Appendix F1

to the
Final Environmental Impact Statement
for the
Wayne National Forest 2006 Land and Resource Management Plan

Final Biological Assessment

on the
Wayne National Forest Land and Resource Management Plan

Prepared by

USDA, Forest Service
Wayne National Forest
August 31, 2005

Biological Assessment

for the

Wayne National Forest
Revised Land and Resource Management Plan

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August 31, 2005

Biological Assessment

Organization of the Biological Assessment

This Biological Assessment is prepared in accordance with the Endangered Species Act (Section 7(c)(1)). It includes detailed information about the proposed action, as well as the effects analyses for federally listed species (Table 1).

Table 1. Contents of the Biological Assessment.

Introduction

The Land and Resource Management Plan (Forest Plan) is a strategic document that establishes land allocations as well as goals, desired conditions, objectives, standards and guidelines for the Wayne National Forest (WNF). The Forest Service initiated the Forest Plan revision process in April 2002 with the publication of the Notice of Intent to revise the Forest Plan in the Federal Register.

As part of the Forest Plan revision process, six alternatives were developed to address issues raised during public involvement and comment periods. A Biological Evaluation was prepared and published in the Draft Environmental Impact Statement (EIS) (Appendix F). This Biological Evaluation identified and addressed the potential effects of the six alternatives on federally listed species, Regional Forester sensitive species, and species proposed for Regional Forester sensitive species designation.

Upon consideration of public comments received during the 90-day formal comment period of the Draft EIS (April 1- July 1, 2005), the Regional Forester made the decision to modify the Preferred Alternative (E), resulting in what will now be designated as the Selected Alternative, or Alternative E_{mod}.

Pursuant to 50 CFR 402.12, this Biological Assessment will evaluate the potential effects of the Selected Alternative (Alternative E_{mod}) on listed and proposed species identified as occurring in or near the WNF. In addition, it will demonstrate how Alternative E_{mod} meets requirements of Forest Service Manual 2672.3 (i.e., the objectives of the Forest Plan must include overall goals of effecting recovery and achieving eventual delisting of any federally listed species known to occur within the National Forest).

Location and Ecological Setting of the Proposed Action

Wayne National Forest

The WNF proclamation boundary encompasses 853,531 acres in 12 southeastern Ohio counties: Athens, Gallia, Hocking, Jackson, Lawrence, Monroe, Morgan, Noble, Perry, Scioto, Vinton, and Washington. There are 238,053 acres of NFS lands within the WNF proclamation boundary; the remaining lands are state-owned, privately-owned, or lands owned by local governments. The WNF is broken into three administrative units (Athens, Ironton, and Marietta).

The WNF is located in the Southern Unglaciated Allegheny Plateau (Ecological Section 221E). The topography is characterized by numerous narrow ridges and deep valleys. Topographic relief ranges from a minimum of 500 feet to a maximum of over 1,000 feet. Slopes are typically benched or segmented with alternating steep and moderate slope gradients. Most gradients average 25 to 55 percent.

The bedrock geology is characterized by inter-bedded sedimentary strata of Permian age on the Marietta Unit, while bedrock underlying the Athens Unit and the Ironton Ranger District is of Pennsylvanian age. Most of the surface soils are silt loam, loam or sandy loam. However, the subsurface

soils range from sandy loam to clay. Soil type and topography contribute to some areas of the WNF having high potential for soil erosion.

The WNF is located in the heart of Ohio's oil, gas and coal deposits. Industrial minerals such as sand, gravel, limestone, clay, shale, sandstone, and salt are also found within the Forest. About 40% of the WNF is currently underlain by federally owned minerals, including oil and gas. Reserved and/or outstanding minerals wholly or partially encumber the remaining 60% of the National Forest.

Extraction of coal, clay, limestone and iron ore have occurred in southeastern Ohio during the last 150 years. Today, remnants of this industrial era are present on the WNF in the form of abandoned surface and underground mines. Features associated with these abandoned mine lands affect riparian and water quality.

The WNF is part of the mixed mesophytic forest region. Approximately 80% of all lands within the WNF proclamation boundary are forested (Ohio Land Use Cover, based on Landsat TM 1994). Just over 94% of NFS lands are forested with the remaining 6% covered by non-forest lands such as roads, water, grasslands and other openland. National Forest System lands are dominated by hardwood forest types, however some pine is present (Table 2).

Table 2. Acres of forest types by age class on National Forest System lands*.

Age (years)	Pine	Pine - Hardwood	Oak - Hickory	Yellow Poplar	Lowland Hardwood	Maple-Beech	Upland Hardwood	Total
No Age	52	23	138		74		34	321
0-9	55	279	110	13	275		312	1,044
10-19	953	640	4,632	93	349	74	4,974	11,715
20-29	1,217	532	4,343	614	747	196	4,725	12,374
30-39	4,470	1,811	4,417	1,088	2,297	274	6,962	21,319
40-49	3,539	3,157	3,024	2,129	1,844	189	7,427	21,309
50-59	2,233	3,093	5,724	3,019	1,281	596	9,239	25,185
60-69	1,405	1,986	10,493	2,792	720	443	8,221	26,060
70-79	364	650	13,120	1,691	505	675	6,254	23,259
80-89	85	297	13,722	899	257	755	3,179	19,194
90-99		352	13,628	347	69	347	2,021	16,764
100-109		34	14,131	125	63	360	1,073	15,786
110-119			10,524	93	17	148	574	11,356
120-129			6,625	12		117	172	6,926
130-139		22	1,859		34	70	51	2,036
140-149			988			20	78	1,086
150+			197			15	28	240
Total	**14,373**	**12,876**	**107,675**	**12,915**	**8,532**	**4,279**	**55,324**	**215,974**

**Data in this table do not include the approximately 9,300 acres of NFS lands where a silvicultural examination has yet to be conducted.*

Of the forested NFS lands, oak-hickory is the major forest type, comprising 47% of all forested stands. The majority of the WNF has been harvested one or more times since the late 1700s. Cultivation or grazing followed the harvest of many forest stands. Today, many of the forest communities were established after timber harvesting that occurred about 80-140 years ago.

All streams in the WNF proclamation boundary flow towards the Ohio River. There are 31 fifth-level watersheds that contain part of the WNF proclamation boundary; however only 15 of these watersheds contain more than 1% NFS lands (Table 3).

Table 3. Fifth level watersheds covering the WNF proclamation boundary.

Watershed Name	Hydrologic Unit Code	Watershed Size (acres)	NFS land (%)
Monday Creek	0503020406	74,209	44.7
Pine Creek	0509010302	117,859	36.5
Symmes Creek (Black Fork to Buffalo Creek)	0509010109	64,168	35.1
Little Muskingum River (Clear Fork to Ohio R.)	0503020110	106,032	26.5
Ohio River (Sunfish Cr. to Muskingum River)	0503020102	87,344	22.3
Sunday Creek	0503020407	88,773	21.9
Symmes Creek (Buffalo Creek to Ohio River)	0509010110	96,987	17.9
Little Muskingum River (above Clear Creek)	0503020109	95,313	15.5
Ohio River (below Big Sandy R. to Pine Cr.)	0509010301	83,471	13.1
Hocking River (Enterprise to Monday Cr.)	0503020405	80,819	10.4
Symmes Creek (headwaters to Black Fork)	0509010108	76,244	10.1
Raccoon Creek (headwaters to Hewett Fork)	0509010102	86,715	6.7
Hocking River (Monday Creek to Athens)	0503020408	65,523	5.2
East Fork of Duck Creek	0503020111	87,190	1.7
Raccoon Creek (Hewett Fork to Elk Fork)	0509010103	99,234	1.4
Little Scioto River (Rocky Fork to Ohio River)	0509010304	97,405	0.37
Federal Creek	0503020409	92,547	0.34
Middle Fork of Salt Creek	0506000208	69,738	0.17
Raccoon Creek (Little Raccoon Cr. to Ohio R.)	0509010106	90.082	0.17
Duck Creek (except East Fork)	0503020112	95,765	0.16
Salt Creek (Queer Cr to Scioto River)	0506000210	85,157	0.07
Hocking River (Athens to Ohio River)	0503020410	70,213	0.01
Wolf Creek	0504000409	98,776	0
Seneca Fork Wills Creek	0504000501	96,296	0
Ohio River (Muskingum R. to Hocking R.)	0503020201	90,407	0
Rush Creek (Little Rush Cr. to Hocking River)	0503020403	87,046	0
Ohio River (Fish Creek to Sunfish Creek)	0503020101	79,210	0
Moxahala Creek	0504000405	69,353	0
Rush Creek (headwaters to Little Rush Creek)	0503020402	63,267	0
Ohio River (Kanawha River to Raccoon Cr.)	0509010101	29,064	0
Ohio River (Raccoon Cr. to Symmes Cr.)	0509010107	88,976	0
Total		**2,523,191**	**9.43**

