit would be higher in Alternative B than in any other alternative. When compared to the other alternatives, larger amounts of even-aged timber harvesting could occur in Alternative B in the immediate area of the Nelsonville Bypass and southwestern part of the Athens Unit where Indiana bats have been found. This could result in the cumulative reduction of optimal foraging and roosting habitat in this localized part of the Athens Unit. The Forest Service has no authority over the location of the Nelsonville Bypass; however, the Forest Service can use the project level planning process to consider how timber harvesting projects might influence short-term and long-term available habitat in this part of the Athens Unit.

Roosting and Foraging Habitat (Permanent Loss of Habitat)

Permanent loss of Indiana bat roosting and foraging habitat would be the most severe adverse consequence of likely cumulative effects to the species in the next 10 years. Under Alternative A, 1,931.5 acres of potentially suitable Indiana bat

habitat on NFS land could be permanently affected in the next 10 years. This amounts to a permanent alteration of about 0.2 percent of the cumulative effects analysis area (Table 3 - 25). A possible surface coal mine that would be located north of the Bear Run area on the Ironton Ranger District could account for 65 percent of potentially lost habitat acreage. Just how many acres of suitable habitat could be lost permanently on private and other public lands within the proclamation boundary during the planning period can only be hypothesized. New oil and gas wells, roads, home sites, and industrial and commercial sites will very likely be developed in the planning area on non-NFS land. Some detail of one project is known, however. The Nelsonville Bypass, a planned four-lane highway would travel through the southwestern part of the Athens Unit, converting 768 acres within the cumulative effects analysis area to highway corridor with associated off-ramps. This project will likely be located in one of the two general locales in the planning area, both with several recent Indiana bat records.

The cumulative effects of Alternatives B through F on foraging and roosting habitat would vary only slightly from the no-action alternative in the amount of acres of potentially suitable Indiana bat habitat that could be permanently affected in the coming 10 years (Table 3 - 25). The differences can be accounted for in the acres of permanent roads or trails that may be constructed. Such variations are minor when compared to the entire planning area. None of these alternatives would be expected to have a significantly lesser or greater cumulative effect on the permanent loss of Indiana bat habitat than that already described for Alternative A.

Effects Determination

A **Likely to Adversely Affect** determination is made for the Indiana bat across all alternatives. The Indiana bat is present on the WNF year round. In addition to the known Priority III hibernaculum and fall swarming sites, there may be additional winter and summer habitat that is unknown. Implementation of management activities that require the removal of trees may accidentally cause direct take through the removal of an undetermined roost tree. Although the potential for this take is extremely small, given the large amounts of available roost trees in the planning area and the established Forest-wide standards and guidelines, the possibility still exists. Removal of trees can also alter foraging habitat.

Although roosting and foraging habitat could be affected under any of the alternatives, none of the expected adverse impacts would likely impede this species recovery. Each alternative would incorporate conservation approaches or other measures to proactively protect and conserve Indiana bat habitat.

- Winter habitat would be actively protected from human disturbance and microclimate modification in each of the alternatives.
- Each alternative would incorporate habitat management tools to provide a diversity of mature forest habitats that could be favorable to the Indiana bat both in the short-term and the long-term.

- A suite of established Forest-wide standards and guidelines would provide added protection of the Indiana bat and its habitat during project implementation (TES-1 to TES-14).

Activities which may directly or indirectly affect the Indiana bat and its habitat would likely be distributed across the landscape and over time. Second-level project analysis would occur, and at that time any additional protective measures needed to minimize or eliminate adverse effects would be identified.

Regional Forester Sensitive Species

The affected environment and evaluation of direct, indirect, and cumulative effects for Regional Forester sensitive species is available in the Biological Evaluation (Appendix F). This section summarizes the key findings for the 23 terrestrial and aquatic plants and animals listed as Regional Forester sensitive species (RFSS).

Regional Forester sensitive species are plants and animals species for which viability is a concern as evidenced by a downward trend in population or habitat capability. Regional Forester sensitive species include:

- U.S. Fish and Wildlife Service candidate species
- Species delisted by the U.S. Fish and Wildlife Service in the last five years
- Species with The Nature Conservancy's Global, Trinomial or National Ranks of G1-G3, T1-T3 or N1-N3 documented within the WNF proclamation boundary.

These species were identified through the Region 9 Regional Forester's Sensitive Species designation process (FSM 2672, R9 Supplement No. 2600-2000-1). During that process many species were evaluated, including those identified by Forest Service biologists and taxonomic experts and other interested people.

These 23 species occur on NFS land in a wide variety of environmental conditions, ranging from highly isolated and existing at very low abundance to broadly distributed and abundant conditions. For some species, the effects of past or current management practices have led to reduced habitat quantity or quality and fewer opportunities for population interactions on the landscape. For other RFSS, suitable habitat may not be greatly influenced by management. They may have historically always been naturally rare.

The prescriptions set forth in the management areas, along with the projected management activities may positively or negatively affect RFSS and their habitats, and the likelihood of maintaining their viability in the planning area. Also, factors outside the control of the Forest Service may affect the likelihood that these species may remain viable within the planning area.

Effects Common to all Alternatives

All of the alternatives would promote the protection, maintenance, or enhancement of RFSS and their habitats. Because of their diverse needs, habitat for all of these species cannot be optimized in each alternative. Rather, the alternatives vary in the amounts of suitable habitat conditions they would provide in the future. All of the action alternatives were designed to increase the likelihood of maintaining RFSS viability by providing well-distributed habitat for them in the planning area. Where adverse impacts from management activities cannot be avoided, management should, at the least, not contribute to a trend toward Federal listing.

Direct, Indirect, and Cumulative Effects

The comparative effects of the alternatives on RFSS were evaluated using information collected from currently accepted and applicable scientific literature, other scientific sources, and from taxonomic experts, along with the professional judgment of Forest Service biologists. The Biological Evaluation provides two assessments of impacts to the species: habitat outcomes and determination of effects.

Habitat Outcomes

Anticipated habitat outcomes (also known as viability outcomes in the species viability evaluations) for RFSS were based on scientific analysis using information gathered from the literature and obtained from discussions with taxonomic experts. Outcomes projections should be considered an index of the environment's capability to support population abundance and distribution of RFSS, not definitive predictions of RFSS population occurrence, size, density, or other demographic characteristics (T. Schenck, pers. comm.). Projected habitat outcomes are described for the direct effects analysis area (NFS land –Table 3 - 26 and for the cumulative effects analysis area (all lands within the WNF proclamation boundary –Table 3 - 27).

Habitat outcomes were estimated for different time periods. The analysis focused on risk factors pertinent to the species within the planning area, and most RFSS were included in the species viability evaluation process. This process, summarized in Appendix E, included exhaustive literature searches to compile information about these species' life histories, occurrences, population and habitat trends, and threats to viability. Taxonomic experts provided additional information about the species, including general data about the effects of management activities on individual or groups of species. For RFSS not included in the species viability evaluation process, habitat outcomes were estimated by the Forest Service after review of conservation assessments and discussions with taxonomic experts.

A judgment of historical environmental conditions provides a reference or context within which to evaluate the impacts of the alternatives. The assessment of current and future habitat conditions took into account species distributions,

habitat quality, and life history. For example, some of these species occur naturally in a localized or patchy distribution, and would not occur in the conditions described in habitat outcomes A through C because their natural condition may be D or E. “Future” is defined as decades 2, 5, and 10 of Forest Plan implementation.

Determinations of the historic, current and likely future habitat outcomes on NFS land are displayed in Table 3 - 28 for each of the RFSS by alternative. Judgments of habitat outcomes within the cumulative effects analysis area (i.e., all lands within the WNF proclamation boundary) are displayed for each species by alternative in Table 3 - 29.

Summary of Direct, Indirect, and Cumulative Effects

Since historical times, up until the present, similar types of disturbances and management practices have occurred in the cumulative effects analysis area as have occurred on NFS land. Habitat outcomes for the direct effects analysis area (NFS land) and for the cumulative effects area are estimated to be the same for all RFSS.

Habitat outcomes for seven RFSS species were estimated to positively or negatively change across the alternatives, while the habitat outcomes for the remaining 16 are not expected to change from current levels. The following paragraphs highlight those species for which habitat outcomes may change.

Aquatic Species (4)

Based on their habitat requirements, likely historical conditions, and comparison to other Regional Forester aquatic sensitive species, the eastern sand darter, round hickorynut, salamander mussel and lilliput probably had the widest distribution in the planning area in the long past. Today they are located in specific sections of at least two watersheds, but their potential distribution is limited by water quality and the habitat degradation that has resulted from past mining activities. Efforts to restore mining-degraded aquatic systems on the Athens Unit and the Ironton Ranger District could result in the recolonization of currently uninhabitable sections of watersheds on these units by the eastern sand darter, round hickorynut, lilliput, or salamander mussel. Recovery of streams affected by acid mine drainage takes a very long time. Therefore, any potential for improved habitat outcomes for these species would not be expected to occur immediately. Watershed restoration activities incorporated into all of the alternatives could result in an increase in the habitat outcomes for these four species in the long-term across all alternatives (decade 10).

Cerulean Warbler

The cerulean warbler is identified as a management indicator species for the Revised Forest Plan. The warbler is generally associated with interior oak-hickory forest habitat in southeastern Ohio. An analysis of how the alternatives would address the habitat needs of this species is detailed in this chapter’s section

entitled "Providing a Variety of Habitats for Plants and Animals, Issue Indicator 8."

Some management activities incorporated into each of the alternatives could fragment interior forest habitat, leading to increased rates of nest predation or parasitism. The Wayne's location within a heavily forested landscape could moderate the intensity of these adverse effects. Each alternative would allocate some NFS land to the DCF and DCFO management areas, which were specifically developed to emphasize management for interior forest species. Within these management areas, the protective measures integrated into each alternative would help maintain the quality of interior forest habitats.

Alternatives A or C through F are unlikely to have either short- or long-term effect on cerulean warbler habitat suitability to change the habitat outcomes from the environmental conditions. The proactive habitat management activities contained in each of these alternatives should result in the maintenance of mature forest cover on most of the WNF over time. The structure and/or composition of the mature forest would vary depending on whether the mature forest habitat came about through uneven-aged or even-aged management, Historic Forest prescriptions, or through natural succession. For instance, communities managed with Historic Forest prescriptions may have a more open structure and would likely have more oak-hickory species, whereas an uneven-aged community may have a denser understory with fewer oaks.

There is low likelihood that implementation of Alternative B would change the habitat outcome from the current level over the short-term. However, in the long-term (e.g., decade 10), possible habitat fragmentation resulting from even-aged management could lead to a lower habitat outcome in Alternative B. Almost 79 percent of the WNF may be covered by mature forest habitat after 100 years of implementation of Alternative B, but approximately 6,500 acres would be harvested by even-aged methods each decade. Even-aged management can temporarily fragment mature, contiguous forest until the stand once again reaches a successional stage that is no longer an ecological barrier to forest-interior species (Rosenberg et al. 2003). Even-aged management can create edge habitat that increases local diversity while reducing habitat quality and quantity for certain species, including Neotropical migratory forest-interior songbirds.

Henslow's Sparrow

The Henslow's sparrow is identified as a management indicator species for the 2006 Forest Plan. It is a grassland-obligate species that occupies reclaimed mine lands on NFS land. An analysis of how the alternatives address habitat needs for this species is detailed under Habitat Indicator 6.

Alternatives C through F allocate NFS land to the GFM management area, while Alternatives A and B do not. Management of reclaimed mine lands within the GFM management area, with implementation of management area direction and guidance, could enhance habitat quality for this species. Habitat outcomes would likely remain the same as current levels under Alternatives C through F.

In Alternatives A and B, the potential exists for future habitat outcomes to decline (decades 5 and 10). Under Alternative A, occupied Henslow's sparrow habitat would fall within the DCF and DCFO management areas, areas that emphasize management for mature forest interior species. In Alternative B, occupied habitat would fall within the FSM and DCFO management areas. Existing grassland habitat may or may not be maintained in Alternatives A or B because composition objectives for these management areas call for only so much herbaceous habitat to be maintained (3 to 6% in FSM; 2 to 4% in DCF and DCFO). In other words, the amount of existing open, grassy habitat could decline or become non-existent in Alternatives A and B, depending on how much herbaceous or herbaceous-shrubland habitat is needed elsewhere in these management areas for other species.

Rock Skullcap

Rock skullcap was thought to be associated with closed-canopy mature forest until botanists discovered it in ice-damaged stands of varying light intensities and along old logging roads on the WNF in 2004. Ohio's State botanist also found this species in more exposed habitats in 2004, suggesting it may be able to tolerate higher light intensities than previously believed. Until more data is obtained, closed-canopy mature forest will continue to be regarded as its preferred habitat.

According to taxonomic experts involved in the species viability evaluation process, the rock skullcap may be able to disperse and increase in abundance when suitable habitat is available. Timber harvesting is the principal management activity that could alter light intensity within their forest communities. Alternative A would incorporate the least amount of timber harvesting; therefore mature, closed-canopy forest would dominate the landscape over time. Habitat outcomes for this species would not likely change in the short-term, but may increase in the long-term (i.e., decade 10) as forest cover increases and grows older. Alternatives B through F call for a significantly greater amount of timber harvesting, and such disturbances could decrease habitat suitability over time. Therefore, the habitat outcome for rock skullcap could decrease (i.e., decade 10) in Alternatives B through F. However, closed-canopy mature forest habitat would be available under each of these alternatives in the DR, FOF, FOFM, SA, and TRL management areas, as well in areas unsuitable for timber production. Potentially suitable habitat would continue to be available across the planning area with Alternatives B through F.

Determination of Effect

Judgments of how the effects of each alternative would impact RFSS are displayed in Table 3 - 30. These determinations are expressed as "likelihoods" or "risk" because of the uncertainty inherent in evaluating future scenarios and because the environmental conditions of many RFSS are often not well understood.

In summary, the Forest Service concluded that for all but one RFSS, the alternatives would impact individuals but would not likely cause loss of viability

in the planning area or trend toward Federal listing. For one species, the Henslow's sparrow, there is a high risk of losing viability in the planning area in Alternatives A or B, but this would not likely cause a trend toward Federal listing. No GFM management area is allocated in these two alternatives, therefore there is a high probability that existing occupied habitat could decline in suitability over time.

Table 3 - 26. Definition of habitat outcomes used to estimate current and likely future conditions for RFSS on NFS land.

Habitat Outcome	Definition
A	Suitable ecological conditions are broadly distributed and of high abundance across the historical range of the species within the planning area. The combination of distribution and abundance of ecological conditions provides opportunity for continuous or nearly continuous intraspecific interactions for the species.
B	Suitable ecological conditions are either broadly distributed or of high abundance across the historical range of the species within the planning area, but there are gaps where suitable ecological conditions are absent or only present in low abundance. However, the disjunct areas of suitable ecological conditions are typically large enough and close enough to permit dispersal among subpopulations and potentially to allow the species to interact as a metapopulation across its historical range within the planning area.
C	Suitable ecological conditions are distributed frequently as patches and/or exist at low abundance. Gaps where suitable ecological conditions are either absent, or present in low abundance, are large enough that some subpopulations are isolated, limiting opportunity for species interactions. There is opportunity for subpopulations in most of the species range to interact as a metapopulation, but some subpopulations are so disjunct or of such low density that they are essentially isolated from other populations. For species for which this is not the historical condition, reduction in overall species range from historical within the planning area may have resulted from this isolation.
D	Suitable ecological conditions are frequently isolated and/or exist at very low abundance. While some of the subpopulations associated with these ecological conditions may be self-sustaining, there is limited opportunity for population interactions among many of the suitable environmental patches. For species for which this is not the historical condition within the planning area, reduction in overall species range from historical condition within the planning area may have resulted from this isolation.
E	Suitable ecological conditions are highly isolated and exist at very low abundance, with little or no possibility of population interactions among suitable environmental patches, resulting in strong potential for extirpations within many of the patches, and little likelihood of recolonization of such patches. There has likely been a reduction in overall species range from historical within the planning area, except for some rare, local endemics that may have persisted in this condition since the historical period.

Table 3 - 27. Definition of habitat outcomes used to estimate current and likely future conditions for RFSS on all lands in planning area.

Habitat Outcome	Definition
A	The combination of environmental and population conditions provides opportunity for the species to be broadly distributed and of high abundance across its historical range within the cumulative effects analysis area. There is potential for continuous or nearly continuous intraspecific interactions at high population size.
B	The combination of environmental and population conditions provide opportunity for the species to be broadly distributed and/or of high abundance across its historical range within the cumulative effects analysis area, but there are gaps where populations are potentially absent or present only in low density as a result of environmental or population conditions. However, the disjunct areas of higher potential population density are typically large enough and close enough to other subpopulations to permit dispersal among subpopulations and potentially to allow the species to interact as a metapopulation across its historical range within the cumulative effects analysis area.
C	The combination of environmental and population conditions restrict the potential distribution of the species, which is characterized by patchiness and/or areas of low abundance. Gaps where the likelihood of population occurrence is low or zero are large enough that some subpopulations are isolated, limiting opportunity for species interactions. There is opportunity for subpopulations in most of the species range to interact as a metapopulation, but some subpopulations are so disjunct or of such low density that they are essentially isolated from other populations. For species for which this is not the historical condition within the planning area, reduction in overall species range from historical condition may have resulted from this isolation.
D	The combination of environmental and population conditions restrict the potential distribution of the species, which is characterized by areas with high potential for population isolation and/or very low potential abundance. While some of these subpopulations may be self-sustaining, gaps where the likelihood of population occurrence is low or zero are large enough that there is limited opportunity for interactions among them. For species for which there is not the historical condition within the planning area, reduction in overall species range from historical has likely resulted from this isolation.
E	The combination of environmental and population conditions restricts the potential distribution of the species, which is characterized by high levels of isolation and very low potential abundance. Gaps where the likelihood of population occurrence is low or zero are large enough there is little or no possibility of interactions, strong potential for extirpations and little likelihood of recolonization. There has likely been a reduction in overall species range from historical within the planning area, except for some rare, local endemics that may have persisted in this condition since the historical period.

Table 3 - 28. Comparison of habitat outcomes for Regional Forester sensitive species on NFS land.

Species	Historic /Current	Alt. A			Alt. B			Alt. C			Alt. D			Alt. E			Alt. E Modified			Alt. F		
Decade		2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Mammals																						
Bobcat	A/B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Black bear	A/B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Birds																						
Henslow's sparrow	+/D	D	E	E	D	E	E	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Cerulean warbler	A/B	B	B	B	B	B	C	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Amphibians																						
Hellbender	E/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Reptiles																						
Timber rattlesnake	D/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Fish																						
Eastern sand darter	C/D	D	D	C	D	D	C	D	D	C	D	D	C	D	D	C	D	D	C	D	D	C
Western lake chubsucker	E/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Ohio lamprey	E/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Mussels																						
Round hickorynut	C/D	D	D	C	D	D	C	D	D	C	D	D	C	D	D	C	D	D	C	D	D	C
Salamander mussel	C/D	D	D	C	D	D	C	D	D	C	D	D	C	D	D	C	D	D	C	D	D	C
Lilliput	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Little spectaclecase	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Insects																						
Grizzled skipper	E/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Plants																						
Pigeon grape	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Umbrella magnolia	D/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Juniper sedge	-/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Yellow gentian	E/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Rock skullcap	B/C	C	C	B	C	C	D	C	C	D	C	C	D	C	C	D	C	C	D	C	C	D
Striped Gentian	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Butternut	B/C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Blue scorpionweed	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Yellow-fringed orchid	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Summary of Habitat Outcome Changes from Current Outcomes																						
Positive change		0	0	4	0	0	3	0	0	3	0	0	3	0	0	3	0	0	3	0	0	3
No change		23	22	18	23	22	17	23	23	19	23	23	19	23	23	19	23	23	19	23	23	19
Negative change		0	1	1	0	1	3	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1

+ Habitat for this species did not occur in planning area historically. - Newly described species in 1990's, historical occurrence unknown.

Table 3 - 29. Comparison of habitat outcomes for Regional Forester sensitive species on all lands in the planning area.

Species	Historic /Current	Alt. A			Alt. B			Alt. C			Alt. D			Alt. E			Alt. E Modified			Alt. F		
Decade		2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Mammals																						
Bobcat	A/B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Black bear	A/B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Birds																						
Henslow's sparrow	+/D	D	E	E	D	E	E	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Cerulean warbler	A/B	B	B	B	B	B	C	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Amphibians																						
Hellbender	E/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Reptiles																						
Timber rattlesnake	D/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Fish																						
Eastern sand darter	C/D	D	D	C	D	D	C	D	D	C	D	D	C	D	D	C	D	D	C	D	D	C
Western lake chubsucker	E/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Ohio lamprey	E/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Mussels																						
Round hickorynut	C/D	D	D	C	D	D	C	D	D	C	D	D	C	D	D	C	D	D	C	D	D	C
Salamander mussel	C/D	D	D	C	D	D	C	D	D	C	D	D	C	D	D	C	D	D	C	D	D	C
Lilliput	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Little spectaclecase	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Insects																						
Grizzled skipper	E/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Plants																						
Pigeon grape	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Umbrella magnolia	D/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Juniper sedge	-/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Yellow gentian	E/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Rock skullcap	B/C	C	C	B	C	C	D	C	C	D	C	C	D	C	C	D	C	C	D	C	C	D
Striped Gentian	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Butternut	B/C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Blue scorpionweed	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Yellow-fringed orchid	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Summary of Habitat Outcome Changes from Current Outcomes																						
Positive change		0	0	4	0	0	3	0	0	3	0	0	3	0	0	3	0	0	3	0	0	3
No change		23	22	18	23	22	17	23	23	19	23	23	19	23	23	19	23	23	19	23	23	19
Negative change		0	1	1	0	1	3	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1

+ Habitat for this species did not occur in planning area historically. - Newly described species in 1990's, historical occurrence unknown.

Table 3 - 30. Summary of the determination of effects for RFSS.

Species	A	B	C	D	E	E Modified	F
Mammals							
Bobcat	MI	MI	MI	MI	MI	MI	MI
Black bear	MI	MI	MI	MI	MI	MI	MI
Birds							
Henslow's sparrow	LV	LV	MI	MI	MI	MI	MI
Cerulean warbler	MI	MI	MI	MI	MI	MI	MI
Amphibians							
Hellbender	MI	MI	MI	MI	MI	MI	MI
Reptiles							
Timber Rattlesnake	MI	MI	MI	MI	MI	MI	MI
Fish							
Eastern sand darter	MI	MI	MI	MI	MI	MI	MI
Western lake chubsucker	MI	MI	MI	MI	MI	MI	MI
Ohio lamprey	MI	MI	MI	MI	MI	MI	MI
Mussels							
Round hickorynut	MI	MI	MI	MI	MI	MI	MI
Salamander mussel	MI	MI	MI	MI	MI	MI	MI
Lilliput	MI	MI	MI	MI	MI	MI	MI
Little spectaclecase	MI	MI	MI	MI	MI	MI	MI
Insects							
Grizzled skipper	MI	MI	MI	MI	MI	MI	MI
Plants							
Pigeon grape	MI	MI	MI	MI	MI	MI	MI
Umbrella magnolia	MI	MI	MI	MI	MI	MI	MI
Juniper sedge	MI	MI	MI	MI	MI	MI	MI
Yellow gentian	MI	MI	MI	MI	MI	MI	MI
Rock skullcap	MI	MI	MI	MI	MI	MI	MI
Striped gentian	MI	MI	MI	MI	MI	MI	MI
Butternut	MI	MI	MI	MI	MI	MI	MI
Blue scorpionweed	MI	MI	MI	MI	MI	MI	MI
Yellow-fringed orchid	MI	MI	MI	MI	MI	MI	MI

NI = No impacts

BE = Beneficial effects

MI = May impact individuals, but it is not likely to cause a trend to Federal listing or loss of viability

LV = High risk of loss of viability in the planning area, but not likely to cause a trend toward Federal listing

Species Proposed for RFSS Designation

The affected environment and evaluation of direct, indirect, and cumulative effects for species proposed for RFSS designation is available in the Biological Evaluation (Appendix F). This section summarizes the key findings for the 20 terrestrial and aquatic plants and animals listed as species proposed for RFSS designation.

The species viability evaluation identified plant and animal species for which viability was a concern in the planning area. Federally listed species and RFSS species were addressed in the previous sections. The plant and animal species addressed in this section are not currently listed as RFSS, but were recommended for listing after risk evaluations were conducted, in accordance with (FSM 2670, Supplement 2600-2001-1). The formal RFSS update process is scheduled for 2005. Until this process is completed, these species will be identified as species proposed for RFSS designation. However, they will be treated as though they had formal RFSS status. In other words, Forest-wide and management area direction and guidance for RFSS will apply to these species proposed for RFSS designation.

These 20 species occur on NFS land in a wide variety of environmental conditions, ranging from highly isolated and existing at very low abundance, to environmental conditions that are broadly distributed and abundant. For some species, effects of past or current management practices have led to reductions in habitat quantity or quality and opportunities for population interactions on the landscape. For other species proposed for RFSS designation, suitable habitat may not be greatly influenced by management, but may have historically always been naturally rare.

The prescriptions set forth in the management areas, along with the projected management activities, may positively or negatively affect species proposed for RFSS designation and their habitats, and their likelihood of viability in the planning area. Also, factors outside the control of the Forest Service may affect the likelihood that these species may remain viable within the planning area.

Effects Common to all Alternatives

Because of the diverse needs of these species, habitat for each cannot be optimized in every alternative. Rather, the alternatives vary in the amounts of suitable habitat conditions they would provide in the future, but the action alternatives were developed to provide a likelihood of maintaining viability and well-distributed habitat for these species in the planning area. Where adverse impacts cannot be avoided, management must not result in a trend toward Federal listing.

Direct, Indirect, and Cumulative Effects

Effects of the alternatives on the species proposed for RFSS designation were evaluated using information collected from currently accepted and applicable scientific literature, other scientific sources, and from taxonomic experts, along with the professional judgments of Forest Service biologists. The Biological Evaluation provides two assessments of impacts to the species: habitat outcomes and determination of effects.