Riparian areas, wetlands and floodplains have been affected by extensive disturbance and modifications. Nearly all floodplains and riparian areas, and most of the wetlands on NFS lands were cleared, drained, and farmed in the past. Transportation corridors, including roads and railroads, were developed through these areas by early settlers. Riparian and aquatic resources have also been affected by stream channel alteration (typically by straightening stream channels and the filling in of oxbows), streamside forest clearing, livestock access to streams, cultivation of fields up to the edge of the channel, and more recently from increased development of residential sites in the floodplain on private lands. Such activities have resulted in altered hydrologic regimes, increased erosion and sedimentation within stream channels, degraded water quality and aquatic habitat.

The landscape of the WNF, including NFS lands and other ownerships, is fragmented by residences, farms, mines and quarries, industrial developments, and towns. The scattered pattern of NFS lands, including subsurface ownership of minerals, has resulted in the construction of roads and utility corridors across NFS lands to access these private inholdings.

Action Area

The term action area is used in the formal consultation process to define the area that will include all direct and indirect effects of implementing the Selected Alternative. Direct and indirect effects of activities associated with the Selected Alternative would occur on NFS lands, and could extend off NFS lands and onto other ownerships.

For purposes of this Biological Assessment, the action area is defined as all lands inside the WNF proclamation boundary and within one mile to the outside of the WNF proclamation boundary. In addition, the action area will also include all lands within one mile of the edge of those NFS lands located outside the WNF proclamation boundary (Figure 1).

The action area encompasses 1,108,199 acres in Ohio, West Virginia and Kentucky, where 238,053 acres of that area (i.e., 21%) are National Forest System (NFS) lands managed by the Forest Service (Table 4). National Forest System lands are intermixed with private and state owned lands. The ecological setting of the action area is the same as that described for the Wayne National Forest, in previous paragraphs.

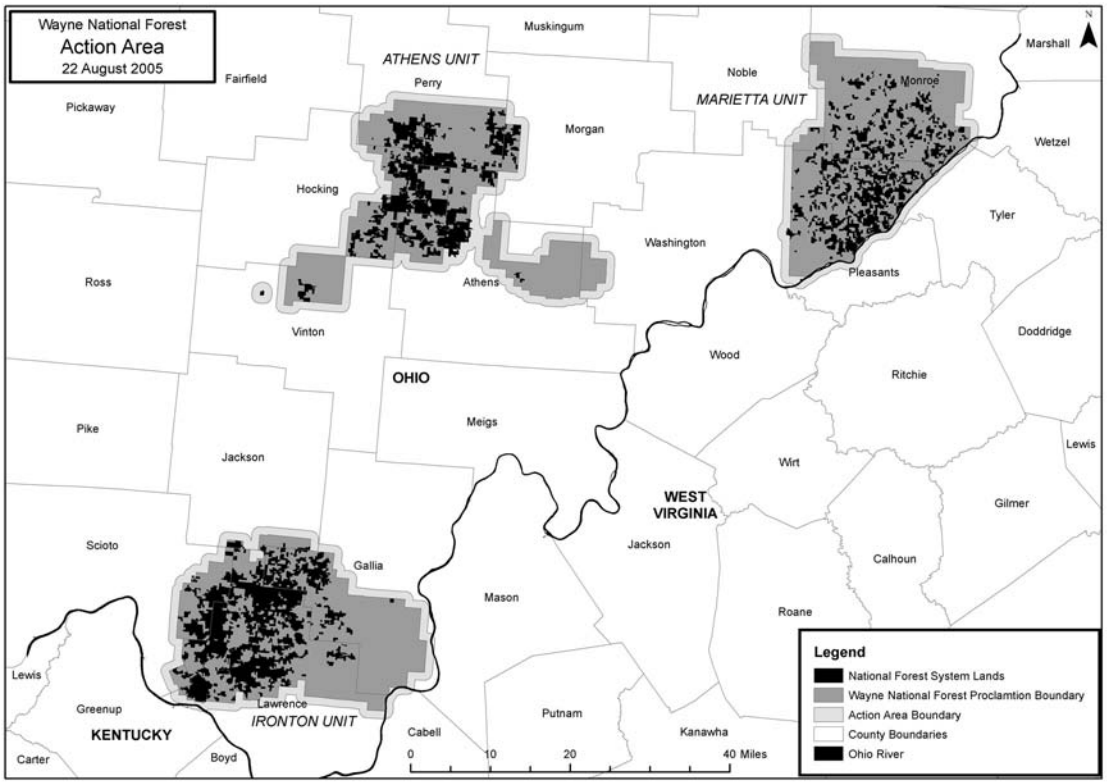


Figure 1. Action area.

Table 4. Action Area Description*

Land Area
Kentucky – 915 acres
Ohio – 1,083,545 acres
West Virginia – 23,739 acres
Ownership
Wayne National Forest – 238,053 acres
Corps of Engineers – 100 acres
Ohio River Islands National Wildlife Refuge – 508 acres
State of Ohio – 25,446 acres
New Page/Escanaba Timber – 5,697 acres
The Nature Conservancy – 4,116 acres
Private/Local Government – 834,280 acres
Land Use
Forest – 79%
Agriculture – 19%
Open Water – 1%
Residential – <1%
Transportation/Industry – <1%

**Data were obtained from WNF GIS and LandSat (1994) except for TNC and FWS acreages.*

Description of the Selected Alternative (Alternative E_{mod})

The National Forest Management Act requires the development and analysis of a broad range of reasonable alternatives that respond to the issues and concerns identified during the planning process. For purposes of this Forest Plan revision, each alternative had a different approach to managing the resources on the WNF. While all alternatives provided a wide range of multiple uses, goods and services, they addressed the issues in different ways.

Preliminary themes for revised Forest Plan alternatives were developed during public and employee collaborative workshops in 2003. These themes were designed to address the issues and concerns identified early on in the planning process. The themes were used to develop five alternatives, in addition to the No Action Alternative (Alternative A) that carried forward the emphasis of the current Forest Plan.

Alternative E was identified as the Preferred Alternative with the release of the Draft EIS and Proposed Revised Forest Plan (announced in the Federal Register on April 1, 2005). After review of public comments received during the subsequent 90-day comment period, the Regional Forester chose to modify the Preferred Alternative, and identified E_{mod} as the Selected Alternative.

The Selected Alternative (Alternative E_{mod}) provides the management strategy that will guide all resource management activities and will establish management direction for the WNF for the next 10-15 years.

Management Areas (MA) are the foundation of a Forest Plan (see Chapter 3 of the revised Forest Plan). Each MA emphasizes different management prescriptions and uses (Table 5). Alternative E_{mod} consists of a specific arrangement of MAs on the ground, otherwise known as the MA allocation. Allocation includes the type, amount and distribution of the MAs referenced in Table 5.

For comparison purposes, Table 6 is provided to show how Alternative E_{mod} falls within the range of MA allocations analyzed for Alternatives A-F (see the Biological Evaluation - DEIS, Appendix F). Table 6 shows that the acreages associated with the MA allocation for Alternative E_{mod} are within the range of those acreages analyzed for Alternatives A-F.

To achieve the desired future condition for each MA, various management activities are projected to occur as the Selected Alternative is implemented. For analysis purposes, the intensity of management activities is projected out for 10 years. Table 7 is provided to show how the projected management activities associated with Alternative E_{mod} fall within the range of management activities previously analyzed for Alternatives A-F (see the Biological Evaluation - DEIS, Appendix F).

Various conservation measures are integrated into Alternative E_{mod} to further the recovery of the nine federally listed species addressed in this Biological Assessment. These measures include Forest-wide goals, objectives, standards and guidelines specific to federally listed species, and other Forest-wide direction relating to protection of potentially suitable habitat. Such conservation measures will be highlighted for each species in the following sections of this Biological Assessment. In addition, a ***Conservation Plan for Federally Listed Species*** has been included in Alternative E_{mod} (as Appendix D, located in the revised Forest Plan). This Conservation Plan is appended to this Biological Assessment (Appendix 1).

Table 5. Brief description of the management areas.

Management Area Name	Description
Candidate Areas (CA)	Emphasis is on the preservation of potentially unique natural areas. These areas possess potentially significant natural or historic characteristics. Management is directed at protecting the potentially unique characteristics of these areas until they can be studied for designation as research natural areas, special areas, or other management areas.
Developed Recreation (DR)	Emphasis is on the management of existing recreation facilities and the future needs for the highly developed sites that serve large numbers of people. It covers the most developed range of recreation opportunities provided on the Forest. By offering a variety of recreation opportunities, services, and facilities in a natural setting, the Forest intends to provide visitors with a quality outdoor recreation experience.
Diverse Continuous Forest (DCF)	Provides mature forest habitat for conservation of forest interior species.
Diverse Continuous Forest with OHVs (DCFO)	Emphasizes trails for motorized recreation and mature forest habitat for conservation of forest interior species.
Forest and Shrubland Mosaic (FSM)	Sustains a distribution of early successional habitat conditions interspersed throughout a forested landscape. Dispersed, non-motorized recreation opportunities are offered in this management area.
Forest and Shrubland Mosaic with OHVs (FSMO)	Emphasizes trails for motorized recreation as well as early successional habitat conditions interspersed throughout a forested landscape.
Future Old Forest (FOF)	Characterized mostly by old forest that change only as a result of natural disturbances and natural succession. These areas offer Forest visitors opportunities to experience solitude and closeness to nature. Such opportunities may be limited in the vicinity of private oil and gas rights until the oil and gas reservoirs are depleted.
Future Old Forest with Mineral Activity (FOFM)	This management area is located on the Marietta Unit of the Athens Ranger District. It continues a primarily custodial regime of vegetation management. Its two objectives are (a) promotion of mostly old forest that changes only as a result of natural disturbance and succession; and (b) opportunities for relatively primitive recreation experiences. Unlike the FOF Management Area, surface occupancy of federal oil and gas leases is permitted in this management area. Many oil and gas wells are already present within this management area, both on lands in private surface ownership and on NFS land where the subsurface minerals are privately owned (outstanding and reserved rights).
Grassland and Forest Mosaic (GFM)	Emphasizes habitat for grassland-dependent wildlife species on expanses of reclaimed coal mine lands. Dispersed, non-motorized recreation opportunities are offered in this management area.

Management Area Name	Description
Historic Forest (HF)	The emphasis of this management area is moving conditions toward the "historic range of variability." This includes maintaining and increasing the predominance of oaks and hickories on most sites, featuring larger and older trees with more open stands than currently cover most of this area. These conditions would be promoted through a combination of mostly uneven-aged timber harvest, frequent prescribed fire, and herbicide use, where necessary, to promote oak and hickory regeneration.
Historic Forest with OHVs (HFO)	Emphasizes trails for motorized recreation as well as moving forest conditions back toward their "historic range of variability". This includes maintaining and increasing the predominance of oaks and hickories on most sites, with larger, older trees and stands more open than those currently found in this area. These conditions are to be attained by a combination of mostly uneven-aged timber harvest, frequent prescribed fire, and herbicide use, where necessary, to promote oak and hickory regeneration.
Research Natural Areas (RNA)	Includes designated Research Natural Areas which emphasize preservation of unique ecosystems for scientific purposes; and research to better understand natural processes.
River Corridors (RC)	Emphasizes retaining, restoring, and enhancing the inherent ecological processes and functions associated with riverine systems. Management will protect or enhance the scenic quality of these areas. As a result, high-quality riverine recreation opportunities should be available in these river corridors. Areas allocated to this management area are linear-shaped and occur along the mainstem of Symmes Creek, the Hocking River, the Little Muskingum River, and along the Ohio River.
Special Areas (SA)	Emphasizes the preservation, management, and study of unique natural areas. These areas are regionally or locally significant and have been formally designated after recommendation by a review committee and approved by the Regional Forester. These areas meet one or more of the following criteria: (a) be representative of unique geological, ecological, cultural or other scientific values; (b) be an appropriate area for scientific research; and (c) have potential to be a regional or national landmark based on its natural or cultural values.
Timbre Ridge Lake (TRL)	Focus of this management area is the scenery and recreation afforded by the 100-acre Timbre Ridge Lake and the rugged, wooded hills that surround it.

Table 6. Management area allocation by acres of NFS lands across the alternatives.

	A *No Action*	B	C	D	E	E_{mod} *Selected*	F
Candidate Areas	981	981	981	981	981	981	981
Developed Recreation	1,839	1,839	4,078	4,078	4,078	4,078	4,078
Diverse Continuous Forest	155,408	12,079	98,292	83,405	55,089	55,267	45,971
Diverse Continuous Forest with OHVs	45,010	27,851	43,901	29,846	22,278	22,953	22,278
Forest and Shrubland Mosaic	0	143,329	22,946	45,536	57,562	54,580	35,779
Forest and Shrubland Mosaic with OHVs	0	17,159	0	0	0	0	0
Future Old Forest	18,470	9,603	23,649	8,793	13,496	16,478	26,326
Future Old Forest with Mineral Activity	0	8,867	0	10,154	10,154	10,154	28,225
Grassland and Forest Mosaic	0	0	5,334	5,334	5,334	5,334	5,334
Historic Forest	0	0	17,869	17,869	26,456	26,278	26,456
Historic Forest with OHVs	0	0	0	14,054	21,622	20,947	21,622
Research Natural Areas	117	117	117	117	117	117	117
River Corridors	8,682	8,682	12,544	12,544	12,544	12,544	12,544
Special Areas	7,546	7,546	7,546	7,546	7,546	7,546	7,546
Timbre Ridge Lake	0	0	796	796	796	796	796
Total	238,053	238,053	238,053	238,053	238,053	238,053	238,053

Table 7. Upper limits of projected outputs for management activities for the first decade.

Units of measure – acres (unless otherwise noted)	A *No Action*	B	C	D	E	E_{Mod} *Selected*	F
Vegetation Management							
Even-aged Hardwood Timber Harvest	0	5,960	1,630	1,780	1,820	1,725	1,370
Even-aged Pine Timber Harvest	0	200	200	200	200	200	200
Uneven-aged Timber Harvest	5,000	5,000	16,120	15,470	14,590	14,556	13,500
Thinning	0	0	940	1,230	1,540	1,460	970
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
Site Prep for Native Pine	200	200	200	200	200	200	200
Reforestation	500	500	500	500	500	500	500
Prescribed Fire							
Oak Regeneration	6,764	12,214	35,725	40,599	46,611	46,215	44,537
NNIS	200	200	200	200	200	200	200
Herbaceous Habitat	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Hazardous Fuels	61,355	55,905	32,394	27,520	21,508	21,904	23,582
Herbicide Application							
Oak Regeneration	800	4,376	7,236	9,005	11,155	10,994	10,846
NNIS	600	600	600	600	600	600	600
Development of Permanent Forest Openings	500	500	500	500	500	500	500
Maintenance of Permanent Forest Openings and other Herbaceous Habitats (Mechanical)	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Control of Non-Native Invasive Species							
Mechanical	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Biological	100	100	100	100	100	100	100
Wetland Restoration & Enhancement	150	150	150	150	150	150	150
Waterhole Construction	15	15	15	15	15	15	15
Fishing Pond/Lake Construction	15	15	15	15	15	15	15
Restoration & Improvement of Aquatic/Riparian Habitat							
Lentic	150	150	150	150	150	150	150
Lotic	20 miles	20 miles	20 miles	20 miles	20 miles	20 miles	20 miles
Installation of Bat-Friendly Gates on Mines	20-30 gates	20-30 gates	20-30 gates	20-30 gates	20-30 gates	20-30 gates	20-30 gates