The habitat outcomes and determination of effects were assessed in the same manner as described for RFSS, in the previous section (Table 3-24 and 3-25). Habitat outcomes for species proposed for RFSS designation on NFS land and for all lands in the cumulative effects analysis area are displayed in Table 3-29 and Table 3-30. The determination of effects for each species proposed for RFSS designation is identified in Table 3-31.

Summary of Direct, Indirect, and Cumulative Effects

From ancient times until the present, similar types of disturbances and management practices have occurred in the cumulative effects analysis area as have occurred on NFS land. Habitat outcomes for the direct effects analysis area (NFS land) and for the cumulative effects area are estimated to be the same for all species proposed for RFSS designation.

Habitat outcomes for one species (the four-toed salamander) may decline with implementation of some alternatives, while the habitat outcomes for the remaining 19 species proposed for RFSS designation are not expected to change from current levels. The following summarizes the potential differences in habitat outcomes for the four-toed salamander across the alternatives.

Four-toed salamander

Though the probability is low, each alternative may impact individuals, but no alternative is likely to cause a trend toward Federal listing or loss of viability for this species. The four-toed salamander has been found in two sites on the Ironton Ranger District, both in the Bear Run area. Loss of mature forest canopy or alteration of vernal pools could affect this species.

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

The amount of mature forest habitat may increase over the long-term in all of the alternatives. Habitat outcomes under Alternative A would not likely

change in either the short- or long-term because only a minimal amount of uneven-aged timber harvesting would occur and mitigation measures would protect suitable habitat. However, the long-term habitat outcome could be reduced by Alternative B. In 100 years, almost 79 percent of NFS land could be covered by mature forest habitat under Alternative B, but more of the Forest would be allocated to even-aged management. Even-aged management can temporarily fragment mature, contiguous forest until the stand once again reaches a successional stage that is no longer an ecological barrier to forest-interior species (Rosenberg et al., 2003). Periodic fragmentation of mature forest habitat on a landscape scale, however, could adversely affect dispersal of this species.

Prescribed fire could affect this species or its habitat, but no information about this was found in the literature. However, prescribed fire has the potential to change the microclimate of the forest floor and can temporarily reduce invertebrate abundance (Boehner, 2000). Prescribed fire is an integral component of Historic Forest and Historic Forest Management Area prescriptions, found in Alternatives C through F. Short-term and long-term habitat outcomes could be reduced in Alternatives D through F because the Historic Forest management prescription would be applied in proximity to known locations of this species. NFS land in this area could be treated with prescribed fire as often as twice per decade. The effects could be reduced to a degree since prescribed fire in mesic areas (i.e., preferred habitat) is more likely to be of a low intensity and more likely to burn in a mosaic pattern because of the moist conditions. Each alternative incorporates guidance (WLF-2) that encourages mosaic pattern burning for these reasons. Furthermore, occupied habitats could be protected with appropriate buffers at the project level.

Table 3-31. Comparison of habitat outcomes for species proposed for RFSS designation on NFS land.

		Alt. A			Alt. B			Alt. C			Alt. D			Alt. E			Alt. E Modified			Alt. F		
Decade		2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Amphibians																						
Green salamander	E/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Mud salamander	D/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Four-toed salamander	E/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Blanchard's cricket frog	D/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Mussels																						
Sheepnose mussel	*	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Insects																						
Rapids clubtail	E/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Green-faced clubtail	E/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Plants																						
Marshes St. John's wort	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Smooth beardtongue	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Little headed nutrush	E/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Butterfly pea	E/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Tall nut rush	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Sparse-lobed grape fern	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Carolina thistle	E/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Pinxter flower	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Feather bells	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Lined sedge	C/C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Pale straw sedge	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Dwarf iris	C/C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Yellow crownbeard	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Summary of Habitat Outcome Changes from Current Outcomes																						
Positive change		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
No change		19	19	19	19	19	18	19	19	19	18	18	18	18	18	18	18	18	18	18	18	18
Negative change		0	0	0	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1

*The sheepnose does not occur within the WNF proclamation boundary. Habitat outcomes for each of the alternatives are provided for its habitat in the Ohio River and for its host fish (sauger) which occurs within the proclamation boundary. It is not included in the summary of change at the bottom of the table.

Table 3-32. Comparison of habitat outcomes for species proposed for RFSS designation on all lands in cumulative effects analysis area.

		Alt. A			Alt. B			Alt. C			Alt. D			Alt. E			Alt. E Modified			Alt. F		
Decade		2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Amphibians																						
Green salamander	E/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Mud salamander	D/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Four-toed salamander	E/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Blanchard's cricket frog	D/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Mussels																						
Sheepnose mussel	*	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Insects																						
Rapids clubtail	E/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Green-faced clubtail	E/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Plants																						
Marshes St. John's wort	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Smooth beardtongue	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Little headed nutrush	E/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Butterfly pea	E/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Tall nut rush	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Sparse-lobed grape fern	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Carolina thistle	E/E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Pinxter flower	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Feather bells	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Lined sedge	C/C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Pale straw sedge	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Dwarf iris	C/C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Yellow crownbeard	D/D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Summary of Habitat Outcome Changes from Current Outcomes																						
Positive change		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
No change		19	19	19	19	19	18	19	19	19	18	18	18	18	18	18	18	18	18	18	18	18
Negative change		0	0	0	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1

*The sheepnose does not occur within the WNF proclamation boundary. Habitat outcomes for each of the alternatives are provided for its habitat in the Ohio River and for its host fish (sauger) which occurs within the proclamation boundary. It is not included in the summary of change at the bottom of the table.

Table 3 - 31. Summary of the determination of effects for species proposed for RFSS designation.

	A	B	C	D	E	E Modified	F
Amphibians							
Blanchard's cricket frog	MI	MI	MI	MI	MI	MI	MI
Four-toed salamander	MI	MI	MI	MI	MI	MI	MI
Green salamander	MI	MI	MI	MI	MI	MI	MI
Mud salamander	MI	MI	MI	MI	MI	MI	MI
Mussels							
Sheepnose	MI	MI	MI	MI	MI	MI	MI
Insects							
Rapids clubtail	MI	MI	MI	MI	MI	MI	MI
Rapids clubtail	MI	MI	MI	MI	MI	MI	MI
Plants							
Butterfly pea	MI	MI	MI	MI	MI	MI	MI
Carolina thistle	MI	MI	MI	MI	MI	MI	MI
Dwarf iris	MI	MI	MI	MI	MI	MI	MI
Featherbells	MI	MI	MI	MI	MI	MI	MI
Lined sedge	MI	MI	MI	MI	MI	MI	MI
Little headed nutrush	MI	MI	MI	MI	MI	MI	MI
Marshes St. John's wort	MI	MI	MI	MI	MI	MI	MI
Pale straw sedge	MI	MI	MI	MI	MI	MI	MI
Pinxter flower	MI	MI	MI	MI	MI	MI	MI
Smooth beardtongue	MI	MI	MI	MI	MI	MI	MI
Sparse-lobed grape fern	MI	MI	MI	MI	MI	MI	MI
Tall nut rush	MI	MI	MI	MI	MI	MI	MI
Yellow crownbeard	MI	MI	MI	MI	MI	MI	MI

NI = No impacts
BE = Beneficial effects
MI = May impact individuals, but it is not likely to cause a trend to Federal listing or loss of viability
LV = High risk of loss of viability in the planning area, but not likely to cause a trend toward Federal listing

Habitat Indicator 8 – Species of Public Interest

Certain plant or animal species are of public interest because they are hunted, fished, trapped, or collected. Three such species are of special interest to the public: white-tailed deer, American ginseng and grouse. The decline in early successional forest habitat has raised concerns about long-term grouse populations on the Forest. This species is addressed in an earlier section of the Final EIS, Habitat Indicator 3. The white-tailed deer and American ginseng are addressed in this section.

White-tailed Deer

The white-tailed deer is a popular game species. Bow and gun seasons were expected to harvest almost 200,000 deer in 2004 (ODNR, 2004a).

Deer hunting can provide an economic boost to local communities near the WNF.

Concerns have been raised that oak regeneration and sensitive plant populations on the Forest may be threatened by deer browsing. Deer browsing has been implicated in negative effects on the morphology and growth rates of young trees and herbaceous or shrubby vegetation. However, the intensity of these effects may be related in part to deer density (Russell et al., 2001). Deer are herbivores that graze and browse on a variety of leaves, plants, and twigs. They require high energy foods; some of the more favorable food items include wild crabapple, sumac, grasses, greenbrier, Japanese honeysuckle, jewelweed, clover and acorns (Gottschang, 1981). Deer take advantage of the corn, soy bean, wheat, and alfalfa crops produced on agricultural land.

The 2004 statewide fall deer population was estimated at 700,000 animals, with the highest numbers located in the forested regions of eastern and southern Ohio (ODNR, 2004). Pre-hunt population estimates for 2004 were slightly above targeted pre-hunt population levels for the counties that contain the WNF (Table 3 - 32). Deer densities in these counties are similar or slightly higher than average densities for Kentucky (21 deer/mile^2), but much lower than average densities in West Virginia (42 deer/mile^2) (M. Tonkovich, pers. comm.).

Table 3 - 32. Estimated deer densities* for Ohio counties that contain NFS land (M. Tonkovich, pers. comm.).

County	Estimated Fall 2004 Population (Pre-hunt) (Deer per square mile)	Target Population (Pre-hunt) (Deer per square mile)
Athens	28.1	19
Gallia	24.9	19
Hocking	24.6	23
Jackson	23.7	19
Lawrence	17.1	19
Monroe	25.8	19
Morgan	26.2	19
Noble	28.6	19
Perry	26.7	19
Scioto	9.5	10
Vinton	21.1	19
Washington	19.9	19

*These deer density figures are average for the county. There is a possibility that higher or lower densities could occur within areas in each county based upon habitat quality and availability.

No deer browse studies have been conducted on the WNF to confirm or deny any effects of deer browsing on tree regeneration or sensitive plant populations, and research is warranted. However, a deer exclosure study

addressing the effects of deer browsing on the height, density, and composition of woody regeneration in oak-hickory forests is ongoing near the Forest in Ross and Vinton counties. Deer densities in this study area were similar to those for counties containing the WNF. After the first study season, researchers found that the percentage of oak stems browsed were only 2.5 percent higher outside the fenced plots than inside them. No evidence has been found to show that browsing affected species richness, community composition, or oak seedlings after two study seasons (Apsley and McCarthy, 2003). This study will continue in the future and may provide more information on the effects of deer browsing on oak seedlings as seedlings grow taller.

Effects of deer browsing on large white trillium have been studied in the Cuyahoga Valley National Park in northeastern Ohio where deer densities are much higher than what are found within the WNF. Researchers found that browsing had a negative impact on trillium; stems were taller inside exclosures than outside and individual plants producing flowers decreased (NPS, 2003a). The Cuyahoga Valley National Park deer densities were estimated to be as high as 107 deer per square mile when this study occurred (NPS, 2003b).

Localized plant populations could be adversely affected by deer, especially if harsh environmental conditions occur, but the overall deer herd condition suggests that overbrowsing may not be a widespread problem in the WNF. One-third of all fawns are breeding, which is considered an indication of good herd condition. Fawn breeding generally ceases when the herd reaches 60 percent of the carrying capacity of the land, or in other words 60 percent of what any one area can support. The current deer herd is most likely at only 45 to 50 percent carrying capacity, based on these reproductive data (M. Tonkovich, pers. comm.). Overbrowsing would be more likely to occur if the number of deer was greater than what the land could support, as evidenced in some urban areas of Ohio where deer browse lines can be seen in the woods.

Antler beam measurements from young bucks harvested each fall are also used to assess the relative condition of the deer herd. Young bucks are still growing rapidly and much of their energy intake is devoted to body growth rather than antler development. Body growth will take precedence when deer are faced with dietary deficiencies, and antler beam diameter would be expected to decline (ODNR, 2002). Ohio Division of Wildlife biologists consider Ohio's deer herd in good condition, although they have observed a gradual decline (0.09 inch) in antler beam measurements for young bucks in the east-central and southeastern parts of Ohio between 1972 and 2002 (ODNR, 2003a). This decline has coincided with the decrease in early successional forest habitat and the maturation of Ohio's forests. Mature forest habitat provides less food for deer, whereas it is estimated that early successional forest habitat (i.e., less than 20 years of

age) can provide the most food (i.e., up to 200 pounds per acre) (Gottschang, 1981).

Direct and Indirect Effects

The quantity and quality of future white-tailed deer habitat may vary among the alternatives. Alternative A (the no action alternative) prescribes only minimal uneven-aged management as an active habitat management tool. No even-aged management would be allowed; therefore early successional forest habitat would decrease and then disappear from the WNF. Even-aged management is not only a tool used to produce an important source of food for deer, it useful in regenerating oaks that produce the acorn crops important for deer's survival winter. Alternative A prescribes no Historic Forest management prescriptions that would combine uneven-aged management and frequent prescribed fire to maintain oak-dominated communities. Within Historic Forest management areas, mature oak trees would likely dominate the area, ensuring acorn availability for deer. Oak-dominated stands would decline in abundance, but oaks would likely remain a minor component of forest stands on drier sites (i.e., ridges and south-west facing hillsides).

Table 3 - 33 summarizes how Alternatives B through F differ from Alternative A in their potential to provide early successional forest habitat and oak-dominated forest communities over the long-term (100 years).

Table 3 - 33. Availability of major forest community types that provide food for the white-tailed deer.

	Current Acreage	A	B	C	D	E	E Modified	F
Acres of early successional forest habitat (in 100 years)	12,759	0	13,308	11,224	13,434	13,520	12,820	9,664
Acres of oak-dominated stands	111,885	18,088	41,082	40,201	49,040	62,118	60,169	57,823

Over time, the amount of early successional forest habitat would be similar to current levels in Alternative B, D and E, while Alternative C would provide slightly less early successional forest habitat than what is available currently. There would likely be 25 percent less early successional forest habitat in Alternative F than what currently exists.

There would likely be a declining trend in oak-hickory forest stands on NFS land with the implementation of each alternative, which suggests decreased acorn abundance could occur. There could be a minus-84 percent trend in oak-hickory stands after 100 years with implementation of Alternative A. Alternative E would likely maintain the most oak-hickory on NFS land after 100 years, but there could be a declining trend of about 45 percent from current amounts. A decline in oak-hickory could affect

animals which rely upon these species for food, like the deer. This concern may be exacerbated with the cyclical oak mast trend seen in the Appalachian region. In all alternatives, oak and hickory trees would likely remain scattered across the WNF as individuals, or found in small groups on ridges and southwest facing slopes. In Alternatives C through F, extensive oak and hickory communities would also be concentrated on the landscape where Historic Forest management prescriptions are implemented.

Cumulative Effects

By 1904, the white-tailed deer was no longer present in Ohio. Increasing forest cover and reintroduction efforts by the Ohio Division of Wildlife have resulted in the reestablishment of a large, healthy deer herd. Within the WNF proclamation boundary, some timber harvesting occurs on private and State lands and will likely occur in the future at levels similar to present. It is impossible to estimate the long-term effects of deer browsing on WNF plant resources since no baseline data are available at this time. We can speculate that active management of NFS land to create early successional forest and maintain oaks could contribute to maintaining a healthy deer herd, and that contribution would be greater in Alternatives B through F than in Alternative A.

Wild American Ginseng

American ginseng (*Panax quinquefolius*) is a native perennial herb highly sought for its medicinal value. Ginseng harvest requires digging the taproot, which kills the plants. The increasing demand and concurrent market value for wild ginseng has intensified collection pressures in forested systems and has called into question the sustainability of current harvest levels and practices on ginseng population viability. Because of recent concerns raised due to declining populations, the Nature Conservancy updated the global rank of ginseng reclassifying it from “common” (G4) to “rare/common” (G3/G4) (NatureServe, 2004). American ginseng was listed as a species of concern in the CITES (Convention on International Trade in Endangered Species) treaty in 1975. In Canada, ginseng is listed as rare and all natural populations are protected.

Wild American ginseng is found in moderate to densely shaded hardwood forests with cool microclimates (Anderson et al., 2002). It is endemic to Eastern North America occurring from southern Quebec and Ontario west to South Dakota and south to Georgia and Oklahoma; overall it is known to occur in 34 states and 3 Canadian provinces (NatureServe, 2004). Common associates of ginseng include bloodroot, wild ginger, Solomon’s seal, mayapple, goldenseal and jack-in-the-pulpit. Ginseng reproduces exclusively by seed with plants only reproducing once they reach an age of five years or more (ODNR, 2004b). Extended seed dormancy is rare in American ginseng (Gagnon, 1999).

Wild American ginseng was first harvested and exported by explorers and missionaries in Canada during the 1700s. It has been an important source of supplemental income for Appalachian people since the mid-1800s. Cultivated ginseng plants have smoother roots and bring a lower price ($10-$15 per pound) than wild grown or wild-simulated plants ($200-$265 per pound), creating a preference for ginseng harvesters to seek wild grown roots. Overall harvest levels in Ohio have decreased significantly (51%) in the last decade from an average of 7,675 pounds of dry root between 1992 and 2001 to 3,757 pounds in 2002 (USFWS, 2002).

The number of roots per pound in Ohio has increased substantially (81%), indicating that smaller roots are being collected (Anderson et al., 2002). A study of herbarium specimens found a significant decrease in overall size of similar-aged plants in Appalachian and Mid-Western states since 1900 (McGraw, 2001). The reason for this decline is unknown, but harvesting practices (selection of largest and oldest plants) may be driving natural selection for smaller plants. Herbarium specimens, however, may not provide an unbiased sample and should not be extrapolated to natural populations without supporting field data. A 10-year monitoring project in North Carolina found an overall decrease in number, density, and size of ginseng plants and similar results were found during monitoring in the Great Smoky Mountain National Park of Tennessee (NatureServe, 2004). Trends in Ohio are unknown.

Other studies looking at ginseng population dynamics are few, especially at a local level, to verify if ginseng populations are declining. A demography study in Canada found that mortality rates for smaller plants are higher than for larger ones (Charron and Gagnon, 1991). Another Canadian study used a projection model to predict ginseng survival under differing harvesting pressures based on four known populations (Nantel et al., 1995). In this study, the model simulations suggested that a minimum viable population size is 172 plants under conditions where 30 percent of the population was harvested every five years. A field study looking at reproductive ability of different cultivated population with varying numbers of individuals found that populations with fewer individuals had lower reproduction than larger populations, likely due to pollinator limitation (Hackney and McGraw, 2001).

The WNF is one of two forests in Region 9 that still allows the collection of ginseng. The Forest Service has adopted restrictions on ginseng harvesting to help protect ginseng population viability on the WNF. These restrictions are consistent with State of Ohio's Ginseng Management Program (ODNR, 2004c) and require an annual permit that authorizes only the collection of up to one pound dry weight of ginseng per person on NFS land (see Forest-wide standards and guidelines, VEG-18). Since 2000, the amount of permits for root collection has been recorded. On average, approximately 149 permits a year have been sold for root collection in the last three years. These permits include all medicinal roots

that can be harvested, thus it cannot be inferred that all 149 permittees collected ginseng. Reporting by permittees of amounts and species of roots collected is voluntary, and usually represents a low percentage of the total permits sold.

Population size and composition necessary to maintain ginseng viability on the Forest is currently not known, and such research is warranted. The WNF has included monitoring goals within the 2006 Forest Plan to monitor American ginseng populations (see Chapter 4 of the Forest Plan). In time, these efforts along with permit information will help acquire basic population data and harvest pressures in southeast Ohio. These data can then be used to monitor the effects of root harvesting over time and allow for adaptive management of ginseng populations. In addition, Forest-wide goals incorporated in all alternatives include providing opportunities for collection while managing to sustain viable populations and increasing public awareness of ginseng harvest impacts (Goal 6.3), use of interpretation and education to increase public understanding of the WNF's natural environment and its use (Goal 11.1c); and collaborating with partners to promote education, conservation and sustainable ecological management practices (Goal 1.1).

The greatest threat to wild American ginseng is irresponsible digging of its roots, where digging exceeds the reproductive rates of plants. Poaching of roots in protected areas is often reported (Gagnon, 1999). Other threats include logging of mesic hardwood forests (NatureServe, 2004) and grazing (Anderson et al., 2002). Grazing and logging are threats because they tend to open the forest canopy and increase light reaching the forest floor.

Direct and Indirect Effects

The quantity and quality of future American ginseng habitat may vary among the alternatives. The three main threats to ginseng have been identified as irresponsible digging of its roots, grazing and activities that involve opening of forest canopies. Within all alternatives there are Forest-wide guidelines and standards which require a permit to collect medicinal roots, including ginseng, on Forest Service lands (VEG-18) and allow for rotational areas or Forest-wide closure orders to let stressed populations to recover from over collection (VEG-20). Wild ginseng collection is prohibited in the management areas SA, RNA, CA, FOF, FOFM, DR and developed recreation areas of TRL. The acreage of these management areas varies by alternative (Table 3 - 34).

Table 3 - 34. **Total area (in acres), and percent of NFS land, where ginseng collection is prohibited in each Alternative.**

	A	B	C	D	E	E Modified	F
Total area	28,953	28,953	36,371	31,669	36,372	39,354	67,273
% NFS land	12	12	15	13	15	17	28

On the WNF, grazing is restricted to suitable open land; no woodland or brushland will be converted to rangeland. Thus grazing activities on the Forest will have little, if any, impact on ginseng habitat. Uneven-aged management methods require that 60 percent of canopy cover be retained (TES-8). This would maintain shaded environments required by wild ginseng and would not likely affect population viability (Anderson et al., 2002).

Even-aged management could threaten current populations of ginseng by increasing light penetration to the understory. A temporary reduction in the amount of suitable habitat for the species would result until trees regenerate and canopies recover. The amount of even-aged management in hardwood stands projected for the first decade of Forest Plan implementation would vary by alternative. Other activities that could have similar short-term impacts on ginseng include temporary road construction and oil and gas development. Activities with the potential to cause permanent loss of suitable habitat involve permanent road and parking lot construction, trail and recreation facility construction, utility corridor construction, and surface mining. The acreages projected for these activities in each alternative over the next decade are provided in Table 3 - 35. Forest biologists and botanists review all areas where management activities involve land exchange, vegetation removal, or soil disturbance before implementation. Because of regional viability concerns, the Forest Service would undertake efforts to maintain habitat for those populations discovered during project implementation. Therefore, direct impacts to existing ginseng populations from management activities are unlikely. While any seedbanks without germinated plants could be lost, the species does not have long-lived seedbanks. Loss of seedbanks, thus, would pose little threat (Gagnon, 1999).

Table 3 - 35. Acres and percentage of NFS land projected for management activities over the next decade with potential to impact ginseng populations or suitable habitat.

	A	B	C	D	E	E Modified	F
Even-aged management in hardwoods	0	5,960	1,630	1,780	1,820	1,725	1,370
Road, log landing and skid trail construction	513	862	1,287	1,276	1,248	1,278	1,129
Recreational trail and facility construction	363.5	363.5	325	362	325	325	285
Oil and gas	121	121	121	121	121	121	121
Surface mining	1,250	1,250	1,250	1,250	1,250	1,250	1,250
Utility corridor construction	50	50	50	50	50	50	50
Total	**2,297.5**	**8,606.5**	**4,663**	**4,839**	**4,814**	**4,749**	**4,205**
% NFS land	**1.0**	**3.6**	**2.0**	**2.0**	**2.0**	**2.0**	**1.8**

Over time, the amount of shaded forest habitat on the Forest will increase from reforestation efforts, land acquisition, watershed improvements (i.e. tree planting and mine reclamation). In all alternatives, the potential ginseng habitat that could be impacted is minimal (Table 3 - 35) when compared to the acreage where collection is prohibited (Table 3 - 34) and to the acreage where no adverse impacts from management activities would likely occur.

Cumulative Effects

Forest cover across Ohio has increased from about 15 percent in 1940 to almost 30 percent today (Ohio Division of Forestry 2004). Historical aerial photos show many areas of the WNF consisted of eroded, abandoned agricultural fields and cut-over areas that today have returned to forested conditions. Almost 80 percent of the land (public and private) within the WNF proclamation boundary are forested (Ohio Land Use Cover, based on Landsat TM 1994). This reforestation has drastically increased the amount of lands suitable for ginseng habitat in contrast to what existed during the Industrial Revolution and Great Depression eras.

The WNF is one of few public land owners that allow ginseng collection on its lands. State managed lands do not allow ginseng. Ginseng harvesting takes place on privately owned properties at land owner discretion. Poaching and illegal digging is believed to be common, however, and some form of ginseng harvest likely occurs across all land ownerships. Poaching also can occur accidentally because of poorly marked land boundaries. Adaptive management of ginseng populations would result from the implementation of the monitoring and evaluation program in Chapter 4 of the 2006 Forest Plan. Therefore, cumulative effects of harvesting on NFS land would be decreased through public education and awareness programs (see Forest-wide Goals and Objectives 1.1, 6.3 and 11.1c) and adaptive management decisions.

Short-term or permanent loss of suitable habitat could occur in the future on private land within the WNF proclamation boundary, primarily from construction of roads and homes, oil and gas extraction, even-aged timber harvest, and surface mining. Any of these activities could disturb or decrease suitable habitat for, or existing populations of, this species. However, with the exception of the potential 1,250 acres of surface mining (reserved rights), these activities would not be expected to increase significantly from current levels. Any potential adverse cumulative effects that may occur on NFS land as a result of implementing any of the alternatives would be mitigated through the implementation of protective Forest-wide standards and guidelines and individual project mitigations. The cumulative impacts of vegetation removal activities on NFS land is unlikely to increase pressures on ginseng population viability beyond that created by similar activities on neighboring non-NFS land.

Habitat Indicator 9 – Non-native Invasive Species

Affected Environment

Background

An estimated 50,000 non-native species are established in the United States (Pimentel, et al. 2000), and 700 to 800 of those are known to occur in the wild in Ohio (ODNR and TNC, 2001). Many of these introduced species play a neutral role on the landscape or are beneficial and/or essential to daily subsistence. On the other hand, some non-native species are invasive and cause substantial economic and environmental harm. In the United States, invasive plants have infested 100 million acres, and continue to infest an additional 3 million acres every year (National Invasive Species Council, 2001).