Units of measure – acres (unless otherwise noted)	A *No Action*	B	C	D	E	E_{Mod} *Selected*	F
Recreation Management							
OHV Trail Construction	223	223	150	187	150	150	110
Hiking Trail Construction	8.5	8.5	18	18	18	18	18
Horse Trail Construction	36	36	61	61	61	61	61
Mountain Bike Trail Construction	36	36	36	36	36	36	36
Recreation Facility Construction & Parking Lots	60	60	60	60	60	60	60
Transportation Management							
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	320	317	311	318	284
Road Decommissioning	29	29	29	29	29	29	29
Skid Trails and Landings	198	441	747	739	718	740	634
Energy Minerals Management							
Surface Coal Mining Activities	1,250	1,250	1,250	1,250	1,250	1,250	1,250
Reclamation of Depleted or Orphan Wells	128 wells (70 acres)	128 wells (70 acres)	128 wells (70 acres)	128 wells (70 acres)	128 wells (70 acres)	128 wells (70 acres)	128 wells (70 acres)
Oil & Gas Well Development	234 wells (121 acres)	234 wells (121 acres)	234 wells (121 acres)	234 wells (121 acres)	234 wells (121 acres)	234 wells (121 acres)	234 wells (121 acres)
Special Uses Management							
Utility Corridor Development & Maintenance	50	50	50	50	50	50	50
Agricultural Crop Production & Grazing	50	50	50	50	50	50	50
Watershed Management							
Treatment of AMD	270	270	270	270	270	270	270
Surface Mine Reclamation	20	20	20	20	20	20	20
Closure of Open Mine Portal/Subsidence	232	232	232	232	232	232	232
Stabilization of Disturbed Areas	100	100	100	100	100	100	100
Fire Management							
Reduction of Hazardous Fuels - Mechanical	10,181	10,181	10,181	10,181	10,181	10,181	10,181
Lands Acquisition Management							
Land Acquisition	Up to 40,000 acres	Up to 40,000 acres	Up to 40,000 acres	Up to 40,000 acres	Up to 40,000 acres	Up to 40,000 acres	Up to 40,000 acres
Land Exchange	400	400	400	400	400	400	400

Consultation History

In 1986, the Forest Service initiated informal consultation with the Fish and Wildlife Service, Reynoldsburg Field Office during the development of the 1988 Forest Plan. It was determined that there were no federally-listed endangered, threatened, or proposed species within the vicinity of the Wayne National Forest which could be affected by National Forest management (1988 Forest Plan, page 4-44).

Informal consultation was conducted as part of the 1992 amendment of the Forest Plan (Amendment 8). This amendment recognized four species as having part of their range on the Wayne National Forest: Indiana bat (*Myotis sodalis*), bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), and Kirtland's warbler (*Dendroica kirtlandii*) (Forest Plan Amendment 8, Page H-1).

The discovery of the Indiana bat on NFS land in 1997, along with reports of other federally listed species occurring near the WNF, prompted the Forest Service to begin amending the Forest Plan. Formal consultation was completed on September 20, 2001, when the Fish and Wildlife Service, Reynoldsburg Field Office, issued its Biological Opinion. The Forest Service incorporated the non-discretionary Reasonable and Prudent Measures and Terms and Conditions, as well as the discretionary Conservation Recommendations, into Forest Plan Amendment 13 on May 22, 2003.

The Forest Service and Fish and Wildlife Service signed a Consultation Agreement on January 23, 2003 to address early coordination on the revision of the Forest Plan, which tiered to the national *Memorandum of Agreement on Section 7 Programmatic Consultations and Coordination among Forest Service, Bureau of Land Management, Fish and Wildlife Service, and National Marine Fisheries Service* signed August 30, 2000.

On September 19, 2003, the Forest Service and the Fish and Wildlife Service discussed the draft Species Data Collection Forms (the products of the species viability evaluations) for the Indiana bat, American burying beetle, and bald eagle. Comments about the drafts, as well as conservation approaches, were incorporated into the final Species Data Collection Forms for these three species.

The Forest Service held three collaborative learning workshops during October and November 2003 in which the public was invited to develop themes for the revision alternatives. A Fish and Wildlife Service employee (Sarena Selbo) attended the Athens workshop and participated in the development of themes.

The Forest Service and Fish and Wildlife Service conducted their annual coordination meeting on January 6, 2004, at which time the preliminary management areas and alternatives were displayed.

The range of alternatives was approved by the Regional Forester on February 5, 2004. The Forest Service met with the Fish and Wildlife Service on March 23, 2004 to describe in detail alternatives for the revised Forest Plan.

The Forest Service requested an updated list of species to include in the Forest Plan revision and biological evaluation on February 25, 2004. The Fish and Wildlife Service responded on March 24, 2004 with a list of nine federally endangered or threatened plants and animals that should be addressed in the revision. In addition, the Fish and Wildlife Service recommended that the Forest Service address the cerulean warbler, sheepnose mussel, and rayed bean mussel in the revision of the Forest Plan. On April 14, 2004, the Forest Service informed the Fish and Wildlife Service that the rayed bean mussel is found outside the WNF proclamation boundary in the Scioto Brush drainage, and that no NFS lands or any lands within the WNF proclamation boundary drain into this watershed. The Fish and Wildlife Service responded via email that no direct, indirect, or cumulative effects are expected to the rayed bean mussel from management actions on the WNF. The Fish and Wildlife Service informed the Forest Service on June 21, 2004 that the agency was working on a candidate assessment for the eastern hellbender, and they recommended the Forest Service consider this species in the revision. The Forest Service responded on June 22, 2004 that the eastern hellbender is one the WNF RFSS and was included in the species viability evaluation process, and would be included in the revision.

On March 1, 2004, the Forest Service made a request to reinitiate formal consultation to modify the incidental take statement in the 2001 programmatic Biological Opinion for the Forest Plan. The Fish and Wildlife Service amended the 2001 Biological Opinion to encapsulate the effects of the 2003 ice storm and other unanticipated forest health improvements on the WNF on March 8, 2004.

Several informal reviews of the draft Forest-wide direction occurred between the Forest Service and Fish and Wildlife Service during April-June 2004.

The Consultation Agreement was amended on May 17, 2004 to reflect new employee contacts and a revised timeline for the Forest Plan revision (Modification 1).

The draft biological evaluation for the Forest Plan revision was developed by the Forest Service and reviewed by the U. S. Fish and Wildlife Service between June and November 2004.

The Consultation Agreement was amended on April 18, 2005 to reflect a revised timeline for the Forest Plan revision (Modification 2).

The Forest Service requested an updated list of federally listed or proposed species to address in the biological assessment on July 7, 2005. The Fish and Wildlife Service responded on July 11, 2005 that the species list was the same as that noted in the March 24, 2004 letter received from the Fish and Wildlife Service. The Fish and Wildlife noted in their July 11, 2005 response that the biological assessment would not have to include the sheepnose mussel or the cerulean warbler (as noted in the March 24, 2004 letter) as these species have not been proposed for listing at this time.

A population of running buffalo clover was found on the Ironton Ranger District in June 2005, and verified by botanical experts in August 2005. The Fish and Wildlife Service was notified of the finding on August 9, 2005. The location and description of the site was provided to the Fish and Wildlife Service on August 15, 2005.

The Forest Service and Fish and Wildlife Service met informally on August 16, 2005 to discuss effects of the Selected Alternative on federally listed species, as well as clarifications of Revised Forest Plan standards and guidelines.

A Biological Assessment was prepared to disclose the effects of the Selected Alternative (Alternative E_{mod}) on the nine federally listed species. It was completed in August 2005.

Species Evaluated

Federally Listed Species

The Fish and Wildlife Service identified nine federally listed plant and animal species as occurring within or near the WNF proclamation boundary that should be addressed in this Biological Assessment (A. Zimmerman, pers. comm.). Of these nine species, only three are known to occur within the WNF proclamation boundary (Table 8). The effects of the Selected Alternative on these nine species are displayed in the following sections of this Biological Assessment.

Table 8. Federally listed species occurring within or near the WNF.