A recent estimate of damages and losses due to non-native invasive species (NNIS) cost an estimated $137 billion per year (Pimentel, et al., 2000). This is likely a gross underestimate, since numbers were compiled primarily from commercially important sectors (e.g., agriculture and livestock). More intangible, non-market impacts, including impacts to natural ecosystems, were generally omitted from analysis due to lack of data (GAO, 2002).

Environmentally, NNIS pose a serious threat to plant and animal community health and diversity. Since NNIS 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. Not only do they compete with native species for resources, they also:

- Cause loss of habitat and food for wildlife
- Alter soil structure and chemistry (Ehrenfeld, 2003)
- Modify fire regimes (Brooks et al., 2004)
- Alter plant succession
- Serve as reservoirs for pathogens
- Hybridize with natives to compromise local genetic diversity.

The resulting change in community composition can severely alter ecosystem dynamics and functions over time. As a result, non-native invasive species are considered the second-leading threat to biodiversity and are the primary threat to 49 percent of all imperiled or federally listed species (Stein et al., 2000). Approximately 100 known invasive plant species are capable of invading and compromising natural areas in Ohio (TNC, 2004).

Legal and Administrative Framework

Law, policy, and direction pertaining to the control and management of noxious and non-native species include, but are not limited to:

- Federal Noxious Weed Act of 1974 (as amended 1988 and 1994)
- Plant Protection Act
- Executive Order 13112, February 1999
- National Invasive Species Council Act, 2003.

Table 3 - 36. Non-native invasive plant species on the Wayne National Forest.

Common Name	*Species*	Rank
Amur honeysuckle	*Lonicera maackii*	1
Asian bittersweet	*Celastrus orbiculatus*	1
Autumn olive	*Elaeagnus umbellata*	1
Cinammon vine	*Dioscorea batatas*	3
Common buckthorn	*Rhamnus cathartica*	1
Common Privet	*Ligustrum vulgare*	2
Common reed grass	*Phragmites australis*	3
Crown-vetch	*Coronilla varia*	1
Dames rocket	*Hesperis matronalis*	4
Dodder (non-native species)	*Cuscuta* spp.	4
Eulalia	*Miscanthus sinensis*	2
Eurasian water-milfoil	*Myriophyllum spicatum*	1
Garlic mustard	*Alliaria petiolata*	1
Giant knotweed	*Polygonum sachalinense*	4
Gill-over-the-ground	*Glechoma hederacea*	3
Glossy buckthorn	*Rhamnus frangula*	2
Indian strawberry	*Duchesnea indica*	3
Japanese barberry	*Berberis thunbergii*	1
Japanese honeysuckle	*Lonicera japonica*	1
Japanese knotweed	*Polygonum cuspidatum*	1
Japanese silt grass	*Microstegium vimineum*	1
Japanese wisteria	*Wisteria floribunda*	3
Kudzu	*Pueraria lobata*	1
Mile-a-minute	*Polygonum perfoliatum*	1
Morrow honeysuckle	*Lonicera morrowi*	1
Multiflora rose	*Rosa multiflora*	1
Narrow-leaved cattail	*Typha angustifolia*	5
Periwinkle or myrtle	*Vinca minor*	2
Poison hemlock	*Conium maculatum*	4
Porcelain berry	*Ampelopsis brevipedunculata*	4
Princess tree	*Paulownia tomentosa*	2
Purple loosestrife	*Lythrum salicaria*	1
Reed canary grass	*Phalaris arundinacea*	3
Roadside penny-cress	*Thlaspi alliaceum*	3
Russian olive	*Elaeagnus angustifolia*	1
Small Carpgrass	*Arthraxon hispidus*	4
Smooth brome	*Bromus inermis*	2
Sweet autumn virginsbower	*Clematis ternifolia*	4
Tatarian honeysuckle	*Lonicera tatarica*	1
Tree of heaven	*Ailanthus altissima*	1
Water milfoil	*Myriophyllum heterophyllum*	5
White sweet-clover	*Melilotus alba*	2
Wineberry	*Rubus phoenicolasius*	4
Winged burning bush	*Euonymus alatus*	2
Wintercreeper	*Euonymus fortunei*	1
Yellow sweet-clover	*Melilotus officinalis*	2

Rankings:

1-highly invasive,

2-moderately invasive,

3–widespread non-native,

4–local concern and monitoring,

5-native invasive

Current NNIS Conditions on Wayne National Forest

Plants

A list of 47 non-native plant species (Table 3 - 36) considered to be substantial threats on the Wayne was compiled from species targeted by Region 9, the State of Ohio, The Nature Conservancy, Ohio Chapter and local botanists. This list is by no means exhaustive and is likely to change as new threatening species are identified within the region.

In 2002, the Forest Service reported 4,300 acres (or 2%) of the Forest to be infested with non-native invasive species. This initial study was based only on agricultural lands (i.e., old fields) on the WNF; about one-third of these lands were infested. This method did not accurately represent all areas of infestation on the Forest and thus underestimated acres actually infested. In the summer of 2002, a non-native invasive plant inventory and mapping program was initiated on the Athens Ranger District and continued in 2003. At the end of 2003, 17,730 acres were surveyed of which 2,280 acres were infested with NNIS. To date, approximately 7.5 percent of the WNF has been surveyed and mapped for NNIS. The initial mapping of NNIS occurrences on the WNF is projected to take at least 5 years. It is estimated that approximately one-third of the Forest, or 94,000 acres are infested with NNIS (2005 Wayne NF NNIS program assessment).

Currently, treatment and prevention of NNIS on the Wayne consists of project designs and mitigations to limit NNIS, some mechanical treatment, one biological control site, education, and detection surveys for species yet unknown to occur on the Forest. To date activities include:

- Pulling garlic mustard on the Little Storm's Creek Special Area on the Ironton Ranger District since 1998
- Pulling garlic mustard and Oriental bittersweet from the Paines Crossing Special Area and Japanese stiltgrass in the Buffalo Beats Research Natural Area on the Athens Ranger District
- Grubbing and mowing 12 acres of multiflora rose on a bottomland field in the Rutherford wetland complex (Athens RD) prior to planting the site with native tree species
- Mechanical grubbing of autumn olive near camp sites on the Ironton Ranger District
- Releasing Galerucella beetles on a 2-acre purple loosestrife infestation along Leith Run (Marietta Unit of the Athens RD)
- Converting a fescue/canary grass field in the Handley Branch wetland restoration area (Ironton RD) to native warm season grasses

- Using goat grazing to treat a kudzu infestation on the Ironton Ranger District
- Removing starling and house sparrow nests and eggs from nesting boxes provided for native bird species
- Public educational signs and bootbrush stations at trailheads to inform hikers on threats and prevention of garlic mustard and Japanese stiltgrass
- Public educational signs on the identification and prevention of aquatic invasive species along Ohio River access sites and inland lakes
- Surveys for zebra mussel in streams of Marietta Unit
- Surveys for Eurasian water-milfoil in strip ponds at Hanging Rock (Ironton RD).

In general, herbicides have not used on the WNF in the past to treat NNIS; however, the use of herbicides to treat NNIS is considered in the proposed 2006 Forest Plan (Goal 7.2; Objective 7.2b). Methods for control of invasive species may include: mechanical removal (e.g. hand pulling, mowing or cutting), biological (e.g. *Galerucella* beetles to control purple loosestrife) or chemical (e.g. herbicide spot spraying individual plants, basal spray of saplings or stump spraying).

Insects and Diseases

Forest ecosystems are subjected to many biotic and abiotic stresses. Native insects and diseases, droughts, tornadoes, windstorms, and wildland fire periodically impact forests or specific tree species, leaving dead or weakened trees. The effects of these stresses may be manifested locally or over a large area, yet they do not cause species extinction. In contrast, exotic pests can threaten the continued existence of a species. Often host species have not evolved genetic resistance to exotic pests, as co-evolutionary processes have not occurred. Following are descriptions of the exotic organisms that are currently causing significant effects in the region in or near the WNF. It is very possible that other unknown exotics will be discovered over the next few decades.

Chestnut Blight

At the turn of the 20th century, the American chestnut was one of the most important trees in forests from Maine south to Florida and from the Piedmont west to the Ohio valley. In the heart of its range, a count of trees would have turned up one chestnut for every four oaks, birches, maples and other hardwoods. Many of the dry ridgetops of the central Appalachians were so thoroughly crowded with chestnut that, in early summer, when their canopies were filled with creamy-white flowers, the mountains appeared snow-capped.

American chestnut was eliminated from eastern forests as a dominant species, however, by chestnut blight (*Cryphonectria parasitica*), an Asian fungus to which native chestnuts had very little resistance. In its wake, it left only dead and dying stems. By 1950, except for the shrubby root sprouts the species continually produces (and which also quickly become infected), the keystone species on some nine million acres of eastern forests had disappeared. Figure 3 - 44 depicts the natural range of the American chestnut. (The American Chestnut Foundation, 2004)

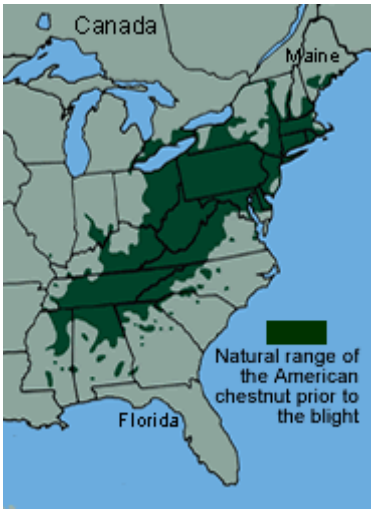


Figure 3 - 44. Nature range of the American chestnut prior to the blight.

Butternut Canker

In 1995, the Forest Service estimated that 77 percent of the butternuts in the Southeast were dead due to the canker-causing fungus *Sirococcus clavigignenti juglandacearum*. This fungus disrupts nutrient flow through cambium areas, which generally kills the trees (USDA Forest Service, 1995). Surviving butternuts are usually found in riparian zones, and the majority of trees are heavily infected and not reproducing. In contrast to American chestnut, butternuts usually will not sprout after stem death. Young trees are subject to mortality, and fungal spores can be carried on the fruit husks. Therefore, when a population becomes infected, that particular gene pool has the potential to be lost permanently. Research is being conducted to develop laboratory and field protocols to screen trees for resistance, host range studies, *in vitro* clonal propagation, and the role of insects in dissemination of the fungus (Schlarbaum et al., 1997).

Dutch Elm Disease

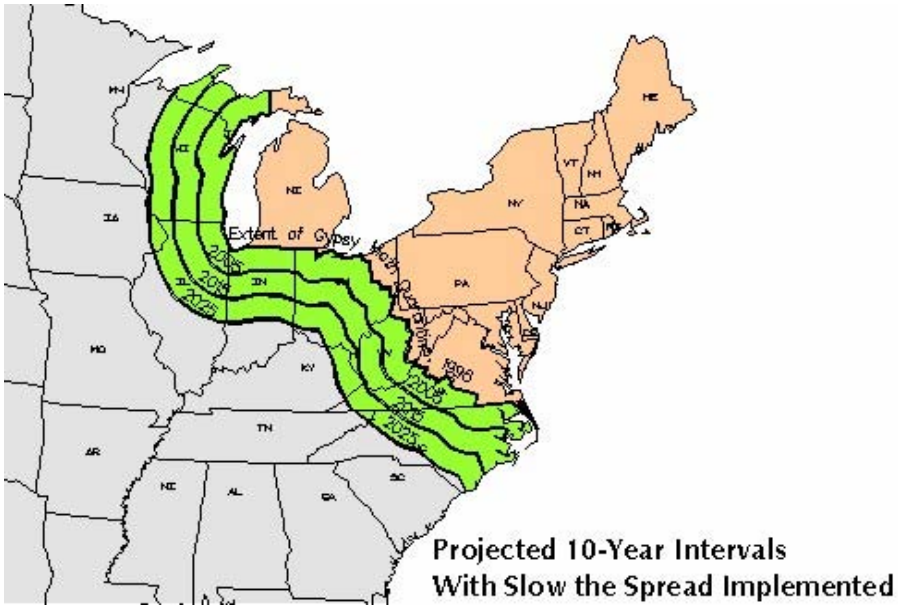
American elm usually occurs in a mixture of other hardwood species. The species' is distributed throughout eastern North American forests, extending well into the Great Plains. The streets of North American cities were once lined with American elms, a fast growing, stress tolerant tree, with a vase-shaped crown. Wood from the species was used for furniture, flooring, construction, hardwood dimension, and veneer. Forest and urban populations of American elm have been devastated by two strains of Dutch elm disease (DED), a non-aggressive strain (*Ophiostoma ulmi*) and an aggressive strain (*O. nova-ulmi*). The disease entered the country on shipments of unpeeled veneer logs from Europe. Dying American elms were first observed in Cleveland, Ohio, in May 1930. The disease spread through eastern forests from three infection centers and had spread through most of country by 1977. Dutch elm disease has proven to be the most devastating shade tree disease in the United States. Although trees with good tolerance to DED have been found, very little is known about the mechanisms of tolerance. Some forest populations, however, still contain large American elms, about 29 inches dbh and greater. (Schlarbaum et al., 1997).

Gypsy Moth

The gypsy moth, *Lymantria dispar*, is one of North America's most devastating forest pests. The species originally evolved in Europe and Asia and has existed there for thousands of years. In 1868 or 1869, the gypsy moth was accidentally introduced near Boston, MA. About 10 years after this introduction, the first outbreaks began. Attempts to eradicate the moth ultimately failed and since that time, the range of gypsy moth has continued to spread.

In spite of the recent declines in the Gypsy Moth populations as a result of a fungal pathogen (*Entomophaga maimaiga),* the gypsy moth will likely continue to expand its range in the future. Eventually, *E. maimaiga* may cause the gypsy moth to behave more like a native insect and less like an unstoppable invasive force. This change in behavior would result in less forest damage. But, the gypsy moth is unpredictable. Numerous environmental factors influence its population dynamics, many of which are not fully understood. *E. maimaiga* will probably not affect all gypsy moth populations the same way in a given year. In some areas gypsy moth populations will totally collapse, some areas will show a population reduction, while others show little impact on the gypsy moth population. Many areas at the leading edge of an infestation do not even harbor the fungus. It usually takes 2 to 4 years for the fungus to establish itself naturally in a gypsy moth population. The initial outbreak will have already occurred and the most severe tree mortality often results from these first defoliation events (Balser and Baumgard, 2004).

Figure 3 - 45 shows the predicted progress of the infestation. As can be seen, Gypsy Moth infestation is currently on the eastern edge of the WNF and will likely move across the Forest in the next 10 to 15 years (USDA Forest Service, 2003).



(map courtesy Virginia Tech Univ.)

Figure 3 - 45. Projected 10-year intervals with Slow the Spread Implemented.

The gypsy moth is known to feed on the foliage of hundreds of species of plants in North America, but its most common hosts are oaks and aspen.

Figure 3 - 46 shows the average defoliation by species on the Western Allegheny Plateau in 1986, which translates into the of species preference for the Gypsy Moth. Note that the most preferred species are the oaks. Therefore, it is reasonable to expect that when the Gypsy Moth infestation does arrive on the Wayne National Forest, the impact will be important since oaks are a predominant species.

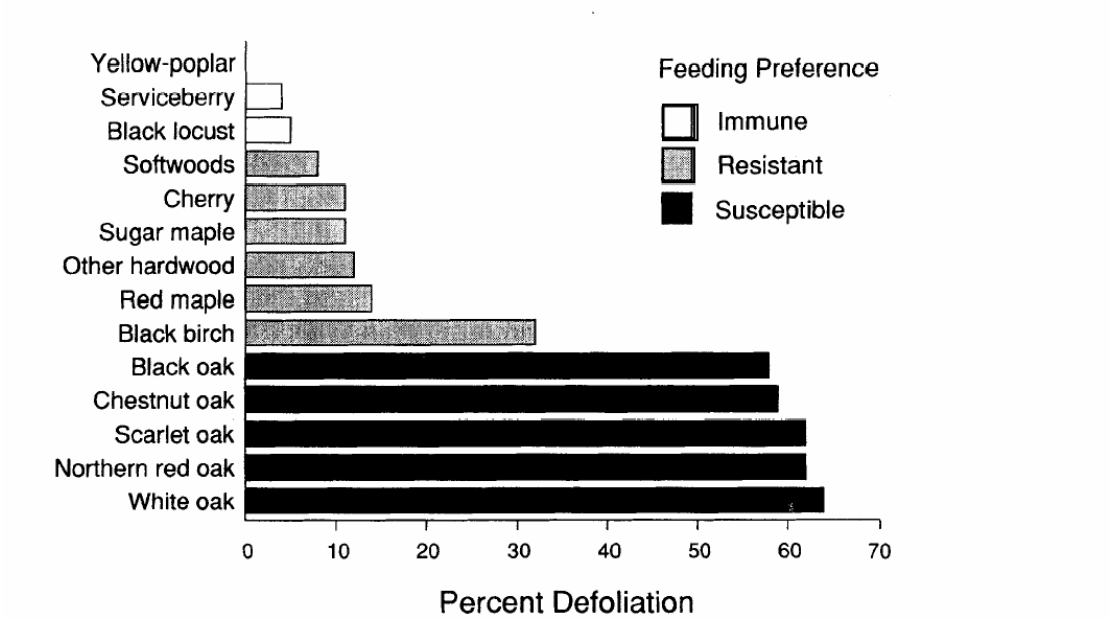


Figure 3 - 46. Average defoliation by species from gypsy moth on the Western Allegheny Plateau in 1986.

Gypsy moth populations are typically eruptive in North America; densities may fluctuate in any forest stand from near one egg mass per hectare to over 1,000 per hectare. When densities reach very high levels, trees may become completely defoliated. Several successive years of defoliation, along with contributions by other biotic and abiotic stress factors, may ultimately result in tree mortality (USDA Forest Service, 2003).

Other Insects and Diseases

An exotic beetle from Asia – the emerald ash borer (*Agrilus planipennis* Fairmaire (Coleoptera: Buprestidae) – was discovered feeding on ash (*Fraxinus* spp.) trees in southeastern Michigan in July 2002. The larvae feed in the phloem and outer sapwood, producing galleries that eventually girdle and kill branches and entire trees (Michigan Entomological Society, 2002).

The Asian longhorned beetle (ALB) has been discovered attacking trees in the United States. Tunneling by beetle larvae girdles tree stems and branches. Repeated attacks lead to dieback of the tree crown and, eventually, death of the tree. ALB probably traveled to the United States inside solid wood packing material from China. In the United States the beetle prefers maple species (*Acer* spp.), including boxelder, Norway, red, silver, and sugar maples. Other known hosts are alders, birches, elms, horsechestnut, poplars, and willows. Currently, the only effective means to eliminate ALB is to remove infested trees and destroy them by chipping or burning. Early detection of infestations and rapid treatment response are

crucial to successful eradication of the beetle (USDA Forest Service, 1999b).

Dogwood anthracnose was first reported as a disease of flowering dogwood in the United States in 1978. In 15 years, it had caused serious losses to flowering dogwood found in the forests and in ornamental plantings over large portions of the eastern and southern United States. The disease kills dogwoods of all sizes, but it is most severe on young seedlings and in understory forest dogwoods. Infection of dogwoods is most likely to occur during cool, wet weather in spring and fall, but can occur at any time during the growing season. Overall, vigorous trees tend to be less damaged than weak trees. The disease is often more severe on trees growing in full shade, and it is reported to be greatest on northeast-facing slopes and in areas where dogwood are abundant. Drought and winter injury appear to increase susceptibility. Consecutive years of infection have killed high proportions of woodland and ornamental dogwood populations (Anderson, et al., date unknown).

Other invasive species not yet documented on the Wayne, but their existence seems inevitable include beech bark disease and hemlock wooly adelgid.

Direct and Indirect Effects

Non-native invasive plant species tend to invade and establish in areas where disturbance has occurred. Disturbance in the form of vegetation removal, canopy opening, or soil exposure, coupled with the introduction of non-native seed, creates ideal conditions for NNIS success. Once established, NNIS can continue to spread along established corridors such as roads, trails, and streams where continued disturbance provides favorable conditions for establishment and transportation. NNIS propagules are able to travel on people, vehicles and machinery, animals, birds, wind, water, and fire. People spread NNIS by transporting propagules on clothing, shoes, camping gear, and recreational equipment. Vehicles and machinery transport NNIS on undercarriages and tires (Westbrooks, 1998; Parendes and Jones, 2000; Lonsdale and Lane, 1994). Animals and birds move NNIS in their hair/feathers, hooves, or by passing seeds through their digestive tracts. Dependent on the species, non-natives can also be dispersed by wind, rain, or fire.

Shade-tolerant species, such as garlic mustard and Japanese stilt-grass, do not require disturbance, only transportation to their preferred habitats from where they are able to spread and invade the forest interior. Likewise, other species actively planted by humans, such as Japanese barberry, can spread from old home sites and cemeteries into the forest interior over time. These shade-tolerant species pose a severe threat to forest understory biodiversity.

Negative impacts of NNIS can be minimized through implementation of Forest-wide goals objectives, standards, and guidelines in the 2006 Forest Plan. Integrated pest management (IPM) methods to control and contain current NNIS infestations are emphasized in the Plan. Prevention methods are to be incorporated in project analysis, planning, implementation, and monitoring to prevent spread of current NNIS infestations and to prevent new invasions. Use of NNIS for revegetation and landscaping activities is prohibited, and use of locally adapted native species is emphasized to maintain biological diversity and health of ecosystems. Education and cooperation with adjacent landowners are also tools identified in NNIS management.

Effects of Roads and Facilities Management

Roads, as fragmenting agents, provide ideal habitat and opportunities for NNIS plant growth by increasing the amount of forest-edge habitat. Road construction, maintenance, and use provide continuous soil disturbance, act as corridors for NNIS dispersal, and contain reservoirs of propagules for future NNIS invasion (Forman and Deblinger, 2000; Parendes and Jones, 2000). Cleaning large machinery used to create roads can decrease the NNIS invasion potential during construction, but the long-term use by vehicles provides the continued opportunity for NNIS to invade and spread. Logging roads, while often short-term in use, are prime areas for NNIS invasion due to their intense use by heavy equipment that often travel between multiple areas and ownerships during logging activities.

The decommissioning of roads can reduce areas populated by NNIS over the long term. After a road is decommissioned and vehicle use prohibited, roadbeds will eventually revegetate through succession. However, the ground disturbance involved in decommissioning and the potential introduction of seed by heavy machinery could at first increase NNIS potential.

A preliminary study on the WNF suggests that roadsides provide habitat and serve as corridors for multiflora rose establishment and spread (Christen and Matlack, 2004). The preliminary data from the Wayne's NNIS inventory and mapping project on the Athens District (NRIS Terra database, housed at Supervisor's Office), along with field experience, show that non-native species have high densities along oil and gas roads, old haul roads, and other access roads. Aside from effects on the natural ecosystem (see introduction), these invaders also detract from visual quality along roadsides, which may affect tourism. The increased edge-effect created by disturbance initially allows for NNIS establishment and spread over time, but studies have shown that if the edge develops into dense vegetation, these edges can decrease the dispersal potential of NNIS into the Forest (Brothers and Spingarn, 1992; Cadenasso and Pickett, 2001). However, in many cases, non-native invasives comprise a large

percentage of the species in edge vegetation and, therefore, can facilitate the dispersal of NNIS further beyond edge habitat.

Analysis of Alternatives

Miles of newly constructed road varies by alternative, and includes all roads projected for all management activities (Vegetation and Habitat, Minerals, Watershed, etc.) over the next decade (Figure 3 - 47). Those alternatives with the greatest amount of new road construction will provide the greatest potential for NNIS habitat. The acreage projected for parking lot construction is consistent across all alternatives: 10 acres over the next decade (Table 3 - 37). Miles of decommissioned road is projected to be 10 miles, or 29 acres, per decade for all alternatives. Forest standards and guidelines that minimize soil disturbance and erosion during construction will help minimize the area available to NNIS invasion and spread.

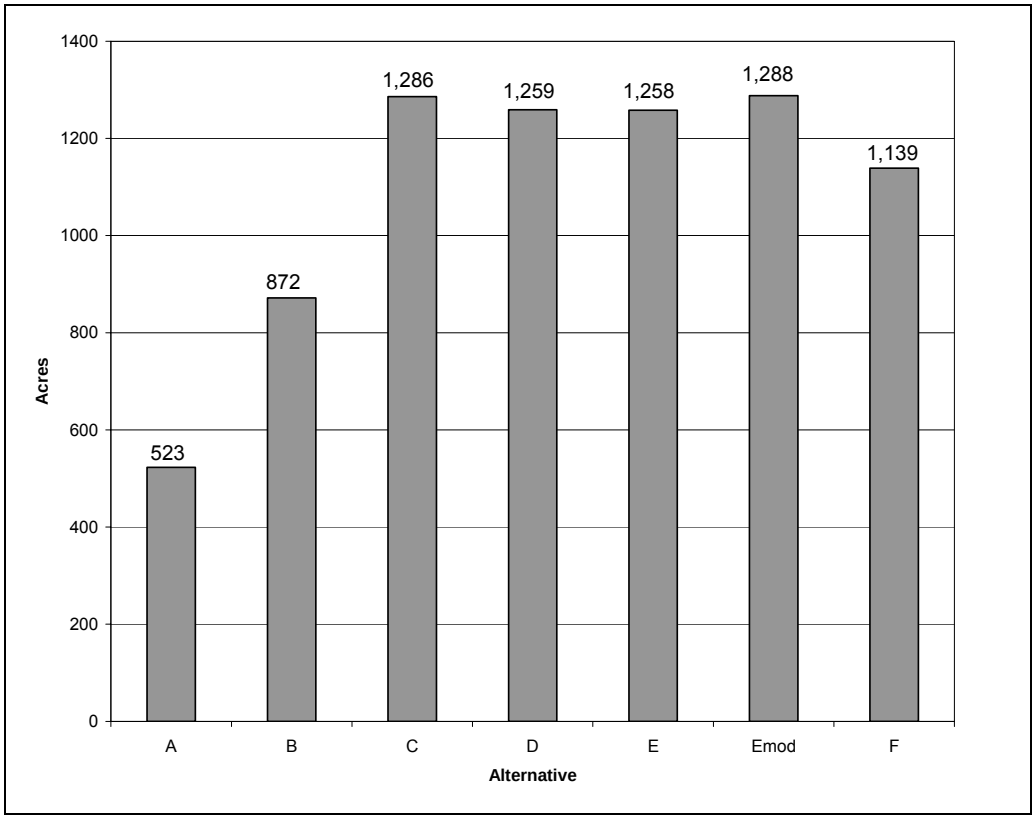


Figure 3 - 47. Total Acres of Road, Skid Trail, Log Landing and Parking Lot Construction projected for first decade.

Table 3 - 37. Measures of projected Road and Facilities Management Activities that could create potential NNIS habitat in the next decade (in acres).

	A	B	C	D	E	E Modified	F
Temporary road construction	118	130	146	146	145	146	140
Permanent Road Construction	52	68	74	74	74	74	71
Permanent Road Reconstruction	145	223	317	311	311	318	284
Timber Transportation (skid trails and landings)	198	441	739	718	718	740	634
Parking Lots	10	10	10	10	10	10	10
Total Road and Facilities Disturbance	**523**	**872**	**1286**	**1259**	**1258**	**1288**	**1139**

Effects from Recreation Management

Recreational activities create soil disturbance and provide transport mechanisms that facilitate NNIS invasion and spread. Most spread occurs along roads and trails where there is concentrated soil disturbance and vectors for spread. Other recreational sites often contain bare or disturbed soil, ideal for NNIS establishment. These include trailheads, parking lots, developed and dispersed recreational sites, popular fishing locations, and other heavily used areas. NNIS are transported by vehicles, ATVs, OHMs, trailers, people and their recreational equipment, and livestock (hair, hooves and digestive tracts). Currently the Wayne has 116 miles of ATV trail, 74 miles of horse trail, 97 miles of trail shared by mountain bikers and hikers, and 61 miles of exclusive hiking trail.

Recreational vehicles, boats, and trailers can transport and introduce aquatic and wetland NNIS that can negatively impact native aquatic species.

Construction of new ATV trails will involve heavy equipment and have impacts similar to road construction (see Road section). Construction of horse, bike, and hiking trails may be constructed by hand or with heavy equipment, depending on various variables. Trails built by hand will have lower NNIS invasion potential than heavy machinery construction.

Analysis of Alternatives

In general, alternatives with the fewest miles of trails and recreational acres on the landscape would result in fewer opportunities for NNIS populations to spread across the Forest (Figure 3 - 48). Alternatives A and B propose increasing OHV trails the most (by 223 acres over the next decade) (Table 3 - 38). Likewise, the increase in all types of new trail construction would be largest under Alternatives A, B, or C.

A Forest-wide guideline (FH-15) recommends the installation and use of trailhead cleaning stations to help prevent the spread and introduction of NNIS by recreationists and their equipment.

A Forest-wide Objective (11.2h) in the Proposed Revised Forest Plan sets a goal of closing a minimum of 20 miles of illegal ATV trails per decade.

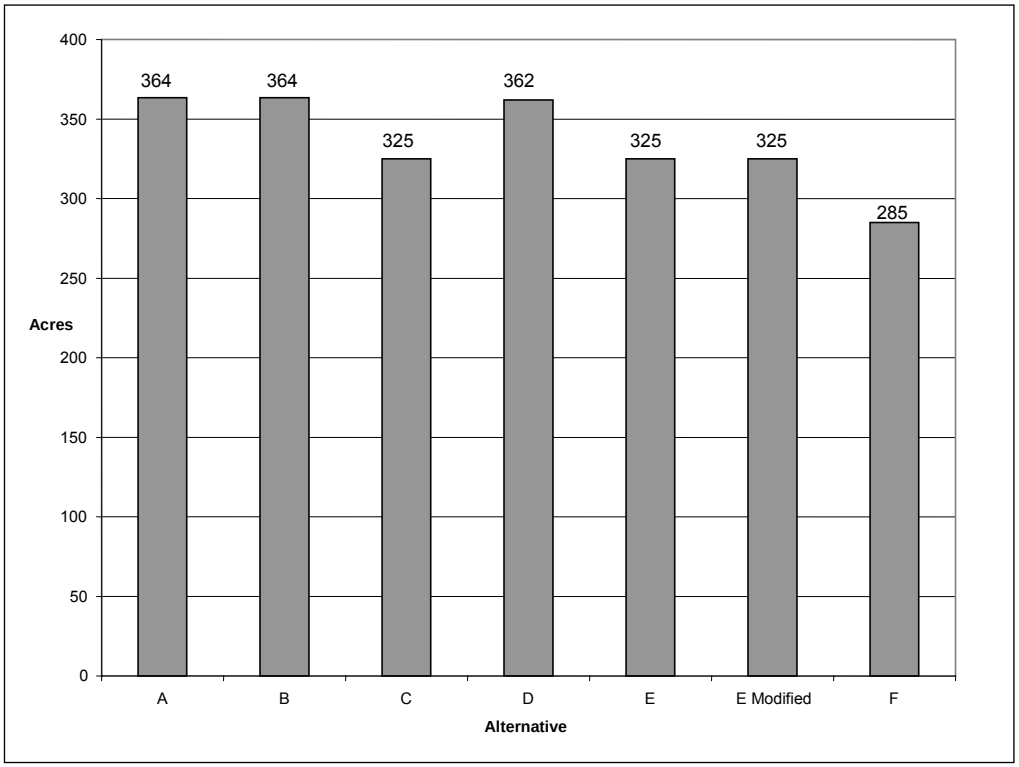


Figure 3 - 48. Total Acres of Recreation Trail and Facility Construction projected for first decade.

Table 3 - 38. Measures of *all* projected Recreation and Facilities Management Activities that could create potential NNIS habitat in the next decade (in acres).

	A	B	C	D	E	E Modified	F
ATV/OHV trails	223	223	150	187	150	150	110
Foot trails	9	9	18	18	18	18	18
Mountain bike trails	36	36	36	36	36	36	36
Horse trails	36	36	61	61	61	61	61
Recreation Facility Construction	60	60	60	60	60	60	60
Total Recreation and Facilities Disturbance	**364**	**364**	**325**	**362**	**325**	**325**	**285**

Effects from Fire and Fuels Management

Severe wildfires can remove litter and vegetation cover, resulting in bare soil and altered light regimes, all of which can facilitate NNIS invasion. Vehicles and other equipment brought from various locations to control wildland fires could spread or introduce NNIS seed.

Prescribed burns have less chance of spreading or introducing NNIS since they are often mosaic in pattern and seldom result in large areas of bare

soil. Furthermore, NNIS control measures (e.g., equipment cleaning, evaluation of nearby NNIS seed sources and threat) will be addressed during project planning and implementation. However, prescribed fires still involve:

- Soil disturbing activities during fireline construction
- Vegetation and canopy reduction through burning
- The reduction of soil protecting litter.

All of these can facilitate NNIS establishment or spread.

For Ohio and the surrounding region, little is known about the role fire plays in NNIS spread. A preliminary study in southeast Ohio found an increase of tree-of-heaven after thin and burn projects, however the effects of prescribed fire on NNIS is still widely unknown (Hutchinson, et al., 2004). In the past six years (1998-2004), the Wayne has burned approximately 600 acres; however, monitoring fire effects on these areas has been limited by funding and manpower.

Fire has also been considered a tool to control NNIS, with success depending on species' biology, treatment timing, and extent of the invasive problem. Preliminary projects in the Northeastern U.S. have found that fire alone rarely solves an invasive species problem (Richburg and Patterson, 2003), rather it is used in conjunction with other management tools to increase control success. An additional 200 acres of burning for NNIS control was projected across all alternatives for the next decade, in addition to the numbers represented below, in the event fire can be used as an effective NNIS eradication tool.

Mechanical Hazardous Fuel Removal will have more potential to increase NNIS when construction of temporary trails and roads for motorized equipment access in needed (see Road and Recreation sections). In areas where work is done by ground crews, NNIS threats will be much reduced.

Analysis of Alternatives

While the amount of wildfire is impossible to predict, the projected use of prescribe fire for fuels treatment would be greatest in Alternatives A and B (Figure 3 - 6). Overall, the more acres burned by fire, the greater the chance of spreading existing NNIS populations or introducing new invasive species (Table 3 - 39). Dozer fireline construction is projected to account for 14 to 15 acres of disturbance over the next decade.

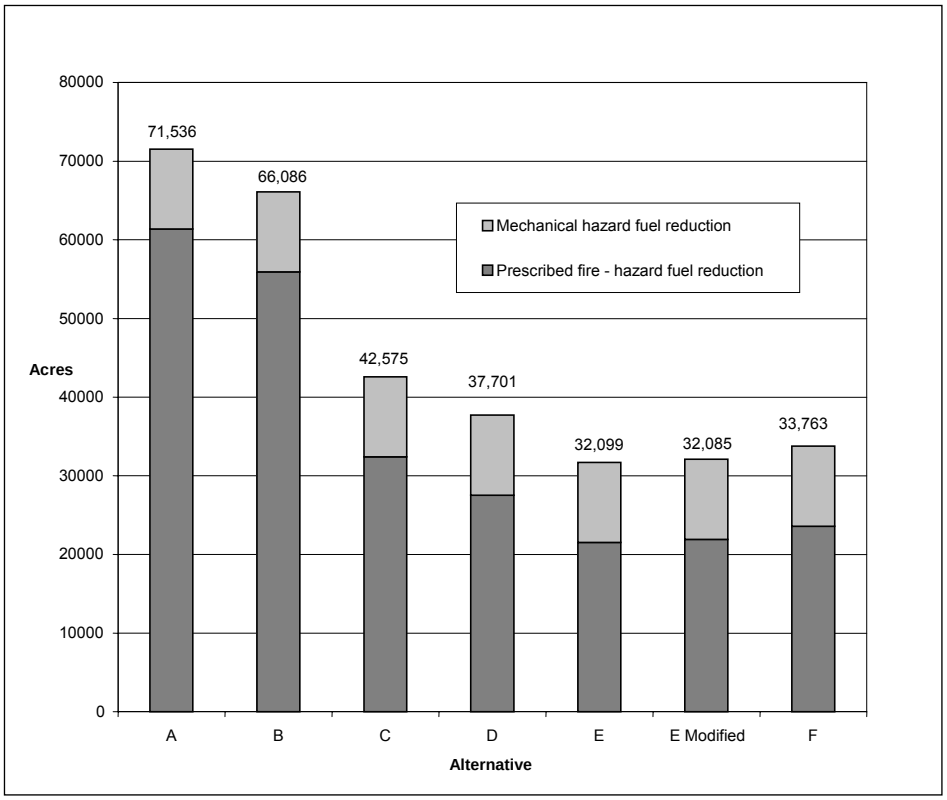


Figure 3 - 49. Total Acres of Fuels Reductions projected for first decade.

Table 3 - 39. Measures of projected fuels reduction-related activities that could create potential NNIS habitat in the next decade (in acres).

	A	B	C	D	E	E Modified	F
Prescribed fire hazard fuel reduction	61,355	55,905	32,394	27,520	21,508	21,904	23,582
Mechanical hazard fuel reduction	10,181	10,181	10,181	10,181	10,181	10,181	10,181
Dozer line construction	15	15	14	14	14	14	14
Total Fire Disturbance	**71,551**	**66,101**	**42,589**	**37,715**	**31,703**	**32,085**	**33,777**

Effects of Vegetation and Habitat Management

Prescribed fire may also be used to improve wildlife habitat, control NNIS, or regenerate oak communities. In addition to fire, various silvicultural techniques may be employed to improve habitat and maintain forest health. Prescribed fire impacts are identified above.

Timber harvesting may help spread NNIS plants through direct introduction on heavy machinery and through site alteration caused by canopy removal and earth disturbance. Movement of forest products can also spread NNIS insects and diseases. The projected acreages for transportation of timber products (skid trails, logging road, etc) are included in the Roads section of this chapter. Timber sale contracts require cleaning of equipment coming from areas known to contain NNIS

populations, and may be applied to log trucks, skidders, and other off-road equipment. Reseeding efforts require the use of NNIS-free seed.

While timber harvesting can help spread NNIS plants, insects, and diseases, it can also be applied to reduce potential impacts of NNIS insects and diseases. Timber harvests are designed to increase the vigor of the residual stand and thus reduce mortality from future outbreaks of NNIS, such as the gypsy moth.

Reforestation activities primarily involve prescribed burning and handheld herbicide applications to larger trees. Acreages provided below do not double count those areas projected to be burned twice within the first decade. For burning impacts on NNIS, see the Fire Section of this chapter. Herbicide for oak stand improvement will create increased light environments within the forest. Whether invasive species increase depends on the proximity of established NNIS populations or seedbanks in the vicinity. Since heavy equipment is not used in these activities, there is little, if any, soil disturbance and lower chances of NNIS introduction.

Timber Stand Improvement (TSI) activities primarily involve crop tree releases and grape vine removal in young stands (approximately 15 years old). If these stands are dense and young, it is likely the areas have sustained a lot of disturbance in the past and established NNIS are likely to already occur. TSI improvements involve removal of trees and vines by ground crews using hand held chainsaws, not heavy equipment. While light penetration is likely to change, soil disturbance and introduction of NNIS to the areas should be minimal. Pine site preparation may require scarification of small amounts of soil to encourage pine regeneration if timber harvest and burning activities do not provide enough soil disturbance. Pine site prep will require equipment and soil disturbance and will have similar impacts as skid trails on NNIS.

Wildlife habitat improvement projects can either increase or decrease the potential for NNIS. Projects including soil disturbance and large machinery are likely to increase NNIS invasion potential, while projects that focus on native plant establishment and NNIS control could reduce NNIS and create healthier communities resistant to NNIS invasion.

Analysis of Alternatives

Tree harvesting activities and timber transport (covered in the Roads section) are the vegetation management activities with the highest overall disturbance and potential for NNIS habitat creation (Figure 3 - 49). However, Forest-wide standards and guidelines reduce the potential spread of NNIS by including NNIS-specific clauses for timber contracts (FH-8), cleaning of Forest Service field equipment between uses (FH-9), using NNIS-free mulch when available (FH-13) and encouraging the use of native species for revegetation projects (FH-11). In terms of timber harvesting, Alternative C holds the highest potential for NNIS spread and

establishment followed in decreasing potential by Alternatives D, E, F, B, and A, with A having the lowest overall potential for NNIS habitat. Fewer impacts to NNIS spread would occur from TSI and reforestation activities (Figure 3 - 50).

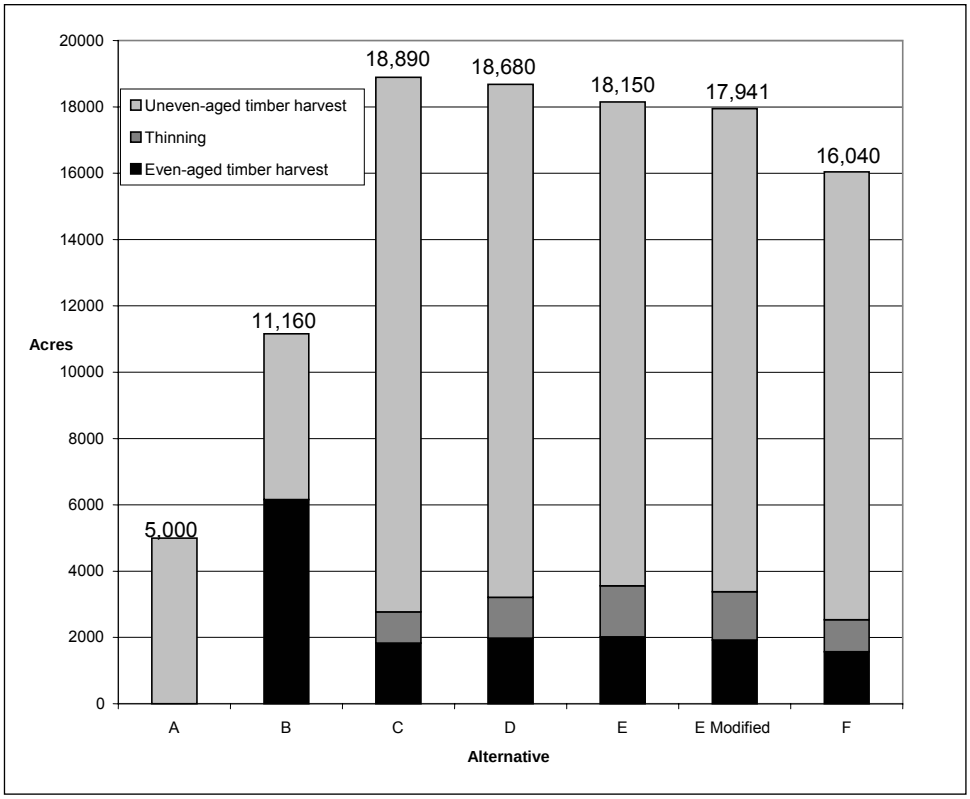


Figure 3 - 50. Total Acres of Timber Harvest projected for first decade.

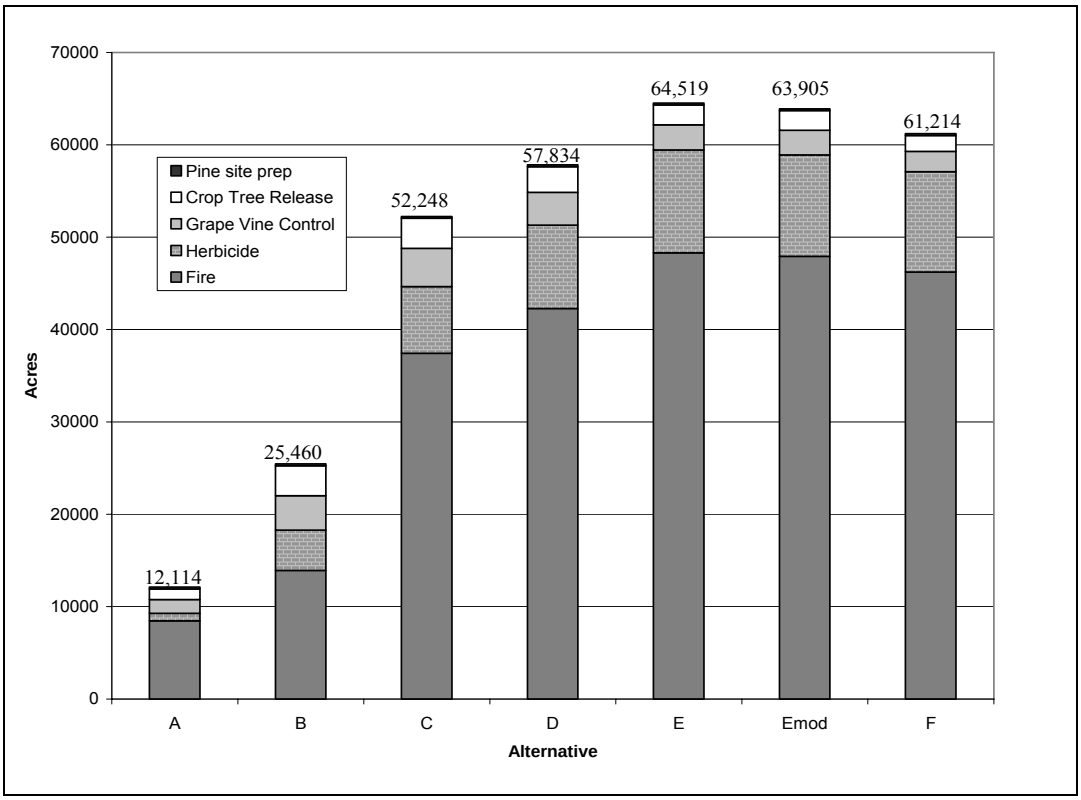


Figure 3 - 51. Total Acres of TSI, Reforestation, and Prescribed Fire for oak regeneration projected for first decade.

Table 3 - 40. Measures of projected Habitat and Vegetation Management Activities that could create potential NNIS habitat in the next decade (in acres).

	A	B	C	D	E	E Modified	F
Uneven-aged timber harvest	5,000	5,000	16,120	15,470	14,590	14,556	13,500
Even-aged timber harvest	0	6,160	1,830	1,980	2,020	1,925	1,570
Thinning	0	0	940	1,230	1,540	1,460	970
Prescribed Fire	8,464	13,914	37,425	42,299	48,311	47,915	46,237
Herbicide Application	800	4,376	7,236	9,005	11,155	10,994	10,846
Crop Tree Release	1,150	3,250	3,239	2,786	2,142	2,113	1,719
Grape Vine Control	1,500	3,720	4,148	3,544	2,711	2,683	2,212
Pine Site Preparation	200	200	200	200	200	200	200
Total Vegetation and Habitat Disturbance	**17,114**	**36,620**	**71,138**	**76,514**	**82,669**	**82,046**	**77,254**

Effects from Energy and Mineral Development

The impacts of road construction and maintenance for mineral exploration and development would be similar to those described in the Roads section. Production site preparation and pipeline installation would also create areas of disturbed soil that could invite NNIS infestation.

Analysis of Alternatives

Mineral development activities with potential to create NNIS habitat would be similar across alternatives, 1,441 acres over the next decade.

Effects from Special Uses

Utility corridor construction creates soil disturbance and potential NNIS habitat. Maintenance activities to maintain corridor accessibility prevents the natural succession of these areas and maintains open light environments preferred by many NNIS.

Special Use requests vary widely in the amount of disturbance and thus their potential for NNIS introduction and establishment. While road construction activities to provide access to private land can increase NNIS, mowing of hayfields can reduce NNIS by controlling invasive species like multiflora rose. Likewise, while grazing permits for livestock can introduce and move NNIS to new areas, livestock can also be used to control invasives like kudzu (Luginbuhl, 1996 and 1999).

Analysis of Alternatives

Utility Corridor and Special Use activities with potential to create or decrease NNIS habitat would be the same across Alternatives, approximately 100 acres over the next decade.

Effects from Land Ownership Adjustment

Land exchanges can result in the loss or gain of NNIS infestations on the Forest. Biological evaluations of the areas involved during the process include assessing the ecological values of the involved land tracts. Decisions on the land exchange take into account the biological evaluation and ecological value of the tracts involved.

Whether land acquisition will increase the potential for NNIS on the Forest depends on past uses of the property. Areas affected by disturbance (e.g., timber harvest, agricultural use) will likely have NNIS already present. If so, the land will likely be allowed to revegetate via ecological succession under Forest Service management. NNIS that require high amounts of sunlight are likely to be replaced by native species over time (Meiners, et al). Conversely, shade-tolerant species, such as garlic mustard, are likely to continue to spread if already present.

Analysis of Alternatives

Land ownership adjustments with potential to create or decrease NNIS habitat would be the same across alternatives. Acreages estimates for this activity will depend on budget and land availability. Projections total as many as 40,000 acres of acquisition, and 400 acres of exchange over the next decade.

Effects from Threatened and Endangered Species (TES) Management

Ground disturbing activities during TES management or reintroduction can increase NNIS by providing new areas for establishment or spread. Conversely, protection of TES areas, including reduced ground disturbance, can decrease NNIS potential.

Analysis of Alternatives

Acreages impacted or protected by TES would be the same across alternatives.

Effects from Soil and Watershed Management

Over the short term, an increase of NNIS would likely occur in watershed improvement areas due to ground disturbance. Likewise, since these areas often are already highly disturbed, NNIS populations that will expand and spread during construction tend to be already established. Conversely, the decrease in bare soil with watershed restoration (decrease in erosion, acid mine drainage and flooding activities) overtime could decrease NNIS establishment and spread.

Analysis of Alternatives

The acreage affected by watershed and soil management activities would the same across all alternatives, 622 acres per decade.

Summary

The management activities with the potential to create NNIS plant habitat are summarized, by alternative, in Figure 3 - 50 and Figure 3 - 51. Table 3 - 41 shows the total acres, by alternative, of management activities that have the potential to increase NNIS invasion or spread within project areas. Those activities identified as potentially increasing or decreasing NNIS potential were not quantifiable and therefore are not included in the summary. The numbers reflected below give a mechanism to compare differences among alternatives and their potential impact on NNIS on the Forest by comparing those activities that differ across alternative. The driving forces in this comparison are prescribed burning for hazardous fuel removal and vegetation management (burning and timber harvesting.)

Table 3 - 41. Management activities that may create potential NNIS habitat (in acres) by alternative.

	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. E Modified	Alt. F
Roads and Facilities	523	872	1286	1259	1258	1288	1139
Recreation and Facilities	364	364	325	362	325	325	285
Fire Management	71,551	66,101	42,589	37,715	31,703	32,099	33,777
Vegetation and Habitat	17,114	36,620	71,138	76,514	82,669	81,846	77,254
Energy and Minerals	1,441	1,441	1,441	1,441	1,441	1,441	1,441
Special Uses	100	100	100	100	100	100	100
Soil and Watershed	622	622	622	622	622	622	622
Total	**91,715**	**106,220**	**117,501**	**118,013**	**118,118**	**117,721**	**114,618**

Alternatives C through F would have similar potential for NNIS spread, but slightly higher than Alternatives A and B because the highest acreage of soil disturbance and/or vegetation removal would be incorporated into Alternatives C through F. Alternative A would present the lowest potential.

Cumulative Effects for Habitat Indicator 9

NNIS will continue to spread onto NFS lands from adjacent and intermingled lands of private and other agency ownerships. Likewise, NNIS from NFS land will continue to spread to adjacent non-National Forest Service lands. Activities outside the Forest that could increase NNIS include:

- Forestry activities (timber harvesting and related activities)
- Agriculture use (farming and grazing)
- Recreation activities and construction of trails
- Road use and construction
- Commercial and private construction activities (home and commercial building, parking lots)
- Stream channelization
- Refuse facilities construction and use
- Mineral developments (coal mining, strip mining, oil and gas drilling).