Species	Documented on the WNF	Status	Recovery Plan Date
Northern Monkshood (*Aconitum noveboracense*)	No	Threatened	1983
Running Buffalo Clover (*Trifolium stoloniferum*)	Yes	Endangered	1989; 2005 Agency Draft
Small Whorled Pogonia (*Isotria medeoloides*)	No	Threatened	1992 (1st Revision)
Virginia Spiraea (*Spiraea virginiana*)	No	Threatened	1992
Fanshell (*Cyprogenia stegaria*)	No	Endangered	1991
Pink Mucket Pearly Mussel (*Lampsilis abrupta* (=*orbiculata*))	No	Endangered	1985
American Burying Beetle (*Nicrophorus americanus*)	No	Endangered	1991
Bald Eagle (*Haliaeetus leucocephalus*)	Yes	Threatened	1983
Indiana Bat (*Myotis sodalis*)	Yes	Endangered	1983; 1999 Agency Draft

Overview of the Effects Analysis

This analysis of effects is programmatic in that it addresses only the effects of the Selected Alternative, which includes revised Forest Plan direction (Forest-wide goals, objectives, standards and guidelines and Management Area desired future conditions, objectives, standards and guidelines) on the nine federally listed species. In addition, the programmatic effects analysis addresses the projected management activities which could occur in the first decade of revised Forest Plan implementation; these management activities are displayed in Table 7.

All management actions proposed under the Selected Alternative would be subject to second level, site-specific analysis once they were authorized with a Record of Decision.

The projected land allocations and management activities that would occur as a result of implementing the Selected Alternative are displayed in Table 6 and Table 7 of this Biological Assessment. It is important to note that one aspect of an activity may have a beneficial effect on one or more species, while other aspects of the same activity could have a potentially adverse effect on one or more species. These effects will be displayed individually, and then summarized in a table at the end of each species analysis.

Because Alternative E_{mod} falls within the range of the previously analyzed Alternatives A-F, the effects disclosed for Alternatives A-F in the Biological Evaluation (DEIS, Appendix F) will be similar for Alternative

E_{mod}. For all species, direct and indirect effects could occur on NFS lands or could occur off-site onto other ownerships. The area where these direct and indirect effects occur for all nine species is called the action area (Figure 1; Table 4). For purposes of the Selected Alternative, the action area is defined as all lands inside the WNF proclamation boundary and within one mile to the outside of the WNF proclamation boundary. In addition, the action area will also include all lands within one mile of the edge of those NFS lands located outside the WNF proclamation boundary.

The extent of the action area was chosen because (1) direct effects of projected management activities on the nine species would primarily occur on NFS lands; and (2) certain indirect effects on the nine species could occur off-site and onto non-NFS lands. Of the potential direct and indirect effects that could occur to the nine species, smoke from prescribed fire and sediment transport from upland areas into streams are likely to travel the farthest from NFS lands. According to the WNF fire manager and Region 9 air quality specialist, smoke dissipates into the air column and detectable levels are minimal at a distance of one mile from the fire. Sediment originating on NFS lands and entering an aquatic system is likely to be deposited a certain distance downstream, depending on velocity and mean particle size (Hjulström, 1939 *in* Ritter et al., 1995). Based on channel morphology and velocity of streams on the WNF, sediment particles would be expected to be deposited within one mile of the origination point under normal flow conditions.

Cumulative effects, as defined for the National Environmental Policy Act, are the impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonable foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. For terrestrial species, the cumulative effects area will coincide with the action area described above. For aquatic species, the cumulative effects analysis area will include the 31, 5th level watersheds that contain the WNF proclamation boundary.

Federally Listed Terrestrial Animal Species

Three terrestrial animal species, the Indiana bat, bald eagle and American burying beetle, are currently listed by the Fish and Wildlife Service as occurring in or near the WNF.

Indiana Bat

Status of the Species

Species Description

Rangewide

The Indiana bat was listed as an endangered species on March 11, 1967 by the Fish and Wildlife Service. It has been found in 27 states throughout much of the eastern United States (USFWS 1999). More specifically, NatureServe (2004) describes its range as going from eastern Oklahoma, north to Iowa, Wisconsin, and Michigan, east to New England and south to western North Carolina, Virginia, and northern Alabama.

Northern populations migrate south to Alabama, Tennessee, Kentucky, Indiana, Missouri, and West Virginia for winter (NatureServe 2004). According to the Fish and Wildlife Service (1999), more than 85% of the range wide population occupies nine Priority I hibernacula (i.e., hibernation sites with a recorded population >30,000 bats since 1960), although two of these currently have extremely low numbers of bats. Indiana, Kentucky, and Missouri each contain three Priority I hibernacula. The most important

Common Name: Indiana bat
Scientific Name: *Myotis sodalis*
Family: Vespertilionidae
Group: Mammals
Historic Range: Eastern and Midwestern U.S.A
Population To Which Status Applies: Entire Range
Current Status: Endangered
Date First Listed: March 11, 1967
Critical Habitat: 11 caves and 2 mines in IL, IN, KY, MO, TN, and WV
Special Rules: NA
Lead Region: Great Lakes-Big Rivers Region (3)
Current Range: AL, AR, GA, IA, IL, IN, KS, KY, MD, MI, MO, MS, NC, NJ, NY, OH, OK, PA, SC, TN, VA, VT, WV
Source: Fish and Wildlife Service

hibernating caves are: Bat Wing and Twin Domes caves (Indiana); Bat, Hundred Dome, and Dixon caves (Kentucky); and Bat Cave, Great Scott Cave, and Pilot Knob Mine (Missouri). Pilot Knob Mine is the largest colony. Priority Two hibernacula (recorded population >500 but <30,000 bats since 1960) are known from the aforementioned states, in addition to Arkansas, Illinois, New York, Ohio, Tennessee, Virginia, and West Virginia. Priority Three hibernacula with recorded populations of <500 bats or records of single hibernating individuals have been reported in 17 states (Alabama, Connecticut, Florida, Georgia, Iowa, Maryland, Massachusetts, Michigan, Mississippi, New Jersey, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, Vermont, and Wisconsin).

Species Range in Ohio

Brack et al. (2002) suggested that the Indiana bat is not likely to be equally distributed across its range; rather, areas of bat abundance are associated with optimal summer and winter temperature conditions. Maternity colonies of Indiana bats are most common in southern Iowa, southern Michigan, the northern two-thirds of Missouri, the southern two-thirds of Indiana and Illinois, and the western edge of Ohio (USFWS, 1999; Gardner and Cook, 2002). Brack et al. (2002) found that summer temperatures in the eastern part of the bat's range are different than where most individuals are found. For example, Pennsylvania and West Virginia have slightly cooler average temperatures than the central Midwestern states where higher Indiana bat populations occur.

Experts believe the Indiana bat is widely distributed throughout the forested regions of the Southern Unglaciated Allegheny Plateau; however its occurrence has only been verified in a percentage of the counties within this area (Figure 2). Surveys have not been conducted in all counties. Where surveys have been conducted, sampling can be limited by topography, sampling gear, and the evasiveness of the species.

In Ohio, the Indiana bat has been recorded from 31 of Ohio's 88 counties either during the summer or winter (Figure 2). A Priority II Hibernaculum is located in Preble County, and Priority III Hibernacula are found in Adams, Brown, Highland, Hocking, and Lawrence counties (USFWS, 1999; Ewing, 2003a).