While some of these activities are similar to those that occur on the Forest, some are activities not seen on NFS land. Also, while similar activities may occur on the Wayne as well as private lands, often the amount and methods can vary. An example is differing road densities on NFS land in contrast to other ownerships.

The 2006 Forest Plan contains Forest-wide objectives (7.2a and 7.2b) that encourage working with adjacent land owners to identify areas of NNIS infestation and to coordinate treatment and monitoring of NNIS.

Habitat Indicator 10: Amount of NFS lands allocated to management areas that allow timber harvesting

Timber harvesting is a management tool used to regenerate oak, hickory, other hardwoods, and pine species and to alter the structure of one or more forest stands. Depending on the methods used, timber harvesting mimics some of the conditions created by natural disturbances such as small wind events, floods, ice storms, and tornadoes. Natural succession and disturbances are allowed to occur on portions of the WNF. On other portions of NFS land, timber harvesting may be used to ensure adequate habitat is available for species of viability or conservation concern or for species of public interest, such as wild turkey or ruffed grouse, and to improve and maintain forest health.

Timber harvesting is broken into two broad harvest method categories: even-aged and uneven-aged management.

- Even-aged management produces a mosaic of different-aged forest stands. Locations of different-aged stands change continually through time as mature stands are harvested, middle-aged stands grow to maturity, and young stands grow to older age classes. Even-aged stands generally have one age class, although two age classes can be found in some two-layered natural or managed stands. These stands generally have a well-developed canopy with a regular top at a uniform height. Even-aged management includes thinning as well as the clearcut, shelterwood regeneration, and two-age methods.

  Thinning – Some trees in a stand are removed to reduce the density of trees on the site and to encourage healthier and larger individual trees.

  Clearcut – The stand overstory is generally removed in one harvest.

  Clearcutting with Reserves – A clearcutting method in which varying numbers of reserve trees are left standing to attain goals other than regeneration. The overstory trees that would be retained, called reserve trees, may be small or large trees, or combinations of small and large trees, retained for future growth; certain species components; current or future den trees; future sources of snags or coarse woody debris; or some level of visual quality.

Shelterwood – The cutting of most of the trees, but leaving those needed to produce seed and create forest floor light conditions favorable for seedling development.

Two-aged – Regenerates a timber stand and maintains two age classes.

- An uneven-aged stand has trees of three or more distinct age classes, either mixed throughout the stand or in small groups. Uneven-aged management includes single-tree selection and group selection methods.

  Single-tree Selection – The act of harvesting single trees or small clumps of trees to achieve and maintain a specific diameter distribution and create a new age-class of tree regeneration.

  Group Selection – A method of tree regeneration in which the objective is to create an uneven-aged stand by regenerating parts of the stand by cutting small "groups". Each group can be up to two acres in size. It creates small openings in the canopy.

The forest communities on the WNF today generally grew from clearcut timber harvests over the last 200 years. A combination of land clearing for agriculture, mining, and charcoal production for iron furnaces meant the forested land was cleared one or more times after 1800.

Current Condition

Timber harvesting has been used on the Wayne to produce early successional habitat as well as to improve diversity of forest stand structure. Currently, uneven-aged management and thinning are the only timber harvest methods available for use to treat forest stands (refer to Amendments 11 and 13 of the 1988 Forest Plan).

Direct and Indirect Effects Common to All Alternatives

Some type of timber harvesting is incorporated into each alternative as a habitat management tool which will affect plant and animal habitat diversity. These effects will vary by site, timing, duration, intensity, and type of management activity. Activities associated with timber harvest that can also affect plant and animal habitat diversity include road reconstruction, temporary or permanent road construction, skid road and landing development, timber stand improvement, and herbicide application.

In general, the direct effects of timber harvest, tree felling, and equipment use, include disruption of nests and animal activities. There is potential for mortality, mainly among individual plants and small, relatively immobile animals such as amphibians, nestling birds, or mammalian young. Other animals, including adults of most species, would vacate an area during

such disturbance. In addition to direct mortality, loss could occur during the breeding season if nests or young are abandoned due to the disturbance. The structural diversity of the forest stand and forage quality and quantity may be indirectly affected by timber harvesting.

Even-aged management would directly reduce the amount of mature and overmature forest. A forest stand generally requires about 60 to 80 years to attain mature characteristics, depending on whether it is pine or hardwood. Each newly regenerated stand, in time, reverts to mature woodland after passing through various stages of succession. Wildlife diversity also changes through time on each treated site as plant succession progresses.

While habitat for species requiring mature forest may be modified, habitat is created or enhanced for species that satisfy part or all of their life requirements in brushy-young forest. Even-aged management is beneficial for a variety of shrub and early forest species (e.g., yellow-breasted chat and ruffed grouse), and is a primary tool used to regenerate oak and hickory. Rich et al. (2004a) point out that certain Neotropical migratory birds with declining population trends benefit from the creation of early successional forest habitat. Furthermore, there are indications that certain forest interior Neotropical migratory birds use early successional forest habitat for feeding between the time the young fledge and the birds leave for their wintering grounds, including the cerulean warbler and worm-eating warbler (Vitz 2003). Even-aged management methods that retain trees in the harvest unit (e.g., clearcut with reserves, shelterwood, and two-age) can provide habitat for both early successional species, as well as some species typically associated with mature forest (Annand and Thompson, 1997; Rodewald and Yahner, 2000).

Uneven-aged management will reduce the number of trees per acre, temporarily resulting in a more open stand structure below the forest canopy. The canopy is temporarily changed from a dense, closed condition that provides almost 100 percent shade to a more open canopy through which some sunlight reaches the forest floor. Periodic removal of selected trees maintains vertical diversity in canopy structure.

Indirect effects of uneven-aged management include changes in light penetration to the forest floor and increased diversity of stand structure where the canopy was opened. Increased sunlight to the forest floor allows more vigorous growth of tree seedlings, shrub species, and herbaceous plants. This may be adverse for plants and animals that prefer shaded, open understories, but may benefit some animals that reproduce or feed in the understory or shrub layers. As an example, Kilgo et al. (1999) concluded that group-selection harvests provided food sources for songbirds during fall migration, including insectivorous species that apparently shift their diet preferences to fruit during the fall. Changes in stand structure may result in short-term changes in the mature forest avian

community, especially if trees in the understory and shrub layer are removed (Rodewald and Smith, 1998). Stands that are treated with uneven-aged timber harvesting methods eventually grow back to a closed canopy, often with greater structural variation than before harvest.

Timber stand improvement includes crop tree release and grapevine control. Crop tree release involves the girdling or felling of smaller-sized trees (usually less than 6 inches dbh) to create enhanced growing conditions for specific trees, often mast-producing species. Crop tree release indirectly benefits future mast production and the species that depend on mast for food. It may also indirectly benefit species which utilize smaller snags for roosting or perching. Grapevine control includes the cutting of some grapevines that may be adversely affecting the growth of certain trees, especially mast-producing trees. Some vines are cut, while others are left in each stand to provide soft mast for wildlife.

Herbicide application to control competing species is confined to the stump or base of the tree bole, but drift could result in direct effects to nearby understory or shrub layer plants. These effects would be minimized because herbicide application would adhere to label directions and requirements. The indirect effects of herbicide application are a reduction in shade tolerant tree species and an increase in oak-hickory regeneration. Species which depend upon oak-hickory mast would benefit, but the benefits may not be seen for a few decades until the trees mature and begin producing acorns and nuts.

Permanent roads, temporary roads, skid roads and log landings are needed for timber harvesting activities. A larger road system is generally needed for areas treated with uneven-aged timber harvesting. Construction or reconstruction activities may result in the direct mortality of plants and less-mobile animals, and the loss of plant and animal habitat. Changes can occur in understory vegetation along the road and in adjacent forest stands because of increased sunlight. For example, species like blackberry and other fruit producing shrubs may flourish, thereby benefiting animal species which rely on these plants for food or cover. Certain native plant species, some of which are rare, can grow and even thrive in disturbed, open edge habitats along roadsides. Roads can indirectly provide a means for dispersal of non-native invasive plant species and increased herbivory by grazing wildlife (e.g., deer).

Timber harvesting and roads used to manage the forest stands can result in habitat fragmentation, or in other words, they can create a greater number of habitat patches that are smaller in size than the original contiguous tract of habitat. Even-aged management may fragment mature, contiguous forest until the stand once again reaches a successional stage that is no longer an ecological barrier to interior mature forest species (Rosenberg et al., 2003). The effects of habitat fragmentation vary by species or species group, however. Roads have been implicated as creating a barrier to

species movement such as small mammals, which in turn affects the gene flow among populations (summary in Conrey and Mills, 2001). Data indicate that the relative abundance of forest interior Neotropical migratory birds is not reduced along narrow forest roads less than 24 feet in width. Rich et al. (1994b) inferred that most of these species do not react to narrow forest dividing corridors as they would forest fragmentation.

Even-aged management and roads create habitat edge, which can indirectly increase local plant and animal diversity. For example, Rodewald and Brittingham (2002) noted that flock size and species abundance in flocks of fall migrating birds were greatest in forest edges, possibly due to higher food availability (i.e., arthropods and fruit), vegetation structure, or microclimate conditions. However, habitat edge can reduce habitat quality and quantity for certain species, including Neotropical migratory forest interior songbirds. Edge-related effects of increased nest predation and nest parasitism have been implicated in reduced nesting success of some forest interior bird species. However, edge effects on nesting success appear to be influenced by the degree of habitat fragmentation at the landscape scale rather than the local scale (Chalfoun et al., 2001; Stephens et al. 2003), as evidenced in studies conducted in the Midwest (Robinson et al., 1995), Northeast (Gale et al. 1997), Pennsylvania (Rodewald, 2002), and within the WNF (Dettmers, 1997). As an example, nest parasitism by brown-headed cowbirds has been negatively correlated to the percentage of forest cover at the landscape scale, possibly because cowbird populations may be limited by availability of foraging areas than by host availability (Robinson et al., 1995). The WNF lies within a heavily forested landscape where 80 percent of all lands within the proclamation boundary are covered by forest (Landsat TM, 1994). Dettmers (1997) found that parasitism rates of forest breeding songbirds on the Wayne were lower than rates documented in the western parts of the Midwest.

Effects that Vary by Alternative

Fifteen management areas are integrated into the alternatives; eight of these management areas would contain prescriptions for timber harvest as a plant and animal habitat management tool. These management areas include: Diverse Continuous Forest (DCF), Diverse Continuous Forest with OHVs (DCFO), Forest and Shrubland Mosaic (FSM), Forest and Shrubland Mosaic with OHVs (FSMO), Grassland and Forest Mosaic (GFM), Historic Forest (HF), Historic Forest with OHVs (HFO), and River Corridors (RC).

All alternatives would allow for plant and animal habitat to be managed to some degree with timber harvesting (Figure 3 - 52). Alternatives A and B would allocate 87.8 percent of NFS land to management areas that prescribe timber harvesting for purposes of plant and animal habitat

management. On the other end of the spectrum, Alternative F would allocate a greater amount of NFS land to management areas that favor natural succession and natural disturbance; therefore it would allocate the least amount of NFS land (71.4%) to management areas that prescribe timber harvesting for purposes of plant and animal habitat management. Alternatives C, D, E, and E Modified would allocate fewer acres of the Forest to management areas that allow timber harvesting for plant and animal habitat management than Alternatives A and B, but more acres than Alternative F.

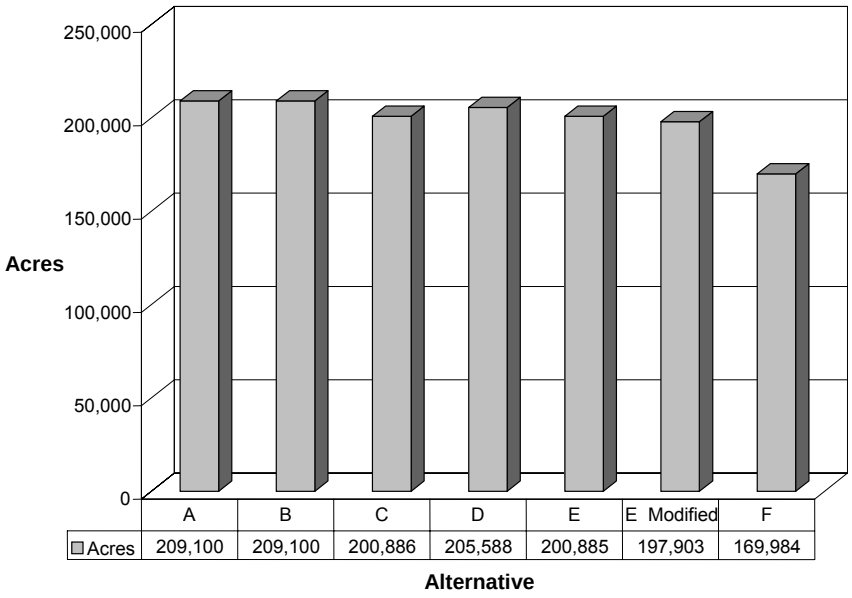


Figure 3 - 52. Acres of NFS land allocated to management areas that include timber harvest as part of plant and animal habitat management.

Cumulative Effects for Habitat Indicator 10

A historical overview of timber harvesting and forest change within the Wayne National Forest proclamation boundary, the cumulative effects analysis area, is provided in Appendix D of this DEIS. The cumulative effects of past timber management and removals have created the forests now present. The species composition, age class distribution, and product outputs of today are the results of past management activities that occurred during the last century.

The forests within the WNF proclamation boundary are managed in a variety of ways and by a variety of landowners, including the Ohio Division of Forestry, Ohio Division of Wildlife, MeadWestvaco Corporation and private landowners. Forests are managed to ensure forest health and to provide quality wildlife habitat in areas like Dean State Forest, Cooper Hollow Wildlife Area, Zaleski State Forest, and other

State-managed properties. A primary goal of MeadWestvaco Corporation is to supply fiber to its Chillicothe, Ohio mill in two forms – hardwood pulp and softwood pulp.

Approximately 80 percent of the lands within the WNF proclamation boundary are forested. Extrapolating the results of an Ohio-wide survey of private forest landowners (Birch, 1994) suggests that it is possible that some type of harvest activity could occur on up to 45 percent of the private forest land in the cumulative effects analysis area over the next decade. Timber harvesting on NFS land would affect only small amount of the forested land in the cumulative effects analysis area over the next decade: Alternative A (0.9%), Alternative B (2.1%), Alternative C (3.2%), Alternative D (3.1%), Alternative E (2.9%), Alternative E Modified (2.8%), and Alternative F (2.6%). The cumulative effects of managing forest habitat on NFS land to improve plant and animal habitat are outlined in the cumulative effects section for Habitat Indicators 1 through 6. The economic effects of timber harvesting on the WNF is described in Appendix K of this Final EIS.

Issue Indicator 11: Amount of NFS lands allocated to prescribed fire and mechanical fuels reduction

Prescribed fire is a management tool used to restore or improve plant and animal habitat, return the land to historic conditions, and reduce hazardous fuels. Periodic, low intensity fire is one tool that will maintain quality habitat for grassland-obligate species by reducing the encroachment of woody vegetation (Ewing, 2003b). It will reduce canopy and midstory canopy cover in oak barrens where plant species need open canopy conditions (Bender, 2000). Officials in the Great Smoky Mountains National Park have successfully used prescribed fire to enhance rare plant populations; the prescribed fire decreases leaf litter and duff, stimulates flowering, or reduces individual diseased plants (Rock, 2000). Blackberry, blueberry, persimmon, flowering dogwood and chokeberry are examples of soft mast (i.e., an important nutritional source for many animals) that has been shown to increase two to five years after prescribed fire (Weaver, 2000). Fire will also enhance the success of oak regeneration on drier sites (Van Lear et al., 2000; Dolan and Parker, 2004).

In the central hardwood forest, the climate warmed and became drier 5,000 to 8,000 years ago, and frequency of fire increased. Native American peoples utilized fire to clear forest from around their camps, clear brush for improved hunting, and for better visibility to protect against enemy attacks (Fralish, 2004). Fire was a disturbance process that historically occurred in oak-dominated ecosystems in Ohio (Hutchinson et al., 2003; Sutherland et al., 2003). For example, fire scar analysis of Vinton County, Ohio, oaks that originated in the mid-1800s, after European settlement but prior to fire suppression efforts, suggested that fires occurred when the tree cambium was dormant, from August to mid-April, but most fires occurred during March and April (Sutherland, 1997). The fire scars indicated that annual fires were unusual and low intensity fires occurred at this site every 3 to 4 years. It was unusual for a more than 12 years to pass between fires. Major fires occurred about every 7 to 8 years at this study site.

Fire is incorporated into the seven alternatives as a management tool to help control non-native invasive species, maintain or improve herbaceous and shrubland habitat, regenerate oak and hickory, and to reduce hazardous fuels.

Affected Environment

Over 90 years of fire suppression has resulted in changed ecological conditions, less forest cover in fire-tolerant species (oaks and hickories), and increasing presence of fire-intolerant and shade tolerant species (maples, yellow popular, etc.). Additionally, heavy leaf litter, downed timber, and denser undergrowth are resulting in fuel loads three to five times heavier than historical norms.

Forest managers now recognize that a "natural" fire regime, a general definition of the role fire would play across a landscape in the absence of modern human mechanical intervention, would include an influence similar to Native American burning. Five natural (historical) fire regimes are classified based on the average number of years between fires (fire frequency) combined with the severity (amount of replacement) of fire on the dominant overstory vegetation. The classification system includes the following five fire regimes:

I – 0 to 35 year frequency with low (surface fires most common) to mixed severity (less than 75% of the dominant overstory vegetation replaced)

II – 0 to 35 year frequency with high (stand replacement) severity (greater than 75% of the dominant overstory vegetation replaced)

III – 35 to 100+ year frequency and mixed severity (less than 75% of the dominant overstory vegetation replaced)

IV – 35 to 100+ year frequency and high (stand replacement) severity (greater than 75% of the dominant overstory vegetation replaced)

V – 200+ year frequency and high (stand replacement) severity.

Fire Regime Condition Classes (FRCC) are used by Federal land management agencies, particularly the Forest Service, as a qualitative measure to describe the degree of departure from historically normal ranges. The current condition of key ecosystem components, such as species composition, structural stage, canopy closure, and fuel loadings define these three classes:

Condition Class 1 – Within the natural (historical) range of variability of vegetation characteristics; fuel composition; fire frequency, severity, and pattern; and other associated disturbances.

Condition Class 2 – Moderate departure from the natural (historical) range of variability of vegetation characteristics; fuel composition; fire frequency severity, and pattern; and other associated disturbances.

Condition Class 3 – High departure from the natural (historical) range of variability of vegetation characteristics; fuel composition; fire frequency, severity and pattern, and other associated disturbances.

Most of the Wayne National Forest is in Condition Class 2 and Condition Class 3. This indicates a moderate to high level of alteration. Fuel types have changed since the year 1800, with the most recent change occurring over the last 80 years with the suppression of nearly all fires. Vegetation mapping and descriptions of historical natural communities reveal that the forest land was generally characterized by open woods comprised of fire-adapted trees with herbaceous and grassy understories (Fuel Model 2, fine herbaceous fuels, litter and dead downed wood from the shrub and timber

overstory). These evolved to dense closed oak canopies (Fuel Model 9, leaf litter with a minimum fuel loading of approximately 4 tons/acre) as fire was excluded.

Historically, frequent fires burned at low intensities through grass/herb fuels. The current Fuel Model 9 on the Forest is estimated to be around 10 to 12 tons/acre. This is based on data generated from control fuel plots installed on the Ironton District in 2003 and on the experience of WNF fire personnel. Increased fuels contribute to higher-intensity wildfires, often with potentially catastrophic effects to timber, homes, and wildlife.

The net effect of the alteration of historic fire return-intervals has increased fuel accumulations above historic levels over large, continuous areas. Apart from the ecological consequences, the possible impacts of this, coupled with the increase of the wildland/urban interface, include the following threats:

- Increased risk of large, severe fires
- Increased risk of serious injury or loss of life to firefighters and the general public
- Increased risk of health effects due to smoke and visibility impairment
- Increased risk of property loss and damage to landscapes that have economic value to people
- Increased fire suppression costs.

Reintroduction of fire is proposed for a number of ecological reasons and to reduce the probability of adverse impacts of wildland fire on public land and adjacent private land and structures. The area where public forest land and private homes and communities come together is commonly referred to as the Wildland Urban Interface (WUI). Nearly the entire Wayne National Forest can be classified as WUI, containing at-risk communities. Development pressure in the WUI is increasing, making management of wildland fire risk on the Wayne a higher priority.

Community developments occur throughout the entire land-holdings of the WNF, as NFS ownership is currently just over 28 percent of the area within the proclamation boundary. Homes and farms interspersed with the Forest would benefit directly from fuel reduction projects on NFS land.

Late-winter through early-spring (i.e., the dormant season) is the primary prescribed fire period on the Wayne, although late-fall offers some opportunity for burning. The Forest Service has used prescribed fire to treat 608 acres of NFS land since 1998 (Figure 3 - 53). These prescribed fires were conducted to improve terrestrial plant and animal habitat and to reduce hazardous fuels. These prescribed fires have occurred on the Athens Unit and the Ironton Ranger District.

The Forest Service's Northeast Forest Experiment Station has conducted prescribed fire research in southeastern Ohio, and some research plots are located on NFS land (Sutherland et al., 2003). The plots are burned at varying frequencies to study the effects of fire to oak regeneration and to forest plant and animal resources.

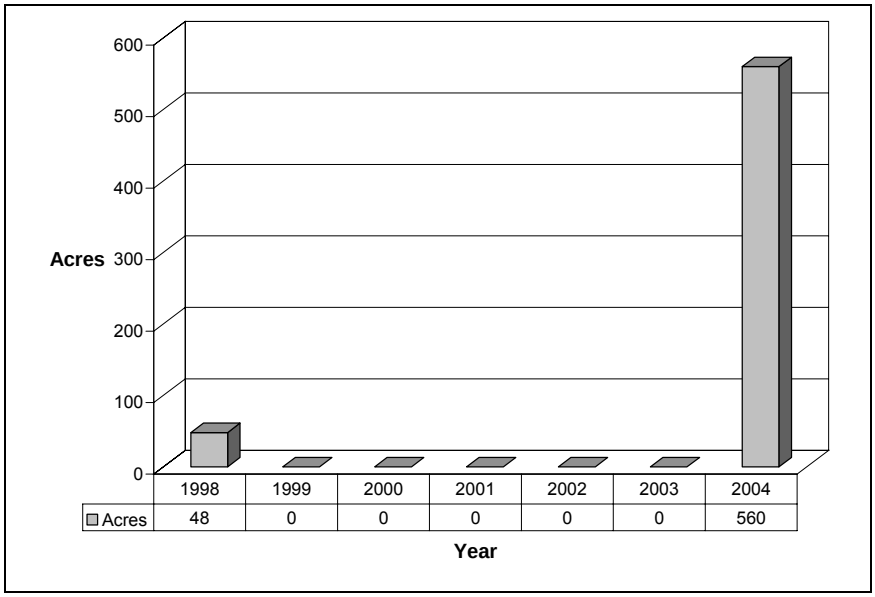


Figure 3 - 53. Acres of NFS lands treated with prescribed fire, 1998-2004.

Direct and Indirect Effects Common to All Alternatives

Fire played a role in the development and maintenance of the oak-hickory forests in the central hardwoods region in the past. However, some researchers (e.g., Kalisz and Powell, 2000) caution that the complexity of ecosystems make fire-effects difficult to understand and predict. Ongoing research studies in southeastern Ohio and the central hardwoods region have provided the following information about the direct and indirect effects of prescribed fire on plant and animal habitat diversity.

Direct Effects

Flames may cause direct injury or death to herbaceous or woody vegetation depending upon when during the year the fire is conducted, the intensity of the fire, and the structural characters of the vegetation (e.g., thickness of tree bark) (Hutchinson and Sutherland, 2000). Some to all of the unconsolidated leaf litter and fine woody material on the forest floor may be consumed within the burn area. As temperature at the forest floor surface increases temporarily, mortality of organisms living in the litter-humus interface may occur (Boerner, 2000). And, less mobile, ground-dwelling animals may be injured or killed.

Any fire, wildland or prescribed, creates smoke. Emissions created by prescribed fire are now subject to Federal Clean Air Act requirements, including standards for regulation of regional haze and the recent revisions to the National Ambient Air Quality Standards (NAAQS) on particulate matter. Additionally, the Ohio Department of Natural Resources/Division of Forestry and the Ohio Environmental Protection Agency require permits and waivers for open burning.

A burn plan is completed before each project burn and must contain provisions for proper smoke transport and dispersal. Direction of smoke, dispersion indices, and transport winds are essential in planning these operations.

Indirect Effects

According to Boerner (2000), transfer of heat to the unburned humus and upper soil layers may induce mortality of soil organisms, especially where concentrations of woody debris continue to smolder. Data suggest that soil animals (e.g., springtails, mites) are more likely to be affected if they are within the litter rather than the mineral soil, but these animals appear to be able to repopulate an area after periodic prescribed fire. Fires conducted annually on the same site may reduce the abundance of these organisms. While few data exist, the same pattern appears to be true for the microbial community (e.g., fungi, bacteria); recolonization of burned areas occurs, but microbial abundance is lower where lengthy smoldering occurred.

Hutchinson and Sutherland (2000) reported that long-term studies of forest communities subjected to prescribed fire show the understory response can be variable. But for the most part, small increases in plant species richness or diversity occurs in the central hardwoods region. A shift in plant species composition may occur in the understory due to the reduction in leaf litter and exposure of mineral soil. Light availability to the understory may increase slightly during the growing season, soil nutrients and pH may increase from litter ash, and soil moisture may decrease due to increased evaporation.

Prescribed fire may reduce the amount of leaf litter and shrubs in the understory over the short term, leading to a short-term loss of suitable habitat for ground nesting bird species such as the ovenbird and worm-eating warbler or shrub nesters like the hooded warbler. This, in turn, may lead to decreased abundance of these species, a change in bird species composition, and the potential for lowered reproductive success over the short-term (Aquilani et al., 2000; Artman et al., 2001).

Prescribed fire may enhance the abundance and diversity of hard mast (e.g., acorns) and soft mast (e.g., blackberry, persimmon, and flowering dogwood) (Weaver, 2000). These foods are important to many birds and mammals, including the black bear. Prescribed fire, used to discourage the

growth of some woody vegetation in grassland and prairie habitats, will encourage production and flowering of some native grasses and forbs.

Construction of firelines, either by hand or by machine, may affect plant and animal habitat diversity. Leaf blowers and rakes are used to manually remove the litter layer from the ground to create a barrier that helps contain the fire. Removal of the litter likely displaces insects and other invertebrates to adjacent areas but should have no long-term effect on the understory vegetation. Mechanized equipment is used to construct firelines in certain cases, primarily on old roads where trees have grown up or in areas where firefighter safety demands a larger firebreak. While care is taken to uproot only trees and remove the litter layer, at times upper soil layers may be removed and placed off-site. In addition to displacing organisms, revegetation of such sites may take longer relative to areas where non-mechanized construction of firelines occurred.

Prescribed fires are considered low intensity fires, and thus, short-term and small-scale increases in surface runoff to streams could occur with consumption of ground vegetation. Until revegetation occurs, transport of sediment and nutrients to nearby streams could increase. Nutrients in the litter, vegetation, and soil can be redistributed by leaching of the ash layer and soil. Surface erosion, or solution transport, can then carry them into a stream. Within a short time, elevated nutrient levels subside as revegetation occurs. While the effects of nutrient concentration on aquatic habitat are not well known, levels appear to be below toxic thresholds for aquatic animals (Swanston, 1991). Sediment entering stream courses could settle out onto stream substrates or could remain suspended in the water column, both of which could ultimately affect aquatic productivity or diversity if the source of sediment persists. Forest-wide standards and guidelines incorporated into all six alternatives would minimize the potential for sediment transport to stream channels by ensuring the use of filterstrips when mineral soil may be exposed during fireline construction. Guidance is also provided on using streams as natural firebreaks rather than constructing firelines and for installing erosion control measures on firelines where necessary to control potential soil erosion. In addition, there is guidance that encourages mosaic pattern burning, where mesic areas and riparian areas experience only spotty burning. In such instances, more ground vegetation remains, providing more filtering capacity for sediment and nutrients.

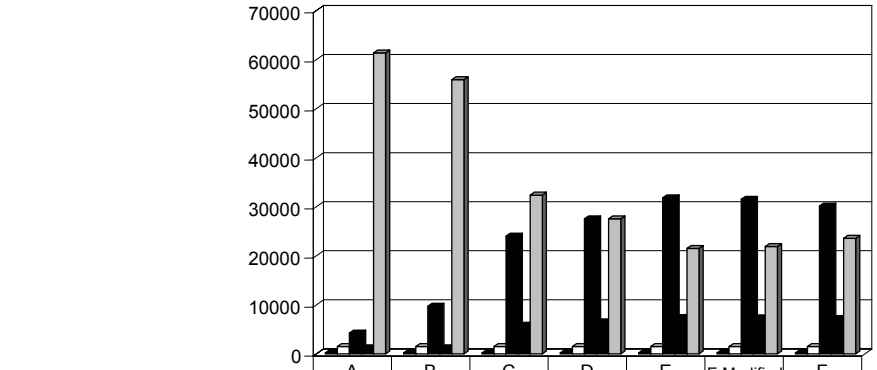
Smoke generated from prescribed fire may indirectly be of concern to:

- Obscured vision on highways, railroads, airports and commercial waterways
- Public health, particularly for residents near fire operations or where smoke may drift
- Firefighter safety and health

- Nuisance issues, such as odor and soiling effects of smoke
- Visibility protection for wildlands and parks.

Effects that Vary by Alternative

All alternatives incorporate prescribed fire as a management tool. Appropriate prescribed fire days are limited each year and to certain times of the year to minimize potential adverse effects to plants and animals. For these reasons, every alternative sets an annual upper limit of 6,982 acres that may be treated with prescribed fire. However, the alternatives vary in the amount of prescribed fire that would be used to manage various resources.



	A	B	C	D	E	E Modified	F
NNIS	200	200	200	200	200	200	200
Herbaceous-Grassy Habitat	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Oak-Hickory Regeneration (One Burn)	4,259	9,709	24,021	27,518	31,807	31,511	30,159
Oak-Hickory Regeneration (Two Burns)	1253	1253	5852	6541	7402	7352	7189
Hazardous Fuels	61,355	55,905	32,394	27,520	21,508	21,904	23,582

Figure 3 - 54. Acres of NFS lands projected to be treated with prescribed fire during the first decade of the planning period.

Habitat and Vegetation Management

Land managers and researchers are studying how non-native invasive plant species react to various control measures, including prescribed fire. Growth of some non-native invasive plant species may become more vigorous after fire. In some cases, however, if used in conjunction with other management tools, prescribed fire may be useful in controlling some non-native invasive plants species (Bennett, 2003). A minimal level of prescribed fire (i.e., 200 acres/decade) is included in the first decade projections for treatment of non-native invasive species.

Certain plant species of viability concern respond favorably with fire, such as the yellow gentian (Larson, 2003), Carolina thistle (McCartney and Swiezynski, 2003), and juniper sedge (McCartney and Goodwin, 2003).

Similarly, some common plants and animals benefit from prescribed fire in permanent forest openings or other herbaceous-grassy habitats. For these reasons, a minimal amount of prescribed fire (1,500 acres/decade) is projected in each alternative to improve herbaceous-grassy habitat.

The acreage of NFS lands projected to be treated with prescribed fire to encourage the regeneration of oak and hickory species, and to some degree pine species, will vary among the alternatives. Alternatives A and B include the least amount of prescribed fire for this purpose, while alternatives C through F incorporate more prescribed fire. Alternatives C through F contain the HF and/or HFO management areas, and the prescription for these management areas calls for prescribed fire to help reduce shade tolerant tree species in the understory. Forest communities in these two management areas would likely be treated with prescribed fire twice in the first decade to mimic typical fire regimes that occurred prior to fire suppression efforts in the early 1900s. The density of the understory and shrub layers is likely to be lower in areas treated with two prescribed burns in one decade than in those treated with just one. Habitat for ground dwelling or shrub nesting species may be reduced with such changes to the understory and shrub layer (Artman et al., 2001).

Fuels Reduction

The Healthy Forest Restoration Act, passed by Congress in December of 2003, promotes treatments to reduce fuel loading on lands in or adjacent to the WUI of at-risk communities and other at-risk Federal lands. The term "at-risk communities" implies that homes and other developments are in very close proximity to wildlands and the untreated fuels that exist outside of historical ranges of FRCC 1. The WNF seeks to work in collaboration with communities to set priorities and, as appropriate, develop Community Wildfire Protection Plans. Through programs such as Firewise, an initiative of the Forest Service sponsored by the National Association of State Foresters, homeowners and residents of WUI communities are instructed to fireproof their dwellings and other improvements. Private citizens can also employ many tactics used by the Forest Service to reduce fuel loads.

The public can access *Firewise* programs through the Website: www.firewise.org. Information is also delivered via television, radio, newspapers, and other media. Fire personnel also visit communities and distribute literature telling residents how to protect themselves. The following are examples of tactics that can be used to reduce risks from wildland fire:

- Defensible space around homes and structures
- Shaded fuel breaks
- Fuels reduction beyond defensible space

- Removal of slash, including piling and burning, mulching, grinding, etc.
- Prescribed fire
- Home maintenance and design to help reduce structural exposure and resistance to fire.

Mechanical reduction of hazardous fuels by large fuel removal, bush-hogging, and lop and scatter methods would remain the same regardless of alternatives. Dozer line construction would be slightly less due to minor road and skid trail construction through the 10-year planning cycle for Alternatives C through F. These roads and trails could then be used for potential fire lines for any prescribed fire action. Dozer line construction throughout all alternatives would be minimal and reclaimed to Forest standards. Though mechanical treatment by any means other than removal will impact potential fire behavior, the fuel loading would remain the same.

Figure 3 - 44 shows the predicted acreage of NFS land that may be affected by prescribed burn and mechanical fuels reduction treatments by alternative. Treatments in any one year may be higher or lower than the average.

Table 3 - 42. Predicted fuels reduction activities for the first decade (shown in acres unless otherwise noted).

Management Activity	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. E Modified	Alt. F
Prescribed Fire for Oak Regeneration *	6,764	12,214	35,725	40,599	46,611	46,215	44,537
Maintenance of Permanent Forest Openings and other Herbaceous Habitats (Mechanical)	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Maintenance of Permanent Forest Openings and other Herbaceous Habitats (Prescribed Fire)	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Control of Non-Native Invasive Species-Prescribed Fire	200	200	200	200	200	200	200
Reduction of Hazardous Fuels - Prescribed Fire	61,355	55,905	32,394	27,520	21,508	21,904	23,582
Reduction of Hazardous Fuels - Mechanical	10,181	10,181	10,181	10,181	10,181	10,181	10,181
Dozer Line Construction	15	15	14	14	14	14	14

* A portion of these prescribed fire projects include acres that are burned twice in one decade.

Alternative A

This alternative, the "no-action" alternative which represents the current Forest Plan, calls for the highest amount of fuel reduction prescribed fire target over the 10-year planning period. It also projects the least amount of fire for vegetative management. Thus, to move the forest's fuel load towards Condition Class 1, especially in areas that are most critical in the WUI, fuel reduction efforts would need to focus primarily on strategic targets, especially high-hazard areas. The burning provided for in this alternative, although beneficial for wildlife and botanical needs, would be funded and carried out primarily to protect communities and any Federal properties at risk. Also, fireline construction using dozers would be a bit more likely in this alternative than in Alternatives C through F.

Alternative B

This alternative would provide for nearly double the amount of vegetative management found in Alternative A. Still it would be only a modest change from the 1988 Forest Plan. Therefore, the amount of hazardous fuel reduction targeted would be second highest among the six

alternatives. The amount of burning to protect at-risk communities would still be very high. Moving forest acreage towards Condition Class 1 would still depend greatly on funding for fuel reduction. Fireline construction using a dozer would be slightly higher in Alternative B than in Alternatives C through F.

Alternative C

Compared to the "no-action" alternative, funding for reduction of hazardous fuels to protect at-risk communities would be nearly halved in this alternative. However, more burning would occur for silvicultural treatments, and the associated benefit of fuel reduction would still be realized, just more economically. Because more hazardous fuels would be treated through vegetation management, funding from strictly hazard fuel reduction accounts could focus on the most critical WUI areas.

Alternative D

This alternative calls for only half the burning purely for hazard fuel reduction as would the no-action alternative. However, a significant number of acres would be burned for vegetative management. Accordingly, fuel reduction funds for social needs would have to target fewer acres.

Alternative E

This alternative would target the fewest acres for purely hazard fuel reduction, but it projects the most acreage for vegetative management burning. Alternative E (and Alternative E Modified) would include the most acreage in the Historic Forest Management Area, possibly moving the Wayne into Condition Class 1 and toward the historic range of variability. This alternative would not focus on the WUI as much as the previous alternatives, and the target acreage in the WUI for purely hazard fuel reduction needs is smallest of any alternative. It would force Forest managers to identify criteria to evaluate degrees of wildfire risk for individual communities.

Alternative E Modified

This alternative would target the fewest acres for purely hazard fuel reduction, but it projects the most acreage for vegetative management burning. Alternative E Modified (and Alternative E) would include the most acreage in the Historic Forest Management Area, possibly moving the Wayne into Condition Class 1 and toward the historic range of variability. This alternative would not focus on the WUI as much as the previous alternatives, and the target acreage in the WUI for purely hazard fuel reduction needs would be the smallest of any alternative. It would force Forest managers to identify criteria to evaluate degrees of wildfire risk for individual communities.

Alternative F

This alternative proposes burning the third fewest number of acres strictly for fuel reduction. It also calls for the third highest amount of burned acres under various vegetative management treatments. With fuel reduction acres on the lower end of the scale, these treatments would need to focus on the communities most at-risk. Though fuels would be reduced by vegetation management burning, coincidental fuel reduction for the most at-risk WUI areas could be minimal.

Smoke and particulate matter should be the same throughout all alternatives, as the burned acreage remains the same whether the land is burned for biological or purely fuel reduction reasons.

Cumulative Effects for Habitat Indicator 11

Beneficial cumulative effects would result for the uses of prescribed fire to improve terrestrial plant and animal habitat and to control NNIS (i.e., about 1,700 acres of NFS land affected during the first decade), since little to no prescribed fire is used for these purposes on private and State lands within the WNF proclamation boundary. The cumulative effects of using prescribed fire in combination with other silvicultural methods to regenerate oak communities are addressed in the Cumulative Effects section for Habitat Indicators 1 through 6.

In terms of fuels reduction, the Forest Service, working in concert with communities at-risk, can minimize the potential for losses from wildland fires by reducing fuels in the WUI, but decades may be required to achieve these goals. Estimating the monetary losses for communities affected by wildland fire would be difficult. New homes, industrial projects, and farming operations in the future should adhere to modern methods of architecture and defensive space requirements to prevent losses from wildland fire.

Smoke from prescribed fires adds to air pollution from all other sources. As long as fires conform to prescription, however, smoke should not result in non-conformance with air quality standards, and public exposure to smoke should be minimal and sporadic. Project-level mitigation should ensure proper lofting, dilution, and transport of pollutants from populated areas. Any visibility concerns should be short-term and not a continuing problem for any area. Additionally, some wildlife species are sensitive to smoke, and proper smoke mitigation methods in such cases would be addressed at the project level.

Smoke has a cumulative effect on the health of firefighters participating in these operations, and further studies in this area are ongoing. Research also continues on the development of practical and effective dust/smoke masks for wildland firefighting. Beyond smoke, literally hundreds of

compounds are emitted by fires, but they are found in very low concentrations. Compounds of concern would be:

- Carbon monoxide can cause serious health effects, such as dizziness, nausea, and impaired mental functions, but it becomes a matter of concern for people in close proximity to fire (including firefighters). Blood levels of carboxyhemoglobin tend to decline rapidly, to normal levels, after a brief smoke-free period.
- Benzo(a)pyrene, anthracene, benzene, and numerous other components found in smoke can cause headaches, dizziness, nausea, and breathing difficulties. They are of long-term concern because of cancer risks associated with repeated exposure to smoke.
- Acrolein and formaldehyde are eye and upper respiratory irritants to which some segments of the public and firefighters are especially sensitive.

Recreation Opportunities

Affected Environment

Introduction

National Forests provide over 191 million acres of public land within the United States. The Wayne National Forest, the second largest supplier of public recreation lands within the State of Ohio, and the largest in southeast Ohio, with approximately 238,000 acres. The WNF provides a variety of unique natural settings for outdoor recreation and includes a wide array of dispersed and developed recreation opportunities within those settings.

Opportunities that the Wayne is well positioned to provide include: camping, picnicking, swimming, boating/canoeing, fishing, hunting, driving for pleasure, off-highway (OHV) vehicle riding, horseback riding, mountain biking, hiking, wildlife viewing, nature study, gathering forest products, natural, cultural, and historic education and interpretation, etc.

In an effort to find the Forest's recreation niche, the WNF recently examined the variety of recreation opportunities it was currently providing and compared it to opportunities that other Federal, State, local, and private organizations in the southeast Ohio region were offering. As a result, the Wayne identified and selected two recreation opportunities that formed the key components of its recreation niche. They include: OHV trail riding and interpreting of heritage/cultural sites. These two activities are what the Wayne is best positioned to provide. This does not imply that

the Forest would stop providing other recreational opportunities. However, by clearly identifying what unique forms of recreation the WNF is best suited to provide, we can ensure that the opportunities which give the forest identity and value are sustained.

Discussion related to OHV opportunities is found in the Recreational OHV Use section of this Final EIS. Heritage and cultural interpretation is discussed in the Heritage section of this document.

Market Area

Market areas are established for National Forests to better evaluate public demand for recreation opportunities. In the Recreation Feasibility Study completed for the WNF in 2003, researchers defined the Forest's market area as within two-hours drive (approximately 100-mile radius) of the recreation site. A two-hour driving distance from one of the units of WNF includes much of Ohio and parts of West Virginia and Kentucky. The four urban areas that lie within this circumference and that were examined in the Recreation Feasibility Study are Columbus, Cincinnati, and Cleveland, Ohio, and Charleston, West Virginia (SRG, 2002).

Opportunities for outdoor recreation are not limited to the National Forest within the market area. Other lands such as Army Corp of Engineers, State forests, parks, and wildlife management areas, private industries and organizations, and municipalities also serve to connect and expand the range of recreation opportunities.

The Ohio Department of Natural Resources (ODNR), the largest supplier of public recreation lands in the State, manages approximately 387,000 acres of State parks and forests distributed throughout Ohio. A majority of those lands are available for public recreation (SRG, 2002). Many of the State parks offer highly developed overnight lodging facilities, water-based recreation opportunities such as swimming, fishing, boating, and water skiing, including dispersed recreation. In contrast, many recreation opportunities offered on a majority of private industry and organization lands are dispersed forms of recreation such as hunting, nature-viewing, hiking, and other non-motorized trail use.

Recreation Supply

Recreation Opportunity Spectrum (ROS)

Recreation opportunities can be analyzed according to the types of recreation experiences available. The Recreation Opportunity Spectrum (ROS) is used as a framework for establishing recreation setting and capacity for each of the Forest's management areas. ROS classes represent a spectrum of settings that provides visitors with an array of experiences. These experiences range from a high probability of solitude and recreational challenge to a very social experience where recreational challenge is relatively minor. The differing acreage available for the various ROS experiences can be used to compare the proposed alternatives. (See the Glossary for a description of each ROS objective.)

ROS is used in two different contexts: either as an inventory tool or a management objective. As an inventory tool, ROS is used to describe the existing array of recreation settings. This application describes the existing recreation opportunities or condition on the Forest and is referred to as the ROS inventory. ROS is also used is to describe a set of recreation management objectives or desired future recreation settings, which are referred to as ROS class objectives. (See the Glossary for a description of ROS class objective.)

To help set the stage for discussion of the existing (inventoried) and desired future (proposed objective) ROS opportunities, it is important to examine the 1988 Forest Plan's ROS projections.

Implementing management activities prescribed in the 1988 Plan would not produce Primitive (P) or Urban (U) ROS acres. However, approximately 4,000 acres of Rural (R), 26,800 acres of Semi-primitive Non-motorized, 68,800 of Roaded Natural Non-motorized (RNNM), 77,200 acres of Roaded Natural (RN) and 4,000 acres of Rural (R) settings are projected. RNNM areas were areas with moderate to high road density but where motorized forms of recreation were not allowed (Management Areas 2.2 and 3.3). When the 1988 Forest Plan was being developed (1988), the Forest was trying to define areas for OHV recreation. RNNM areas were established to help the public understand where OHVs were and were not allowed (even if an area contained high a number of roads).

The 2004 ROS inventory combined RNNM with RN areas for two reasons:

- A clear OHV management footprint is now clearly defined on the forest and is generally understood by the public so there is no longer a need to set aside RNNM areas and
- Travel routes in RNNM and RN areas have been essentially managed the same – roads within both ROS areas have been closed

to motorized use if there was not a need to keep them open. This is not likely to change in the Revised Forest Plan.

The 2004 ROS inventory identified three ROS settings on the WNF. They range from those that provide visitors with opportunities for solitude in an environment with limited evidence of human impacts to intensely social settings in highly developed environments. These ROS settings include: Roaded Natural, Rural, and Urban. Neither Primitive nor Semi-primitive Non-motorized characteristics were then found on the Forest. Table 3 - 43 compares the 1988 ROS inventory and the 2004 (existing) ROS inventory acreage.

Table 3 - 43. Comparison of 1988 Forest Plan ROS projections and 2004 ROS inventory.

ROS Objectives	1988 ROS Inventory Est. Acres	2004 ROS Inventory Est. Acres	2004 ROS % of Total Forest Acres
Primitive	0	0	0
Semi-primitive Non-motorized	26,800	0	0
Semi-primitive Motorized	0	0	0
Roaded Natural Non-motorized	68,800	0	0
Roaded Natural	77,200	144,470	61
Rural	4,000	91,881	38
Urban	0	1,702	1
Total	176,800	238,053	100 %

Source: WNF ROS Inventory from GIS, 2004 and Forest Plan DEIS, 1988

Compared to the 1988 ROS inventory, the existing inventory shows a shift in acres and percentages toward more developed ROS objectives. The Forest trend continues to show no acres for Primitive and SPNM, while the RNNM areas have shifted toward RN. Additionally, an estimated 91,881 acres of RN has shifted toward the Rural ROS objective while approximately 1,702 acres have shifted toward the Urban ROS objective. Some reasons for the shift toward the more developed ROS objectives may be the acquisition of lands that contained more developments such as roads and/or the ROS inventory criteria used for the 1988 Forest Plan may have differed slightly from the 2004 ROS inventory. Thus, the result of this analysis does support the public's claim for the need for more Primitive or SPNM areas.

Also in 2004, the WNF evaluated its land to determine if any area met the national criteria for Roadless/Wilderness areas. (See Appendix C for a complete discussion of the Forest's Roadless/Wilderness evaluation and results). Roadless/Wilderness areas have similar characteristics found in Primitive and SPNM ROS objectives. However, no areas on the Forest were found to meet roadless or wilderness definitions.

Developed Recreation

The Forest provides for a mix of developed recreation facilities such as campgrounds, picnic areas, beaches, boat launches, interpretive sites, and observation sites. Table 3 - 44 displays the total number of developed recreation sites available on each Ranger District.

Table 3 - 44. Summary of developed recreation sites on the WNF.

Ranger Districts	Total # of Tent Camp Units	# Group Camp Units	# RV Camp Units	# of Single Picnic sites	# of Family Picnic sites	Picnic Shelters	Swim Sites	Boat Launch	Canoe Launch	Observation Sites	Interpretive Sites
Athens	74	3	45	6	4	5	0	2	3	0	2
Ironton	81	1	46	3	3	3	1	2	0	1	1
Totals	**155**	**4**	**91**	**9**	**7**	**8**	**1**	**4**	**3**	**1**	**3**

Source: WNF District Offices and Infra Database

Lake Vesuvius and Leith Run recreation areas were developed to be all-inclusive recreation destinations. These highly accessible recreation areas typically receive the highest concentrated recreation use on the Forest, especially during the summer recreation season. Both recreation areas are predominantly operated by concessionaires.

Smaller, less developed campgrounds can be found throughout the Athens District, primarily on the Marietta Unit along the Covered Bridge Scenic Byway (State Highway 26).

Dispersed Recreation

As developed campgrounds fill up on weekends during the summer, visitors are displaced, often to dispersed recreation areas. Many other visitors choose a dispersed setting for their desired activities or experiences. They include areas of concentrated use to semi-primitive areas relatively void of human sounds or influences. The general emphasis for dispersed recreation sites on the Forest is to maintain a natural appearance. Some specific dispersed activities include driving for pleasure, OHV riding, horseback riding, hiking, wildlife viewing, nature study, gathering forest products, hunting, canoeing, fishing, etc.

Dispersed recreation sites contribute approximately 295,778 or 30 percent of the Forest's total Persons at one Time (PAOTs). This value, however, does not include the number of visitors that may participate in such activities as hunting, fishing, gathering forest products, wildlife viewing, pleasure driving, or other dispersed recreation activities.

Trail riding, especially off-highway vehicle riding, is becoming one of the more popular dispersed recreation activities on the Wayne. Of the 349

miles of trails on the Forest, approximately 288 miles of trails were developed to accommodate multiple user groups. These trails are designated as OHV/mountain bike/hiking, equestrian/mountain bike/hiking, equestrian/hiking, or mountain bike/hiking. Table 3 - 45 displays the miles of trail available by each trail use type.

Table 3 - 45. Miles of WNF trails by administrative units.

Units	Hiking	Equestrian	Mountain Bike	ATV/OHM	Total Miles
Athens Totals	129.4[1]	19.4	70.0[2]	70.0	129.4[1]
Marietta Totals	90.7[1]	12.3	90.7[3]	0	90.7[1]
Ironton Totals	129.0[1]	42.7	46.0[2]	46.0	129.0[1]
Forest Totals	**349.1**	**74.4**	**206.7**	**116.0**	**349.1**

[1] Trail miles may be shared with mountain biking, ATV/OHM, and/or equestrian use.

[2] Trail miles shared with ATV/OHM use.

[3] Trail miles shared with hiking.

Source: WNF District Offices and Infra Database

Motorized Trails

See "Recreational OHV Use" section in this Final EIS.

Non-motorized Trails

Mountain bike and horseback riding accounted for less than five percent of trail use on the Wayne between 1998 and 2003. Trail use information related to hiking is unknown because the Forest does not charge fees for this activity. However, based upon the 2002 WNF Recreation Feasibility Study, the need for additional equestrian trails (19.4%), hiking trails (17.3%), and mountain biking trails (13.3%) were among the top six requests from local and statewide users. Additionally, one of the top issues discussed the March, 2003, Ohio Trails Partnership (OTP) Symposium was the need for Federal and State agencies as well as local governments to provide more non-motorized trail opportunities. OTP is a statewide consortium of equestrian, hiking, and mountain bike enthusiasts that promotes opportunities for non-motorized trail use.

Other Dispersed Recreation

According to ODNR's record of annual license sales, the demand for fishing and hunting licenses has gradually declined over the last decade. For the twelve counties surrounding the Wayne, fishing license sales experienced a drop of 23 percent, while hunting license sales dropped 5.8 percent between 1988 and 2000.

Recreation Demand

Recreation demand is a complex relationship between people's desires and preferences, availability of time, price, and availability of facilities. The evaluation of current and future demand for recreation on the WNF is based on recent surveys that identify and quantify:

- Estimated number of current recreation visits to the WNF.
- Current participation rates for recreation activities within the forest market area.
- Future recreation demand/trend based on projected population growth.

Current WNF Recreation Visits

The 2003 National Visitor Use Monitoring (NVUM) effort by the Forest Service has provided baselines for estimating current use of recreation sites on the Wayne. (See Table 3 - 46) These numbers account only for people visiting developed or dispersed sites for the purpose of engaging in a recreation activity. They do not include the millions of people that simply drive through the Forest.