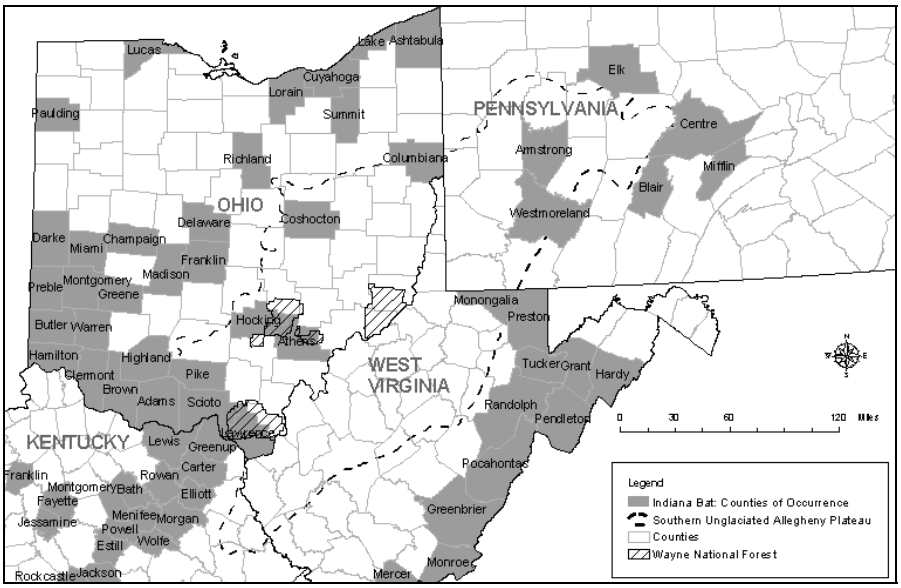
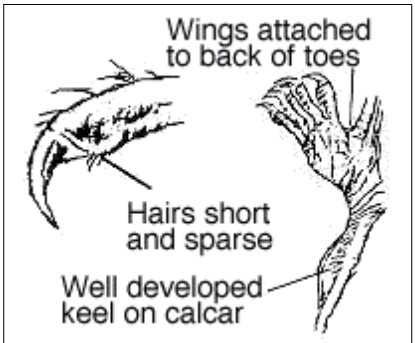


Figure 2. Known county occurrences of the Indiana bat in the Southern Unglaciated Allegheny Plateau. (Source: ODNR, 2003a; S. Selbo (pers. comm.); Western Pennsylvania Conservancy (R. Evans, pers. comm.); and BCI (2001)).

Life History

The Indiana bat is a medium-sized bat, closely resembling the little brown bat (*Myotis lucifugus*) but differing somewhat in coloration. Its fur is a dull grayish chestnut rather than bronze, with the basal portion of the hairs of the back dull lead colored. This bat's underparts are pinkish to cinnamon. The ear and wing membranes are blackish-brown. The calcar (heel of the foot) is keeled. Its body length is about 2 inches, and its wingspan is approximately 9.5-10.5 inches. The Indiana bat's hind feet are smaller and have shorter toe hairs than those of the little brown bat. During hibernation Indiana bats congregate in more densely packed clusters than other bats in its range.



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Diet

Female Indiana bats primarily feed on soft-bodied insects, including true flies (Diptera) and caddisflies (Trichoptera), followed by moths (Lepidoptera) and beetles (Coleoptera), less frequently. Females tend to feed on the highest percentage of Diptera during lactation, but on Trichoptera during pregnancy and the transition between pregnancy and lactation. Diets of male bats consist more heavily of Lepidoptera and Coleoptera (Kurta and Whitaker, 1998). In the northern part of its range,

aquatic insects make up a large portion of the diet (Murray and Kurta, 2002).

Fall Swarming and Mating

From late-August to mid-October, prior to entering hibernacula, large numbers of Indiana bats fly in and out of cave or mine openings from dusk till dawn in a behavior called swarming. Swarming usually lasts for several weeks and mating occurs toward the end of this period. Male Indiana bats tend to be active for a longer period of time than females during swarming and will enter the hibernacula later than females (USFWS, 1999). Adult females store sperm through the winter, thus delaying fertilization until early May. Individuals relocate to summer roosts during April and May; however, males and females usually leave the hibernaculum at different times. Females begin grouping into maternity colonies by mid-May and give birth to a single pup between late-June and early-July (Easterla and Watkins, 1969; Humphrey et al., 1977). Temperature and relative humidity are important factors in the selection of hibernation sites. During the early autumn, Indiana bats roost in warm sections of caves and move down a temperature gradient as temperatures decrease. In mid-winter, Indiana bats tend to roost in portions of the cave where temperatures are cool. Long-term data suggest an ideal temperature range for suitable hibernacula is between 37^{o}-43^{o}F (USFWS, 1999). A recent study of highly populated hibernacula documented a temperature range of 37^{o}-45^{o}C (Tuttle and Kennedy, 2002). Relative humidity in Indiana bat hibernacula tends to be high, ranging from 66 to 95 percent (Barbour and Davis, 1969).

Female Maternity Colony and Summer Roosting Habitat

Upon emergence from the hibernacula in the spring, females seek suitable habitat for maternity colonies (USFWS, 1999). These colonies are typically located under the sloughing bark of live, dead, and partially dead trees in upland and lowland forest (Cope et al., 1974; Humphrey et al., 1977; Gardner et al., 1991). Colony trees are usually large-diameter, standing dead trees (snags) with direct exposure to sunlight. The warmer temperature from sunlight exposure expedites development of fetal and juvenile young (Racey, 1982). A maternity roost may contain up to 100 adult females and their pups.

Roost trees often provide suitable habitat as a maternity roost for only a short period of time. Roost trees are ephemeral in nature; suitable trees fall to the ground or lose important structural characteristic such as exfoliating bark (Gardner et al., 1991; Britzke et al., 2003). Dead trees retain their bark for only a certain period of time (about 2-8 years). Once all bark has fallen off a tree, it is considered unsuitable to Indiana bats for roosting. Gardner et al. (1991) found that 31% of occupied Indiana bat roost sites were unavailable the summer following their discovery; 33% of the remaining occupied roost sites were unavailable by the second summer.

However, researchers have documented that female Indiana bats are often faithful to their summer maternity grounds, and will use roost trees in consecutive years, if the trees remain suitable (Gardner et al., 1991; Callahan et al., 1997; Kurta and Murray 2002). For unknown reasons, Indiana bats require many roost trees to fulfill their needs during the summer (Callahan et al., 1997). In Michigan, Indiana bats used two to four different roost trees during the course of one season (Kurta and Williams, 1992). In Missouri, each colony used between 10 and 20 roost trees, which were not widely dispersed (all fell within a circle ranging in diameter from 0.5 to 1 mile) (Miller et al., 2002).

It is unknown how many roosts are critical to the survival of the colony, but the temporary nature of the roost trees dictates that several must be available in an area if the colony is to return to the same area annually and raise their young successfully. Two important factors associated with roost trees is their ability to protect individuals from the elements, and to provide thermal regulation of each bat's environment. Maternity colonies have at least one primary roost, which is generally located in an opening or at the edge of a forest stand (USFWS, 1999). Maternity colonies also use multiple alternative roosts, which may be located in the open or in the interior of forest stands (USWFS, 1999). In Missouri, use of dead trees in the forest interior increased in response to unusually warm weather (i.e., shading provided a cooler thermal environment), and use of live trees and snags in interior forest increased during periods of precipitation (Miller et al., 2002). Maternity colonies in North Carolina and Tennessee used roosts located above the surrounding canopy (Britzke et al., 2003).

Indiana bats have been found roosting in several species of trees, and it appears that they choose roost trees based on their structural composition, instead of solely on species. Therefore, it is difficult to determine if one species of tree is more important than others. However, twelve tree species have been listed in the Habitat Suitability Index Model as primary species (Class I trees) (Rommé et al., 1995). These trees include silver maple (*Acer saccharinum*), shagbark hickory (*Carya ovata*), shellbark hickory (*C. laciniosa*), bitternut hickory (*C. cordiformis*), green ash (*Fraxinus pennsylvanica*), white ash (*F. americana*), eastern cottonwood (*Populus deltoides*), red oak (*Quercus rubra*), post oak (*Q. stellata*), white oak (*Q. alba*) slippery elm (*Ulmus rubra*), and American elm (*Ulmus americana*). These tree species are favored by Indiana bats because as these trees age, their bark will slough. In addition, Indiana bats use sugar maple (*A. saccharum*), shingle oak (*Q. imbricaria*), and sassafras (*Sassafras albidum*), which are listed as Class II trees (Rommé et al., 1995). The Class II trees are those species believed to be less important, but that still have the necessary characteristics to be used as roosts.

During a fall survey in Kentucky in 1994 and 1995, female Indiana bats roosted singly in sourwood (*Oxydendrum arboreum*) and pignut hickory (*Carya* glabra) trees. The roost trees were between 6 and 10 inches in diameter and contained bark cover between 54 and 70 percent. Females tended to roost within 0.75 miles of the hibernaculum, whereas males roosted anywhere from 0.95 to 2.35 miles from the hibernaculum. Both males and females were found to use 2 to 3 roost trees for 2 to 3 days at a time (Kiser and Elliott, 1996). Britzke et al. (2003) documented the use of conifers by maternity colonies in the mountains of Tennessee and North Carolina.

Male Roosting Habitat

Some adult males use mature forests around and near their hibernacula for roosting and foraging from spring through fall. However, some male bats have been found to leave the hibernaculum area completely (USFWS, 1999). Researchers have also documented male Indiana bats returning to the same habitat in subsequent years (USFWS, 1999).

Roost trees in Kentucky are primarily dead snags on upper slopes or ridgetops; however, live shagbark hickory and pignut hickory trees have also been recorded as roost trees. Male Indiana bats have been found to roost singly during autumn in scarlet oak (*Quercus coccinea*), Virginia pine (*Pinus virginiana*), red maple (*Acer rubrum*), shagbark hickory, and red oak. These trees ranged in diameter from 4.6 to 26 inches and had bark coverage ranging from 1 to 100 percent. However, the majority of roost trees had bark coverage of at least 60 percent (Kiser and Elliott, 1996).

During a 1999 summer radio telemetry survey on the WNF, males were found roosting in American elm, red maple, shagbark hickory, and sugar maple trees, all of which were dead. The average dbh of these trees was 11.8 inches and the average length of time each tree was used was 2.3 days (Schultes, 2002). In 2000, two male Indiana bats were found roosting in dead American elm, red maple, black oak (*Quercus velutina*), white oak, pignut hickory and shagbark hickory. The average dbh of these trees was 11.9 inches and the average length of time each tree was used was 1.9 days (Schultes, 2002).

MacGregor et al. (1999) reported male Indiana bats were roosting, during the autumn pre-hibernation period, in forest stands that were harvested by the two-age timber harvesting methods 0-5 years prior to the study. Harvesting followed guidelines in the Daniel Boone National Forest Land and Resource Management Plan where 16 live trees/acre and a minimum of 2 snags/acre were to be retained.

Canopy cover around roost trees documented in different studies ranges from low to high. MacGregor et al. (1999) found canopy closure around autumn roost trees used by males ranged from 20 to 93% (mean = 80%) in a Kentucky study. Of the 70 roost trees located in their study, 27% were

located in fairly open canopy (<60% canopy cover); 24% were in an intermediate canopy coverage (60-80%); and 48% of the roost trees were found in areas with more than 80% canopy cover. A study on the WNF found roost trees used by male Indiana bats were more likely to be located in a canopy gap than in a shaded location (Schultes, 2002).

Foraging

Foraging habitat for male and female Indiana bats in the core of its range is assumed to include forest habitats with open understories and canopy closures of 50 to 70 percent (Rommé et al., 1995). Other foraging habitat includes upland, bottomland, and riparian woodlands, as well as forest and cropland edges, fallow fields, and areas of impounded water (Kiser and Elliott, 1996). Other studies show that summer roosting and foraging areas, in parts of its range, can contain diverse cover types, including agricultural lands, residential areas, and open woodlands (Carter et al., 2002; Farmer et al., 2002; Miller et al., 2002; Sparks et al., 2004).

Females may use larger foraging areas than males during the summer. One study recorded a post-lactating female's foraging range as approximately 530 acres; males had an area of approximately 140 acres (Kiser and Elliott, 1996). New information from a Michigan study documented pregnant and lactating females traveling up to 2.6 miles from the day roost to foraging areas (Murray and Kurta 2004). However, Menzel et al (2005) found no significant difference in home range size for male or female bats during a study in Illinois, leading them to believe that the abundance of riparian and bottomland hardwood habitats in their study area allowed the individuals to meet their foraging requirements without having to travel a great distance.

Observations by Murray and Kurta (2004) indicated that female Indiana bats would not fly over open spaces between foraging areas on the northern edge of its range in Michigan, but instead appeared to follow wooded corridors described as a narrow fence line of mature trees. These foraging areas included lakes, ponds, an area that was 50% wooded and 50% open fields, woodlands, and forested wetlands. Menzel et al. (2005) found that Indiana bats foraged significantly closer to forest patches, roads, and riparian areas than agricultural lands or grasslands in a heavily fragmented area in Illinois. These data suggested that Indiana bats may use linear landscape features like narrow wooded patches, riparian corridors and roads as foraging habitat as well as traveling corridors in fragmented landscapes.

During summer months, some males remain near the hibernacula and forage along floodplain pastures, within dense forests, and on ridgetops. Male Indiana bats generally travel between 1.2 and 2.6 miles from their summer roosts to summer foraging areas (USFWS, 1999). A study in Kentucky indicated male Indiana bats have a minimum foraging area size

of about 400 acres and a high use area size of 115 acres (Kiser and Elliott, 1996).

During the fall, male bats were found to forage in upland, ridgetop forest, as well as valley and riparian forest areas (USFWS, 1999). Male Indiana bats tend to use larger foraging areas during autumn than in summer. However, female bats use even larger autumn foraging areas than males. During October, males were observed to be traveling between 0.89 and 1.5 miles to forage (Kiser and Elliott, 1996).

General

Young females can mate in their first autumn and have offspring the following year. Males do not mature until their second year (USFWS, 1999).

A study done in Indiana found mortality between birth and weaning was about 8% (Humphrey et al., 1977). Humphrey and Cope (1977) reported the following survival information for an Indiana population: female survivorship (76% for ages 1-6 years; 66% for ages 6-10 years); male survivorship (70% for ages 1-6 years; 36% for ages 6-10 years). Humphrey and Cope (1977) reported maximum ages for banded females (15 years) and banded males (14 years) in an Indiana population.

Population Dynamics

Winter census information for hibernating Indiana bat populations is compiled by the U. S. Fish and Wildlife Service (Table 9). Based on hibernacula surveys, the Indiana bat population is estimated to be about 458,332 individuals, as of 2005.

Table 9. Rangewide Indiana bat winter population size estimates, 1960-2005.

	1960/1970	1980	1990	2001	2003	2005
Indiana	160,300	155,200	163,500	173,076	183,332	206,609
Missouri	399,000	342,000	150,100	72,983	66,805	65,104
Illinois	14,800	14,800	14,900	19,328	35,030	44,343
Ohio	150	3,600	9,500	9,788	9,436	9,769
Michigan				20	20	20
Kentucky	248,100	102,200	78,700	47,918	41,498	63,339
Tennessee	20,100	20,100	16,400	10,172	8,900	9,971
Arkansas	15,000	15,000	4,500	2,476	2,124	2,067
Alabama	350	350	350	250	317	296
New York				29,642	32,923	41,702
Pennsylvania	700	700	400	702	853	746
West Virginia	1,500	1,200	6,500	9,744	9,741	12,677
Virginia	3,100	2,500	1,900	833	1,090	735
New Jersey					644	652
Vermont					175	297
Oklahoma					5	5
Total	**863,100**	**657,650**	**446,750**	**376,932**	**392,893**	**458,332**

(Data for 1960-1990 from Clawson 2002; data for 2001-2005 from A. King, pers. comm.).

Status and Distribution

The Indiana bat population has decreased since winter censuses were initiated in 1960; however a slight increase in its rangewide population size has occurred over recent years. The Fish and Wildlife Service reported that winter populations appeared to have increased or remained stable in most state's hibernacula resulting in a 16.7% overall increase above the 2003 population estimates (A. King, pers. comm.). Some of this increase may be explained by an increased effort by biologists to identify previously unknown hibernacula.

Since 1990, the Ohio winter population has remained stable to slightly increasing. However, Indiana bats within the Priority III hibernaculum on the WNF increased from about 150 individuals in 1999, to an estimated 200 individuals in 2003, to an estimated 333 individuals in 2005 (Schultes, 2003; 2005).

Threats to the Species

Rangewide

The causes for the population decline of the Indiana bat have not yet been definitively determined. However, the documented and suspected reasons for decline include disturbance and vandalism; improper cave gates and structures; natural hazards; microclimate changes; adverse land use practices; and chemical contamination.

Human disturbance of hibernating bats led to a decline in Indiana bat populations from the 1960s to the 1980s (USFWS, 1983b; 1999). Disturbance from recreational cavers and researchers entering hibernacula can cause bats to expend crucial fat reserves before they are able to forage in the spring. A hibernating bat can use up as much as 68 days of fat supply in a single disturbance event (Thomas et al., 1990 in USFWS, 1999). The Fish and Wildlife Service (1999) described an example of how human disturbance has led to direct mortality of bats. In 1960, three youths entered a hibernaculum in Kentucky and killed about 10,000 bats by tearing them from the ceiling and trampling or stoning them to death. Indiana bats have also been killed in their hibernacula by shotgun blasts.