Table 3 - 46. Annual WNF recreation use estimate.

Visit Type	# of Visits	80 % Confidence Interval
Recreation Site Visits[1]	598,626	15.9
National Forest Visits[2]	548,409	15.4

Source: WNF National Visitor Use Monitoring Report, 2003

[1] Recreation Site Visits – As visitors were visiting the WNF, some visited more than one recreation site while on the Forest. The total reflects these multiple site visits.

[2] National Forest Visits – Estimated number of visits to the WNF Day Use Developed Sites (DUDS), Overnight Use Developed Sites (OUDS), and General Forest Areas (GFA) in 2003.

Recreation use on the WNF for fiscal year 2003 at the 80 percent confidence level was 548,409 National Forest visits +/- 15.4 percent. There were 598,626 site visits, an average of 1.06 site visits per national forest visit. (Note**:** Several major recreation facilities and activities on the Forest were impacted by the draining and reconstruction of Lake Vesuvius and closure of its surrounding recreation areas for the past three recreation seasons.) These major forest areas were not open to the public during the survey year resulting in recreational use that was lower than usual. (NVUM, 2003)

The Forest sold approximately 43 mountain bike trail permits and 257 horse trail permits during the 2003 trail season, which accounts for one and two percent of total permit sales respectively. There is no charge for hiking on the Wayne, and therefore, visitor use information related to this activity is not available.

Recreation Activities' Participation Rates

Both long and short-term past trends point to continued growth in outdoor recreation across all segments of the population, some more than others. (Ken Cordell – Outdoor Recreation Participation Trends Website, Ch. 4, 2003) Many studies have shown that this upward trend can be directly or indirectly attributed to several factors. These factors may include but are not limited to growth in the national, regional, and local population; a shift in the population's age (i.e., Baby Boomers getting older with more free time to recreate); the greater need to spend quality time with family and/or get away from job-related demands and stress; and more people achieving higher levels of education which translates to jobs with higher income and more disposable income to spend on recreation activities.

Results of the 1994 National Survey on Recreation and the Environment (NSRE) show that 94.5 percent of Americans 16 years of age or older participated in at least one or more forms of outdoor recreation. That is almost 19 out of 20 people or approximately 189 million participants nationwide. (K. Cordell – Outdoor Recreation in the United States: Results Website, Ch. 2, 2003)

Table 3 - 47. Comparing local, State, regional, and national outdoor recreation trends by percentage of population.

Recreation Activities	Area Rec Users [g](2002)	Regional Midwest NSRE (1994/95)	National NSRE (2000)	National NSRE (1995)	National NSRE (1983)	% of National Change [f]83'-2000
Nature Viewing/Sightseeing	79	NA	38.2/108.6	54.1/113.4	21.2 / 81.3	+80.2% / +33.6%
Hiking	70	68.2	69.8	47.8	24.7	+ 182.6 %
Picnicking	64	52.2	118.3	98.3	84.8	+ 39.5 %
Swim/ Beach	59	53.4	94.8	78.1	56.5	+ 67.8 %
Visit Historical Site	53	43.9	46.3	44.1	NA	NA
Jogging	42	23.9	NA	26.2	NA	NA
Lodge	36	NA	NA	NA	NA	NA
Boating	35	31.8	76.7	58.1	49.5	+ 54.9%
Fishing	33	31.5	67.9	57.8	60.1	+ 12.9 %
Tent Camping	27	21.7a	25.8	28.0	17.7	+ 45.8 %
Tour Bike	24	31.4b	39.7c	3.2c	NA	NA
Off Road Vehicle	18	12.6	35.0	27.9	19.4	+ 80.4 %
Recreational Vehicle	14	NA	NA	8.6	NA	NA
Mountain Bike	13	NA	21.5	28.6	NA	NA
Hunt/Trap	12	11.3	20.9	18.6	21.2	- 1.4 %
Shooting	12	NA	NA	NA	NA	NA
Horseback Riding	10	6.8	23.1	14.3	15.9	+ 45.3 %
Backpacking	9	5.4	27.9	15.2	8.8	+ 217.1 %
Rock Climbing	5	3.3	NA	3.7	NA	NA

Source: Information in columns 1-3 came from SRG Wayne National Forest Recreation Feasibility Study; Information in columns 4-6 came from Ken Cordell's book – "Footprints on the Land", p. 218.

[a] Numbers in the tent category for regional and national data refer to developed camping, which may include campers in recreational vehicles.

[b] Numbers for tour biking regionally refer to all biking and may include mountain biking.

[c] Numbers for tour biking in NSRE 2000 refer to long distance biking.

[d] Numbers for tour biking in refer to all biking and may include mountain biking.

[e] Number for mountain biking in NSRE 94/95 refer to all biking and may include mountain biking.

[f] Percentage of change is from National NSRE 1983 to National NSRE 2000.

[g] Area recreation users represent the four urban areas surveyed in the SRG's 2002 WNF Recreation Feasibility Report.

According to the Forest's 2003 NVUM report, participation rates for three of the top seven outdoor recreation activities on WNF essentially supports the regional and national trends as shown in Table 3 - 47. They include: viewing nature and wildlife, OHV use, and hiking. The other top visitor activities were relaxing, picnicking, driving for pleasure, and fishing. (See Table 3 - 48) Forest visitors participating in many of these popular recreation activities favor doing them in the more natural and remote settings that can be found in Roaded Natural and Semi-primitive Non-motorized ROS objective. (Note: The results of the NVUM activity analysis DO NOT identify the types of activities visitors would like to have offered on the national forests. It also does not tell us about displaced

forest visitors – those who no longer visit the Forest because the activities they desire are not offered.)

Table 3 - 48. WNF activity participation and primary activity.

Activity	% Participating	% as Primary Activity
Developed Camping	4.8	1.2
Primitive Camping	5.7	0.3
Backpacking	3.7	2.9
Resort Use	0.2	0
Picnicking	14.4	6.0
Viewing Natural Features	68.0	0.4
Visiting Historic Sites	3.8	0
Nature Center Activities	3.3	0.1
Nature Study	6.5	0
Relaxing	62.3	5.0
Fishing	21.7	18.5
Hunting	5.2	4.7
OHV Use	54.9	50.9
Driving for Pleasure	14.4	3.8
Snowmobiling	0	0
Motorized Water Activities	0.1	0.1
Other Motorized Activity	0.2	0
Hiking / Walking	20.4	5.1
Horseback Riding	1.2	1.0
Bicycling	1.2	0.8
Non-motorized Water	0.4	0
Downhill Skiing	0	0
Cross-country Skiing	0	0
Other Non-motorized	1.9	0.7
Gathering Forest Products	2.9	0
Viewing Wildlife	68.2	<.1

Source**:** WNF National Visitor Use Monitoring Report, 2003

Note: The "Primary Activity" column totals more than 100% because some visitors chose more than one primary activity.

Projected Population Growth

Population trends for southeast Ohio and the 12 counties surrounding the WNF for the previous decade (1990-2000) show mixed results. Hocking, Vinton, and Noble counties sustained both the most annual increases and the highest percentage change for population increase. (See Table 3 - 49) In contrast, Monroe and Scioto Counties had a population decline for the same period. However, the overall population for the 12-county area showed a slight increase of 15,595 persons, which is below the State average growth rate of 4.6 percent (SRG, 2002).

Table 3 - 49. Population trends for the 12 counties surrounding the WNF.

Athens Area	Total Population & Percent Change			
County	**1990**	**2000**	**1990-2000 Pop. Change**	**1990-2000 % Change**
Athens	59,549	62,223	2,674	4.50%
Hocking	25,533	28,241	2,708	10.61%
Morgan	14,194	14,897	703	5.00%
Perry	31,557	34,078	2,521	8.00%
Vinton	11,098	12,806	1,708	15.40%
Total	141,931	152,245	10,314	7.27%
Marietta Area	**Total Population & Percent Change**			
County	**1990**	**2000**	**1990-2000 Pop. Change**	**1990-2000 % Change**
Monroe	15,497	15,180	-317	-2.05%
Noble	11,336	14,058	2,722	24.01%
Washington	62,254	63,251	997	1.60%
Total	89,057	92,489	3,402	3.82%
Ironton Area	**Total Population & Percent Change**			
County	**1990**	**2000**	**1990-2000 Pop. Change**	**1990-2000 % Change**
Gallia	30,954	31,069	115	0.37%
Lawrence	61,834	62,319	485	0.78%
Scioto	80,327	79,195	-1,132	-1.41%
Jackson	30,230	32,641	2,411	7.98%
Total	203,345	205,224	1,879	.92%

Source: WNF Recreation Feasibility Study, 2002

Recreation Trends

Developed Recreation

Developed recreation is expected to receive a 16 percent increase in visitor growth by the next decade. Based on the 2002 WNF Recreation Feasibility Study, camping received the third highest number of responses asking the Forest to consider expanding. Not only are campers demanding more campsites, those using developed campgrounds are demanding campsite amenities, such as improved RV pads, electricity, and sewer hookups (NOI Comment Analysis 2002 and SRG 2002). Users have also expressed the need for more parking areas, interpretative facilities, and informative brochures, maps, and signs (SRG 2002). Historically, camping facilities located near large bodies of water or scenic vistas are favored over any other sites.

Visitors participating in developed recreation activities generally prefer developed facilities in natural settings, which may be found in Urban and Rural ROS objectives.

Dispersed Recreation

The demand for dispersed forms of recreation on the Forest is equivalent to or higher than that of developed recreation, depending on the activity. Dispersed recreation is expected to receive a 10 percent increase in visitor growth by the next decade. According to the latest national, regional, and local recreation studies, demand for such activities as wildlife/nature viewing, hiking, OHV riding, horseback riding, mountain bike riding, primitive camping, visiting historic and other interpretive sites, and driving for pleasure will continue to increase.

Visitors participating in many of these dispersed recreation activities generally prefer more natural settings that can be found in Roaded Natural, Semi-primitive, and Primitive ROS classes.

Environmental Consequences

Analysis Area

The analysis area includes all WNF land. This area represents Forest land where recreation resources exist, as well as land where those resources could receive impacts from management activities.

Effects Common to All Alternatives

Recreation Opportunity Spectrum (ROS)

To repeat, ROS is generally used in two different contexts – either as an inventory tool or a management objective. As an inventory tool, ROS is used to describe the existing array of recreation settings. This application describes the existing recreation opportunities or condition on the Forest and is referred to as the ROS inventory. The second way ROS is used is to describe a set of recreation management objectives or desired future recreation settings, which is referred to as ROS class objectives. (See the Glossary for a description of each ROS class objective.)

The Forest desires to provide a wide range of quality outdoor recreation opportunities that responds to public needs/demands, fulfills its recreation niche, and stays within the capabilities of the land. This desire is reflected across all proposed alternatives, including the “no action” alternative.

The general themes developed for Alternatives A through F emphasize various resource management objectives. Each alternative prescribes a different set of management activities and land allocations to meet those objectives. These land management prescriptions provide the parameters needed for redefining the current ROS distribution and the level of recreation facility development.

For each alternative, management activities would strive to meet its assigned ROS objectives. Generally, these activities may move an area

toward a lesser developed ROS objective, but not a more developed objective. For example, an area classified as RN may move toward SPNM, but not toward the Rural ROS.

Table 3 - 50. ROS setting objectives by alternatives (Acres and % of Forest).

ROS Objective	2004 ROS Inventory Acres (%)	ROS Acreage Allocation and Percent of Forest Inventory by Alternatives Acres / %						
		Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. E Modified	Alt. F
Semi-primitive Non-motorized	0	18,470 (8%)	9,603 (4%)	24,445 (10%)	9,589 (4%)	14,292 (6%)	17,274 (7%)	27,122 (11%)
Roaded Natural	144,470 (61%)	217,744 (91%)	226,611 (95%)	209,530 (88%)	224,386 (94%)	219,683 (92%)	216,701 (91%)	206,853 (87%)
Rural	91,881 (38%)	1,839 (1%)	1,839 (1%)	4,078 (2%)	4,078 (2%)	4,078 (2%)	4,078 (2%)	4,078 (2%)
Urban	1,702 (1%)	0 / 0 %	0 / 0 %	0 / 0 %	0 / 0 %	0 / 0 %	0 / 0 %	0 / 0 %

Source: WNF ROS Inventory, 2004

No areas on the WNF can be classified as ROS Primitive as it is currently defined (See ROS User's Guide). Table 3 - 50 show all alternatives shifting acres of existing Urban (U) and Rural (R) ROS settings toward the ROS objectives Roaded Natural (RN) and Semi-primitive Non-motorized (SPNM). Although the acre change varies for each ROS setting (except the Urban setting), these changes are relatively small across all alternatives. No alternatives would have an Urban ROS objective. The ROS acreage allocation for Alternative E Modified changed slightly from Alternative E. Roaded Natural acres decreased by one percent while SPNM acres increased by one percent in Alternative E Modified from Alternative E. All other ROS acres remain unchanged. These changes were directly resulted from the shift in the boundaries and subsequently the acres (2,982 acres) of the Forest and Shrubland Mosaic to the Future Old Forest Management Area.

Approximately 98 percent of the Forest's existing Rural ROS acres would move toward the RN ROS objective. The RN ROS objective has the highest ROS percentage across all alternatives. Though the existing ROS inventory did not result in any SPNM areas, this ROS objective would see an increase across all alternatives, with the highest increase under Alternative F (27,122 acres). To be able to move an area toward or retain SPNM "remote" character, the Forest's existing low-service roads would have to be closed to motorized use, new roads would not remain open for general public use, and SPNM recreation activities such as hiking, backpacking, horseback riding, mountain biking, wildlife viewing, and primitive camping would be emphasized.

The Rural and SPNM ROS were specifically assigned to Forest areas to be managed with a recreation emphasis. The Rural ROS objective was assigned to management areas containing highly developed recreation sites, such as the Lake Vesuvius and Leith Run recreation areas. Conversely, management areas with the SPNM ROS objective emphasize recreation activities and opportunities in more natural remote settings, such as the Future Old Forest (FOF) and the Timbre Ridge Lake (TRL) Management Areas.

Finally, ROS acres, as well as other recreation factors, were used to determine the Forest's maximum reasonable capacity of across the range of alternatives. The results from the assessment show no alternatives to likely exceed the Forest's recreation capacity.

Table 3 - 51. Forest Acres Allocated for Developed and Dispersed Recreation, Carrying Capacity, and Constructed Recreation Facilities by Alternatives.

Management Activity	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. E Modified	Alt. F
Land Allocated for Developed Recreation Development (acres)	1,839	1,839	4,078	4,078	4,078	4,078	4,078
Land Allocated for Dispersed Recreation Development (acres)	236,214	236,214	233,975	233,975	233,975	233,975	233,975
Reasonable Maximum Carrying Capacity (Recreation Visitor Days)	1,026,328	1,050,889	1,011,591	1,052,742	1,039,714	1,039,714	1,004,176
Number of Recreation Facilities Constructed (i.e. Campgrounds)	1 to 5	1 to 5	1 to 5	1 to 5	1 to 5	1 to 5	1 to 5

Source: WNF GIS and recreation project file, 2004

Developed Recreation

Developed areas, such as campgrounds, picnic sites, and swim beaches are dedicated to and managed primarily for high visitor interaction and usually include constructed facilities. All alternatives emphasize offering developed sites with varying levels of development – from highly accessible recreation facilities with modern amenities such as electricity and showers to less developed sites with natural surfaces and little or no facilities.

Regardless of alternatives, all sites would be maintained to meet health and safety standards, protect natural resources, increase accessibility, and be cost effective to operate and maintain. Emphasis would also be placed on reducing the Forest's deferred maintenance backlog, upgrading existing facilities, and altering or decommissioning less valued sites before considering new development. Generally, improvements are made for site and resource protection, however, visitor comfort and convenience would also be considered. Any facility upgrade or new construction would be developed at a level appropriate for the desired ROS setting. Each

alternative proposes only a moderate increase in new facility development due the reality of limited budgets.

Dispersed Recreation

All alternatives provide areas for visitors to enjoy various forms of dispersed recreation. Dispersed sites support recreation activities that are generally found in the undeveloped areas of the Forest such as hunting, nature study, hiking, and primitive camping. These activities require little or no visitor interaction or constructed facilities with the exception of designated trails. Management activities generally can affect dispersed recreation more than developed recreation because developed recreation areas are dedicated primarily to recreation use, while dispersed recreation areas are shared with other and sometimes competing resource benefits, such as wildlife habitat improvement or mineral development.

One of the more popular dispersed recreation pursuits on the Wayne is trail riding, particularly motorized trails. Effects of the alternatives on motorized trail use will be discussed in detail under the Recreational OHV Use section of this chapter. The following paragraphs will focus on effects of alternatives on non-motorized trails and other dispersed recreation activities.

Based upon comments received from public scoping and local recreation surveys, the demand for additional miles of non-motorized trails was clearly evident. The 1988 Forest Plan projections for new equestrian and hiking trails have not been met. Mountain bike use was not addressed and therefore no miles were planned for this activity in the 1998 Plan. The sport was relatively new when the 1988 Plan was written. If Alternative A (continuance of the 1988 plan) is selected, it would include a mileage range of 15 to 30 new miles of new mountain bike trail construction. Moreover, all alternatives would have the same mileage range for this trail type. (See Table 3 - 52 for range of miles of new trail construction.)

The lack of adequate miles of ATV/OHM, equestrian, mountain bike and hiking trails would be addressed by any, all, or a combination of:

- Constructing additional new trails
- Sharing compatible uses on existing trails
- Converting existing low use level roads or user-developed trails to system trails
- Relocating trails off existing roads.

Where possible, trails would be connected to provide for longer continuous trails. Additionally, some camping areas may be constructed to accommodate the demands associated with popular trail activities, such as ATV/OHM and horseback riding. Similar to develop recreation

developments, the level or miles of new trail construction will be proportionate to the availability of funds and resources.

Table 3 - 52. New Non-motorized Trail Density, New Construction Miles, and Cross-country Travel by Alternatives.

Management Activity	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. E Modified	Alt F.
New Hiking Trail Construction (mileage range)	5 to 14	5 to 14	5 to 30	5 to 30	5 to 30	5 to 30	5 to 30
New Non-motorized Trail Constr. (Density Range - miles/sq.mi)	1.5 to 4.5	1.5 to 4.5	Up to 2.5	Up to 2.5	Up to 2.5	Up to 2.5	Up to 2.5
New Equestrian Trail Constr. (mileage range)	5 to 30	5 to 30	5 to 50	5 to 50	5 to 50	5 to 50	5 to 50
New Mtn. Bike Trail Constr. (mileage range)	15 to 30	15 to 30	15 to 30	15 to 30	15 to 30	15 to 30	15 to 30
Equestrian Cross-country Use	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited
Mtn. Bike Cross-country Use	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited
Hiking Cross-country Use	Allowed	Allowed	Allowed	Allowed	Allowed	Allowed	Allowed

Source: WNF Recreation Project File, 2004

Also common to all alternatives is the desire to reduce the amount of cross-country travel from such uses as ATV/OHM, horseback, and mountain bike riding. Limiting these activities to designated trails minimizes adverse effects to soils, water quality, aquatic wildlife habitat, vegetation, and aesthetics. Unmanaged user-developed trails and concentrated use area (CUAs) would be assessed for their impacts to resources and usability. User-developed trails and sites found to be environmentally sound and economically viable may be managed to standard and incorporated into the Forest's existing system of trails and recreation sites. All other user-developed trails and CUAs would be closed and rehabilitated as funding permits. Due to the relatively low impact of hiking on the natural resources, this activity is permitted in most areas of the Forest, except where signed "closed to foot travel". This would apply to all alternatives, including the "no action" alternative.

Opportunities for other dispersed recreation such as fishing, canoeing/boating, camping, backpacking, viewing wildlife, and visiting historic sites would remain relatively the same as what is currently provided.

With respect to hunting, all alternatives would feature an increase in general big game (deer and turkey) and small game (rabbit, squirrel,

grouse, and quail) habitat over 1988 Forest Plan direction. Management activities in Alternative B (160,488 acres) would see the greatest increase in big and small game habitat in the Forest Shrubland Mosaic (FSM) Management Areas (with OHV and without OHVs). Besides Alternative A, Alternative C has the smallest increase in big and small game habitat with 22,946 acres in the FSM and FSMOHV management areas. Alternatives D, E, E Modified, and F round out the acreage but would provide between 35,000 and 58,000 acres of big and small game habitat. Alternative B would provide the best opportunity hunting for big and small game species.

Direct and Indirect Effects – Recreation Opportunity Spectrum (ROS)

This section discusses the different direct and indirect effects among the range of alternatives as it relates to ROS allocation and the variety of developed and dispersed recreation opportunities. The changes discussed in this section may not be immediately evident and may take 10 or 20 years before noticeable results may be observed.

Alternatives A and B

Alternative A represents 1988 Forest Plan management objectives and would provide a baseline for evaluating other alternatives. This alternative focuses more on providing mature forested landscape with little or no provision for early successional habitat. Alternative A provides relatively little area for expansion of highly developed recreation. Approximately 1,839 acres (less than 1%) of the Forest is allocated for Rural ROS and none for Urban ROS. Alternative A would move all existing Urban ROS acres and most of the existing Rural ROS acres toward RN and SPNM ROS. This translates to Alternative A being able to provide a larger area for those visitors seeking a remote natural setting or backcountry experience and less positive for those seeking a more developed setting and motorized access. This alternative would provide the third highest acreage for a SPNM experience. Only Alternatives C or F would offer more.

Conversely, Alternative B would emphasize a mosaic of early successional forest landscape. Alternative B is similar to Alternative A in that the acres allocated for the Rural ROS objective would be the same (1,839 acres). However, Alternative B would offer slightly less acres for Semi-primitive Non-motorized (-8,867 acres) and equally more Roaded Natural (+8,867 acres) settings than Alternative A. As a result, visitors would have less area to enjoy a primitive or backcountry experience.

Alternatives C and F

Alternatives C through F are same with respect to the number of acres they would allocate for the Urban (no acres) and Rural ROS objectives (4,078 acres). The acres of Rural ROS called for in each of these

alternatives are essentially double what would be provided under Alternatives A or B. Though relatively small when compared to the total Forest land base, these ROS acres would offer the most potential for expanding and improving highly developed recreation sites. New recreation facilities would be constructed primarily in response to demonstrated public need, however. Existing sites could be enhanced and reconstructed to standard. The Forest would strive to continue to offer a broad range of developed day and overnight use sites within this area. New developed recreation sites to support associated dispersed recreation opportunities would be considered. Sites at varying development levels would be provided. Some existing sites could be upgraded to a higher development level if a need was demonstrated.

Alternatives C and F would allocate approximately 24,445 acres and 27,122 acres respectively toward the SPNM objective in three separate sections of the Future Old Forest (FOF) Management Area plus 796 acres in the Timbre Ridge Lake (TRL) Management Area. No vegetation management except for that needed to protect public health and safety, or to protect private property, would occur. Opportunities to close low-service Forest roads in the FOF Management Areas would be given serious consideration. New roads in this area would not remain open for general public use. The Forest would manage these FOF areas toward a mature, natural appearing forest, thus providing visitors with areas where they can experience remoteness, solitude, and high level of challenge. Non-motorized recreation activities such as hunting, fishing, boating, hiking, mountain biking, horseback riding, and wildlife viewing would be common. Recreation sites that encourage the study and enjoyment of nature and scenery, interpret unique historical or biological communities, or promote the use of the National Scenic North Country Trail would be given priority. Recreation sites at lower development levels would have precedence, but sites at higher development levels would also be considered if there is a high public demand. All recreation sites would be constructed or reconstructed to compliment the natural setting and meet the SPNM ROS objective.

Alternatives C and F also would provide essentially the same RN ROS acres (approximately 209,530 and 206,853 acres, respectively). Visitors recreating in the RN areas would continue to experience some sense of remoteness, independence, and closeness to nature but not at the same level as found in SPNM areas. Visitors would typically find more evidence of human activity, motorized use, and facility development in RN areas. Recreation site development would continue on an as needed basis but at a higher development level than what may be found in SPNM areas.

Alternatives D, E, and E Modified

Like Alternatives C and F, Alternatives D and E and E Modified would provide the same acreage allocation for Urban and Rural ROS. Unlike Alternatives C and F, Alternatives D, E, and E Modified would increase the number of RN acres and proportionately decreases the number of SPNM acres. (See Table 3 - 50) Actually, Alternative D is closer to Alternative B, while Alternative E and E Modified is more nearly resembles Alternative A with respect to the number of acres they would allocate for RN and SPNM. Thus, the net recreation effects of RN and SPNM allocation for Alternatives B and D are similar while Alternatives A and E and E Modified are similar. (See Alternatives A and B in this section for a description of recreation effects.)

Developed Recreation

Alternatives A through F

The lands around the Forest's highly developed recreation areas such as Lake Vesuvius, Leith Run/Capitol Christmas Tree Complex, Burr Oak Cove Campground, and Lamping Homestead were included to allow more opportunities for future expansion. These areas are all within the Developed Recreation Management Area (DR) which would be managed mainly for a variety of developed and some dispersed non-motorized recreation opportunities. Vegetation management would occur only to protect or enhance the recreational facilities and natural settings.

There are no considerable differences across the range of alternatives in the type of recreation opportunities and experiences the Forest would offer. Each alternative proposes only moderate increases in new developed recreation facilities. The number and level of new facility development would directly depend upon public demand, availability of funding, and the ROS objective. The only noticeable difference among the alternatives is the acre allocation for future developed recreation expansion. Alternatives A and B would provide approximately 1,839 acres each, while Alternatives C, D, E, E Modified, and F would provide approximately 4,078 acres each.

All alternatives will emphasize reducing the number of low use recreation sites and facilities and maintaining or upgrading existing facilities to meet public health, safety, and accessibility standards, to provide site and resource protection, as well as meet visitor expectations.

Dispersed Recreation

Alternatives A and B

When compared to motorized trail use on the Forest, non-motorized trail use appears small. However, the demand for more non-motorized trails is increasing among this group of users. Alternatives A and B projections for

new equestrian trail construction range from 5 to 30 miles, while new hiking trail construction would be between 5 and 14 miles by the end of the next decade. These projections were derived from the 1988 Forest Plan. The 1988 Plan also provided a trail density of 1.5 to 4.5 miles/sq. mile for equestrian and hiking trails. Thus, the result would be the potential for up to 95 total miles (sum of existing and new trails) of trails for each trail activity. (See Table 3 - 52)

The mileage range and density for non-motorized trail use within Alternatives A and B would be within the acceptable limits of the land due to the relatively large land base available for non-motorized trail construction.

Management activities in Alternative A would provide no real increase in big or small game habitat, while Alternative B would provide the greatest habitat increase of any alternatives with 160,488 acres. The emphasis of Alternative B is providing a mosaic of early successional habitat patches of various sizes interspersed throughout a predominately forested landscape. The Forest would contain mixed hardwood forest communities over 100 years old, permanent herbaceous forest openings, ponds and wetlands to enhance wildlife and visual diversity. Trees greater than 120 years old may occur throughout the area as individuals or groups. Game species associated with shrub and seedling/sapling forest habitats such as deer, turkey, and rabbits would flourish. Game species associated with more mature hardwood forests like squirrel and grouse would thrive. Under Alternative B, there would be no increase in acres of grassland from current levels, but early successional habitat would be greater than in the other alternatives. Thus, compared with other alternatives, Alternative B would generally offer hunters the greatest opportunity for hunting big and small game species.

Alternatives C through F

Alternatives C, D, E, E Modified, or F would provide the same total trail density, but within each alternative, the mileage range among the different trail types would vary slightly.

Alternatives C, D, E, E Modified, or F would provide 20 more miles of new equestrian trails and 16 more miles of new hiking trails than either Alternatives A or B. Mountain bike trails miles would remain the same across all alternatives.

Compared to motorized trails, noticeably fewer miles of new trail would be constructed for equestrian, hiking, and mountain bike use due to current and historic use from these activities. For Alternatives C through F, the proposed range of new trail construction for each trail activity would be:

- Equestrian (5 to 50 miles)
- Mountain biking (5 to 30 miles)

- Hiking (5 to 30 miles).

The trail density would be set at 2.5 miles/sq. mile for each trail activity across Alternatives A through F.

The mileage range and density for non-motorized trail use is well within the acceptable limits of the land due to the relatively large area available for non-motorized recreation opportunities. Furthermore, the miles of new trails proposed coupled with the mileage of existing trails should fulfill the need of this user group in the next decade.

The miles of new trail construction, whether motorized or non-motorized, will be directly dependent upon the availability of contiguous and suitable land, internal and external funding (i.e., appropriations, recreation fees, and grants), and partnership and volunteer contributions, as well as other environmental, social, and political factors.

Second only to Alternative A, Alternative C would increase big and small game habitat the least, with 22,946 acres in the FSM and FSM/O Management Areas. Alternatives D, E, E Modified, and F round out the acreage but would provide increases ranging from 35,000 and 58,000 acres of big and small game habitat. Alternatives C through F would moderately increase big and small game hunting opportunities.

Cumulative Effects

To adequately discuss the cumulative effects to the Forest's recreation program, activities on adjacent non-Federal lands must be taken into account. Unlike many of the nation's larger national forests, in which the land base is mostly contiguous, the WNF is significantly fragmented by private and State land. Thus, any activities on adjacent lands will very likely affect the recreation opportunities, settings, and experiences found on the Forest.

The private lands surrounding the Wayne are gradually losing their preferred settings and access for nature-based recreation. This trend can be traced to agricultural, mineral, and urban/suburban development. Furthermore, as more private lands are posted to prevent public access or are leased to hunting clubs, public lands may be among the few remaining areas where recreationists can pursue certain kinds of outdoor activity. Additionally, the WNF is one of the few large public land bases in Ohio that visitors may visit to experience solitude, closeness to nature, and semi-primitive settings. The Forest also provides a sense of place and beauty for local residents as they identify with and enjoy its natural landscapes and historic features. Because of these and other factors, the WNF is considered an important national treasure and is highly valued for the recreational opportunities it provides. If the Forest retains this character, visitor use and recreation demands will almost certainly increase over the next decade and beyond.

Providing outdoor recreation opportunities in Ohio requires involvement and collaboration between Federal, State, and local governments, as well as from private recreation associations, clubs, and businesses. Individually, each entity fulfills a unique niche. Together, they play an important role in providing a wide spectrum of recreation opportunities for the public.

Federal agencies such as the Forest Service generally manage for outdoor recreation opportunities that require large land bases, for example, hiking, backpacking, trail riding, hunting, primitive camping, etc. National Forest System lands are well suited to support long trails, recreation sites with few amenities, sites with scenic vistas, and backcountry recreation. The State also provides recreation opportunities that require large land bases, but invests heavily in water-based recreation and lodges. Local governments tend to focus on providing highly developed indoor and outdoor facilities, such as community centers and parks and hardened hike/bike trails. The private sector largely focuses on theme parks or providing recreation support facilities, such as specialty shops, bed & breakfast inns, and restaurants.

Because each entity offers its own unique recreation opportunities and settings, they complement each other by giving visitors an array of recreation opportunities from which to choose. Thus, the WNF will continue to attract a select group of visitors that desires to recreate in a large natural setting with some sense of remoteness and solitude and/or a high level of challenge.

Many communities are beginning to see the benefits of visitors coming to the Forest and are encouraging tourism centered on the WNF to stimulate their economies. This is evident from the growing interest of local businesses, trail associations/club, and community leaders in having the Forest's trail system linked to their town or place of business.

Recreation supply and demand will invariably shift with time. As demand exceeds supply, conflicts among user groups will become greater, the visitor's recreation experience will be reduced, illegal trail use will escalate, and impacts to natural and visual resources will rise.

The Wayne's capability to fulfill the public's recreation expectations is limited by a number of factors. Much of the Forest has been affected by human activities in one form or the other. Additionally, the Forest's scattered land ownership pattern, the difficulty in reducing the high density of public roads, and the increasing competition from Forest users for the same lands are just some of the factors that may limit the Forest's ability to provide for large Primitive/Semi-primitive areas, thus making it difficult for visitors to "get away" and seek solitude.

These and other limiting factors suggest the appropriate recreation niche for the Forest. Based on this niche the Forest can direct its budget,

resources, and efforts toward providing a set of recreation opportunities that best fulfills its particular role. Other Federal, State, and local agencies and private organizations can then concentrate on providing other types of recreational opportunities. This approach would help the Forest devote resources to the recreation opportunities for which it is best suited, provide better customer service, and ensure a higher level of user satisfaction. Such a strategy would also allow the Forest to find and develop strong working partnerships to help meet the growing recreation demands of its constituents.

Summary

All alternatives would provide a range of recreation opportunities, settings, and experiences, and would meet the public's recreation needs in differing ways.

Alternative F would provide the greatest opportunity for future Semi-primitive recreation in the Future Old Forest and Timbre Ridge Lake management areas while also providing high opportunities for developed recreation expansion by enlarging the Developed Recreation Management Area. The second highest opportunity for SPNM recreation would come under Alternative C followed by Alternatives A, E, E Modified, B, and D, respectively.

Alternatives A or B would each allocate the same acreage for developed recreation. Alternatives C through F would allocate more than twice the acreage to developed recreation as Alternatives A or B. Additionally, fewer miles of horseback riding and hiking trails would be constructed in Alternatives A and B compared to Alternatives C through F.

With respect to hunting opportunities, Alternative A would provide no real increase in new big or small game habitat, while Alternative B would offer the greatest potential to increase big and small game habitat (except for quail) of any alternative. Alternatives C through F would provide a moderate increase in big and small game hunting opportunities.

Recreational OHV Use

Public opinion about recreational off-highway vehicle (OHV) use on the Wayne National Forest spans a broad spectrum – from an insistence that OHV riding be prohibited on the Forest to a strong desire that the Forest Service maximize its opportunities to construct more OHV trails or routes.

The Forest Service has determined that OHV riding is a legitimate use on NFS lands, and the WNF has a well established system of designated all-terrain vehicle (ATV) and off-highway motorcycle (OHM) trails. Currently, the Forest has no designated trail system for four-wheel drive (4WD) and similar high-clearance vehicles.

This discussion of resource effects takes into account the environmental impacts on the WNF related to OHV use on proposed designated trails and cross-country travel. Discussions of these effects are included in the various resource sections of this Final EIS. They are also part of project-level analysis.

This section discusses direct and indirect social effects such as, use trends and demands, use conflicts and compatibility, and illegal trail activity, as well as the fiscal effects of constructing and maintaining new motorized trails on the Forest. Discussions of cumulative social effects consider the opportunities for OHV use on other land ownerships within and near the Forest's proclamation boundary and/or within the State of Ohio. Discussions of cumulative fiscal effects consider the opportunities for obtaining outside sources of funding through partnerships, grants, and volunteers to help offset costs associated with ATV/OHM trail construction and maintenance.

For the purpose of this analysis, the following definitions for the various types of recreational motorized vehicles are given to provide clarification during the discussion of the affected environment and environmental effects.

- Off-highway vehicle (OHV) – Includes ATVs, OHMs, 4WDs, SUVs, dune buggies, mini-bikes, go-carts, Gators®, and similar high-clearance vehicles designed to travel off maintained roads.
- All-terrain vehicle (ATV) – Motorized flotation-tired vehicle, with three to six low-pressure tires, generally 50 inches wide or less, straddled by the rider, and designed to travel off maintained roads.
- Off-highway motorcycle (OHM) – Motorcycle designed generally for use off maintained roads and commonly referred to as a "dirt bike" or designed for use off or on maintained roads such as a "dual sport bike".
- Four-wheel Drive (4WD) – Licensed high-clearance all-wheel drive vehicles capable of on or off-highway travel.

- Sport utility vehicle (SUV) – Licensed two or all-wheel drive, high-clearance vehicles capable of on or off-highway travel.

OHV INDICATOR 1 – Miles of new motorized trail construction

The first indicator addresses the demand for additional designated ATV and OHM trails on the WNF. The effects of the alternatives on new motorized trails are based on the maximum miles of additional designated ATV/OHM trails each alternative could potentially provide. All alternatives, including the "no-action" alternative, would provide for motorized trail use and opportunities to construct new trails.

OHV INDICATOR 2 – Construction and maintenance cost of providing more OHV opportunities on the Forest

The second indicator addresses the financial costs of constructing and maintaining existing as well as new trails on the WNF. The effects of the alternatives on the cost of constructing and maintaining new motorized trails are based on the maximum miles of additional designated ATV/OHM trails each alternative could potentially provide. All alternatives, including the "no-action" alternative, would provide for the construction of new motorized trails.

Affected Environment

Introduction

The Wayne's motorized trail system is a highly popular attraction for ATV and OHM enthusiasts. It is one of a few areas in Ohio or the Midwest region where riders may come to enjoy their sport. Motorized trail riders from as far as Indiana, Michigan, Pennsylvania, West Virginia, and Kentucky come annually to ride. For this reason, the WNF has identified providing motorized trail opportunities as one of the key elements that form its recreation niche.

However, as will be discussed, the OHV use is likely to continue increasing. Thus, managing OHV use will continue to be an issue and a challenge for the WNF, just as it has become a national issue for the Forest Service. Unmanaged recreation, especially the undesirable impacts from unmanaged OHV use, has been identified by the Chief of the Forest Service as one of the key threats facing the national forests and grasslands. Concerns have been expressed over the amount of unplanned roads and trails, erosion, lack of quality OHV recreation opportunities, degradation of water quality, and destruction of habitat from unmanaged OHV activity.

Market Area

Market areas are established for national forests to better evaluate public demand for recreation opportunities. In the Recreation Feasibility Study completed for the WNF in 2003, researchers defined the Forest's market

area as within two-hours drive (approximately 100-mile radius) of the recreation site. A two-hour driving distance from one of the units of WNF includes much of Ohio and parts of West Virginia and Kentucky. The four urban areas that lie within this circumference and that were examined in the Recreation Feasibility Study are Columbus, Cincinnati, and Cleveland, Ohio, and Charleston, West Virginia (SRG, 2002).

Opportunities for outdoor recreation are not limited to the national forest within the market area. Other lands such as Army Corp of Engineers, State forests, parks, and wildlife management areas, private industries and organizations, and local municipalities also serve to connect and expand the range of recreation opportunities.

The Ohio Department of Natural Resources (ODNR), the largest supplier of public recreation lands in the State, manages approximately 387,000 acres of State parks and forests distributed throughout Ohio. A majority of those lands are available for public recreation (SRG, 2002). Many of the State parks offer highly developed overnight lodging facilities, water-based recreation opportunities such as swimming, fishing, boating, and water skiing, including dispersed recreation. In contrast, many recreation opportunities offered on a majority of private industry and organization lands are dispersed forms of recreation such as hunting, nature-viewing, hiking, and other non-motorized trail use.

Recreation Supply

The Midwest region contains only a handful of large areas designated for motorized recreation. Some of these areas include the Hatfield-McCoy Trail (WV), the Allegheny National Forest (PA), Huron Manistee National Forest (MI), and the Daniel Boone National Forest (KY). Of the six motorized trail systems in Ohio, three are found on the WNF. The 1988 Forest Plan designated two management areas (2.3 and 3.2 MA) for motorized OHV recreation. Within these management areas, the Forest Service has constructed approximately 116 miles of OHV trails, compared to 43 miles managed by the State of Ohio. This situation creates a high demand for the Wayne's motorized trail system both now and into the future.

OHMs and ATVs 50 inches wide or less are permitted on designated motorized trails only. With the exception of dual sport motorcycles, all street legal or licensed 4WDs and SUVs are limited to open roads only (maintenance level [ML] 2 roads or higher). Cross-country travel by motorized vehicles is prohibited on the Forest.

Recreation Demand/Trend

Two decades of national recreation studies have shown off-road driving to be one of the fastest growing outdoor activities. During a 17-year period (1983-2000), this sport has increased by 80.4 percent. A second indicator

of the increasing trend of motorized vehicle use can be seen in State registration figures. From 1998 to November 2002, the registration of ATVs has almost doubled. (See Table 3 - 53)

Table 3 - 53. ATV and OHM registrations statewide in Ohio for the last five calendar years.

Type of Registrations	CY1998	CY1999	CY2000	CY2001	CY2002[3]
ATV in-state[1]	7,014	8,712	11,839	12,518	13,350
OHM in state[1]	2,495	2,201	2,141	2,341	2,629
ATV Non-resident[2]	N/A	N/A	136	97	128
OHM Non-resident[2]	N/A	N/A	31	21	51

Source: Ohio's Bureau of Motor Vehicles

[1] Ohio's in-State registrations are good for 3-year periods of time.

[2] 30-day non-resident placards (permits). Ohio began to issue these in February, 2000; therefore, CY-2000 non-resident is only for 11 months.

[3] CY-2002 includes Jan 1, 2002 through Nov 30, 2002.

State and national OHV sales from 1995 through 2001 also support the increasing trend for this type of motorized sport. (Table 3 - 54) Ohio has maintained a ranking of 5th in the nation for retail sales of motorcycles from 1995 to 2001, but moved from 12th in the nation in sales of ATVs to 5th in this same time period.

Table 3 - 54. Off-highway Vehicle State and National Trends in Retail Sales.

Ohio New Retail Sales	Dual-Sport Motorcycles	ATVs	Total
1995	3,964	9,495	13,459
2001	10,045	28,901	38,946
% of Change	**153.4%**	**204.4%**	**189.4%**
US New Retail Sales	**Dual-Sport Motorcycles**	**ATVs**	**Total**
1995	90,679	277,787	368,466
2001	270,209	729,054	999,263
% of Change	**198%**	**162.5%**	**171.2%**

Source: Motorcycle Industry Council

Similar to national and regional trends, motorized trail use on the Wayne is increasing annually. This is reflected by the increasing number of OHV sales, State all-purpose vehicle (APV) registrations, and the number of recreation visits and revenues collected from motorized trail permit sales on the Forest. OHV riding accounts for more than 90 percent of trail permits sold on the Forest.

In 2003, over 16,800 motorized trail permits were sold on the Forest through the Fee Demo Program. Forest trail permit sales for 2004 are expected to meet or exceed 2003 sales.

Environmental Effects

Analysis Area

The analysis area includes WNF lands within the OHV management areas. They are: Diverse Continuous Forest with OHV (DCFO), Forest and Shrubland Mosaic Forest with OHV (FSMO), and Historic Forest with OHV (HFO). These areas represent Forest land where recreational motorized trail riding is permitted, as well as adjacent lands where management activities may impact that sport.

Effects Common to All Alternatives

General Resource Protection Measures

Adverse effects from motorized vehicle use would be mitigated by implementing appropriate Forest-wide standards and guides, Best Management Practice (BMP) techniques, or through proper trail design. Additionally, by applying effective education and enforcement programs, the Forest would help increase public understanding and compliance of its OHV policies, thus reducing impacts to natural resources.

OHV Use Policy to be Applied Across All Alternatives

No alternatives would permit OHV use off designated motorized trails or routes. Additionally, these recreational vehicles are not permitted on Forest system roads, except where roads serve as trail connectors. These road crossings would be appropriately signed to allow such use. Trails are designed for OHMs and ATVs 50 inches wide or less. Trails are open for use only from mid-April through mid-December.

Construction of new motorized trails and associated facilities would be limited to only the Diverse Continuous Forest with OHV, the Forest and Shrubland Mosaic with OHV, and Historic Forest with OHV management areas. All of these management areas were assigned the Roaded Natural (RN) ROS objective. (See Recreational Opportunities and Settings section for a description of this ROS objective.)

All alternatives allow some non-motorized uses on motorized trails, such as mountain biking and hiking, though these user groups typically do not like to share trails with OHV riders. Horseback riding is not permitted on the motorized trail system for safety and compatibility reasons.

Opportunities to provide designated 4WD roads or trails would be limited across all alternatives. Any proposal to close low-maintenance system roads and designate them for high-clearance vehicle use would be

considered on a case-by-case basis. However, no routes or areas on the Forest have been designated for 4WD or high-clearance vehicle use.

Social Effects

A positive effect from motorized recreation is that it provides pleasure to a large segment of the population. Some of these visitors may include people with a physical disability or the elderly who may perhaps not be able to enjoy the outdoors otherwise. Motorized vehicles also provide visitors easy access to remote areas of the Forest; allow them to experience more of the Forest by covering more area; provide them an opportunity to build close family ties; and provide deer hunters with a convenient way to transport game out of the woods.

Motorized recreation also contributes to a community's economic welfare. On the Wayne, local vendors benefit by selling Forest trail permits. Not only do they receive revenue from the direct sale of trail permits, they also gain additional business from the sale of food, gas, and supplies to visitors. Additional revenues are generated from visitors lodging and eating at local hotels and restaurants.

However, negative social effects may also result from motorized recreation. A principal effect is the displacement of some non-motorized users seeking solitude such as hikers, mountain bikers, backpackers, primitive campers, bird watchers, and even some hunters. This is generally attributed to factors as loud noise, exhaust emissions, and the high rate of speed from these recreational motor vehicles.

To help absorb displaced non-motorized users, the Wayne limited motorized trail use to a few management areas that cover approximately 19 percent of the Forest. The remaining 81 percent is open to non-motorized recreation use.

Also, accelerated motorized recreation use could strain the Forest's limited law enforcement program. Heavily used areas require more routine patrol, and create an uneven distribution of law enforcement officers (LEO) across the Forest. Less used recreation areas would lack the enforcement oversight they deserve, and therefore, may experience more vandalism or visitor non-compliance.

This effect would be mitigated through the use of more Forest protection officers (FPO) and developing partnerships with State and local law enforcement to assist in patrolling the Forest's motorized trail system.

Natural Resource Effects

This section briefly discusses the general effects of natural resources from motorized recreation use. A detailed discussion of effects would be found under each applicable resource section of this Final EIS or during site-specific project level analysis.

The degree of natural resource impacts from motorized trail use is proportionate to the level and intensity of use and/or to the level at which the trail was constructed and maintained. In other words, the more use a trail receives and the harder a trail is ridden, the higher the probability of negative effects on resources from use if the trail was poorly designed, constructed, and maintained.

Regardless of which alternative is selected, some illegal OHV use can be expected to occur. Though the Forest currently provides a system of designated trails for motorized use, illegal off-trail riding continues. Illegal off-trail riding has created many user-developed routes on the Forest. Some contributing factors for this illegal activity are:

- Trail demand is greater than the current supply
- Existing trails do not provide the challenge some riders are seeking
- Lack of Law Enforcement Officers to patrol trails
- No established trail patrol program to educate/inform riders of Forest OHV policies and to routinely monitor or patrol trails
- Lack of adequate signing or marking of existing designated trails.

Though many user-developed routes may be found on the Forest, they are not condoned. However, some user-developed trails could be considered for system trail designation if they are well located and could be easily incorporated into the existing designated trail system. Many user-developed trails are causing adverse effects to natural resources and pose a risk to rider safety. When user-developed trails are identified and cannot be reasonably incorporated into the existing designated trail system, they will be closed and rehabilitated. Certainly, the miles of user-developed trails the Forest could incorporate or rehabilitate/close in a given year is dependent on its budgetary and personnel capabilities.

Without routine trail monitoring, maintenance, and/or rehabilitation, adverse effects to soils, water quality, aquatic habitat, wildlife habitat, vegetation, and scenic resources would inevitably occur.

INDICATOR 1 – Miles of New Motorized Trail Construction

Direct and Indirect Effects

This section discusses the different direct and indirect effects among the range of alternatives as it relates to the development of new ATV and OHM trails. It is important to note that the changes discussed in this section may not be immediately evident and may take 10 or more years before noticeable results may be observed.

The demand for a longer motorized trail system will continue to be voiced by the Forest's largest group of trail users – its OHV constituents. If the

Wayne provided the miles of motorized trails needed to meet public demand, this group maintains, the expansion would reduce trail overcrowding, lower maintenance costs, minimize illegal off-trail activity and resource impacts, while increasing rider safety and enjoyment.

All alternatives would provide for additional ATV and OHM trails. Table 3 - 55 displays the projected mileage range for new OHV trail construction and Forest total when completed.

Table 3 - 55. New Motorized Trail Density, New Construction Miles, and Cross-country Travel by Alternatives.

Management Activity	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. E Modified	Alt F.
New OHV Trail Construction (Density Range - miles/sq.mi)	3.2 to 6.4	3.2 to 6.4	2.0 to 3.5	2.0 to 3.9	2.0 to 3.5	2.4 to 3.5	2.0 to 3.0
New OHV Trail Construction (mileage range)	109 to 184	109 to 184	21 to 124	21 to 154	21 to 124	50 to 124	21 to 91
Total OHV Mileage Range (existing + planned)	225 to 300	225 to 300	137 to 240	137 to 270	137 to 240	137 to 240	137 to 207
OHV Cross-country Use	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited

Source: WNF Recreation Project File, 2004

Unlike non-motorized trails which could be developed over most of the Forest, motorized trail development is confined only to the management areas open to OHV use. For this reason, trail density is applied differently for motorized trails when compared to non-motorized trails. Density for motorized trails is applied within the OHV management areas while non-motorized trails are applied on a site-specific basis.

Alternatives A and B

Alternatives A and B each propose to construct between 109 and 184 miles of new OHV trails. These new miles added to the existing 116 miles would give the Forest a minimum of 225 miles and a potential maximum of 300 miles of designated motorized trails. This is equivalent to a density of 3.2 to 6.4 miles per square miles when completed. This is the projected total in the 1988 Forest Plan (Alternative A).

The WNF could meet public demand if the 300-mile maximum was constructed. However, that amount would likely exceed the land's acceptable limit for trail construction.

Alternatives C, E, and E Modified

The existing designated trail system was mapped along with any potentially new trails (within environmental and management area constraints) to determine the land's maximum acceptable trail density. The result of the mapping and trail assessment showed the existing density at approximately 1.0 mile/sq. mile. This total, coupled with the additional

miles of new trails that could be potentially developed, produced a new trail density at approximately 2.0 miles/sq. mile.

This figure, however, does not take into account any low-level system roads or user-developed trails that could be converted to system trails. If these factors were considered, the density would be moderately higher.

Alternatives C and E propose to construct between 21 and 124 new miles of trails. If added to the existing 116 miles, it would give the Forest a minimum of 137 miles and a potential maximum of 240 miles of designated motorized trails. This is equivalent to a density of 2.0 to 3.5 miles per square miles when completed. Alternative E Modified proposes to construct between 50 up to 124 new miles of trails. If added to the existing 116 miles, it would give the Forest a minimum of 166 miles and a potential maximum of 240 miles of designated motorized trails. This is equivalent to a density of 2.4 to 3.5 miles per square miles when completed. The 240 miles is the maximum threshold at which the land is thought to be capable of sustaining OHV use within the Forest's OHV management areas.

Alternatives C through F would provide 60 miles less of new trails than Alternatives A or B, if the maximum miles were constructed.

The Forest may fall short in meeting public expectation and demand if Alternatives C, E, or E Modified is selected. Nonetheless, the trail density would remain within the land's maximum acceptable limit for trail construction.

Alternative D

In an effort to provide a reasonable range of new motorized trail construction miles across the alternatives, the Forest generated different mileage thresholds (maximums) for Alternatives D and F.

Alternative D would construct between 21 and 154 new miles of trails. If added to the existing 116 miles, it would give the Forest a minimum of 137 miles and a potential maximum of 270 miles of designated motorized trails. This is equivalent to a density of 2.0 to 3.9 miles per square miles when completed. Alternative D would provide 30 miles or 10 percent less of new trails than Alternatives A or B; 30 miles more than Alternatives C or E; and 63 miles more than Alternative F.

Alternative F

Under Alternative F, between 21 and 91 new miles of trails could be constructed. If added to the existing 116 miles, it would give the Forest a minimum of 137 miles and a potential maximum of 207 miles of designated motorized trails. This is equivalent to a density of 2.0 to 3.0 miles per square miles when completed. Alternative F would provide the least new miles of trail than any other alternative – approximately 93 miles