Changes in the microclimate of a cave or mine can affect temperature and moisture level, thereby affecting suitability of the hibernaculum or affecting bat physiology (Richter et al., 1993; USFWS, 1999; Tuttle and Kennedy, 2002). Blockage of entry points can alter airflow in a cave or mine. This poses serious consequences when a hibernaculum is on the warm edge of the species hibernating tolerance, or has less stable temperatures. In northern areas, changes in airflow could lead to areas of the mine or cave being too cold for the bat. In either case, changes in airflow and the microclimate could force individuals to use less optimal

locations in the hibernaculum. This could leave them vulnerable to predation, freezing, or exhaustion of fat reserves.

Improper gates have either rendered hibernacula unavailable to the Indiana bat, or have altered air flow causing hibernacula temperatures to be too high for bats to retain fat reserves through the winter (USFWS, 1999). Cave entrances essential to proper cooling of key hibernating sites must be identified and protected from inadvertent closures, including those that may occur naturally (Tuttle and Kennedy, 2002).

Natural hazards including flooding, freezing during severe winters, and ceiling collapse have caused the loss of Indiana bats (USFWS, 1999). Indiana bats have been drowned by flooding of caves or mines, either by river flooding or changes in subsurface and surface hydrology. Severe weather can affect bats roosting in summer or autumn habitat. There has been a documented occurrence of strong winds and hail stripping bark from a tree, forcing the bats to move to another roost (USFWS, 1999).

The Fish and Wildlife Service (1999) stated that land use practices, fire suppression, and agricultural development have reduced available roosting and foraging habitat, as well as reduced the abundance of insect prey across the species range. Ongoing research and monitoring is helping to enhance the understanding of habitat use and characteristics. When done properly, experts consider forestry practices to be compatible with Indiana bat conservation; however, silvicultural methods need to maintain structural features important for roosting and foraging, such as snags, small openings, and edge habitats (BCI, 2001). Other studies are showing that summer roosting and foraging areas, in parts of its range, contain diverse cover types, including agricultural lands, residential areas, and open woodlands (Carter et al., 2002; Farmer et al., 2002; Miller et al., 2002).

Very little information is available about Indiana bat predation. Sparks et al. (2003) observed Indiana bats being flushed from their roost by foraging woodpeckers. The woodpeckers did not pursue the bats, but the authors suggest that Indiana bats flushed from their roosts during daylight areas could be more susceptible to other predators (e.g., birds). Sparks et al (2003) witnessed a raccoon actively trying to capture some evening bats, and speculated that interactions between tree-roosting bats and other forest vertebrates could occur.

Bioaccumulation of environmental contaminants is suspected as a potential factor in the decline of the Indiana bat (USFWS, 1999). Organochlorine insecticides became widely used after World War II; they are neurotoxic synthetic chemicals, many of which are resistant to metabolism in mammals (O'Shea and Clark, 2002). Organochlorine insecticides may have resulted in chronic mortality of Indiana bats (O'Shea and Clark, 2002). For example, guano collected from an Indiana

bat roost in Indiana in the 1970s had concentrations of dieldrin comparable to the levels found in colonies of gray bats that suffered mortality from dieldrin poisoning (O'Shea and Clark, 2002). Schmidt et al. (2002) measured levels of Polycyclic Aromatic Hydrocarbons (PAH) and organochlorine pesticides in surrogate bat species to ascertain potential effects to the Indiana bat. At low concentrations, these chemicals cause cancer and cellular mutations in mammals, and may affect reproductive success by reducing viability of gametes or offspring. In this Missouri study at Fort Leonard Wood, all red bats and eastern pipistrelles had detectable concentrations of DDE, heptachlor epoxide and PAHs, and many had measurable amounts of dieldrin.

Wind power facilities located on wooded ridges pose a newer threat to bats in general. An estimated 48 bats per wind turbine were killed at the Mountaineer wind farm in West Virginia (Tuttle, 2005). A Bats and Wind Energy Cooperative has been launched to conduct research on mortality causes and to develop solutions to prevent or minimize fatalities at wind farms.

Action Area

Of the rangewide threats to the Indiana bat and its habitat, the Forest Service has control over activities that affect known or potential hibernacula, and foraging and roosting habitat on the WNF. These threats will be specifically addressed in the evaluation of effects for the Selected Alternative.

Environmental Baseline

Status of Species in Action Area

Species Range

The action area is within the range of the Indiana bat, but the action area is located slightly to the east of the core of its range. The Indiana bat is present year round on the WNF. The following inventory and monitoring efforts have been conducted on the WNF to determine the presence of the species.

1979 Mine surveys and mist netting conducted in 1979 and 1980 did not record the Indiana bat on the WNF (Bookhout and Lacki, 1981).

1997 Mist net surveys were conducted in July on the Athens Unit (20 sites) and on the Ironton Ranger District (20 sites) (Kiser and Bryan, 1997). Four lactating female Indiana bats were captured along the Hocking River in the Haydenville area on the Athens Unit. This was the first evidence that maternity roost(s) occurred in or near the WNF on the Athens Unit. One male Indiana bat was captured in the Shawnee area of the Athens Unit. One male was captured in the Five Forks area on the Ironton Ranger District.

1998 Mist net surveys were conducted during the summer at 11 sites in the Bluegrass Ridge area of the Ironton Ranger District, but failed to capture Indiana bats (Kiser et al., 1998).

A passive survey was conducted at a mine opening on the Ironton Ranger District in September, and a harp trap survey was conducted at the same location in October (L. Andrews, pers. comm.). One male Indiana bat was captured, indicating that Indiana bats may have been using the mine for hibernation.

1999 Wintering Indiana bats were confirmed when an abandoned limestone mine was entered and approximately 150 Indiana bats were found. This mine has since been designated as a Priority III hibernaculum.

Mist net surveys were conducted in June and July on the Athens Unit (19 sites) and the Ironton Ranger District (18 sites) (Kiser et al., 1999). One adult male Indiana bat was captured in the Dorr Run area on the Athens Unit. Biologists captured what they thought was a pregnant Indiana bat in the Dorr Run area, however genetic study determined it to be a little brown bat. Five Indiana bats (three adult males, one young-of-year male, and one post-lactating female) were captured in the Bear Run area on the Ironton Ranger District. This survey provided the first indication of reproduction occurring on the Ironton Ranger District.
Six of the Indiana bats captured during the mist net surveys (four adult males, one juvenile male, and one post-lactating female) were fitted with radio-transmitters, and three were successfully tracked to collect more information about their summer roost tree use (Schultes, 2002).

2000 Abandoned limestone mines near the Priority III hibernaculum were entered in February, but no Indiana bats were found.

Mist net surveys were conducted in June and July on the Athens Unit (25 sites) and the Ironton Ranger District (26 sites) (Kiser et al., 2000; Schultes, 2002). Two adult male Indiana bats were captured, one on the Athens Unit (Dorr Run area) and one on the Ironton Ranger District (Bear Run area). One additional adult male was captured on privately-owned land adjacent to the Dorr Run area of the Athens Unit.

Three of the adult male Indiana bats captured during the mist net surveys were fitted with radio-transmitters and tracked to collect more information about their summer roost tree use (Schultes, 2002).

In September during a fall-swarming survey, a female Indiana bat was captured at the entrance to an abandoned underground coal

mine in the Dorr Run area (Athens Unit) (Brack and Little, 2001).

2001 The Priority III hibernaculum was closed to the public with the installation of a bat-friendly gate.

2002 Fall swarming surveys in September resulted in the capture of a male Indiana bat in the Snake Hollow area of the Athens Unit (L. Andrews, pers. comm.). The individual was captured in a mist net that was set at the entrance to an abandoned underground coal mine.

2003 A follow-up February survey of the Priority III hibernaculum found approximately 200 Indiana bats inside the mine (Schultes, 2003).

Two abandoned limestone mines in the Bear Run area on the Ironton Ranger District were closed to the public with bat-friendly gates.

2004 The "Brushy Mine", an abandoned limestone mine, was surveyed in February. Illegal off-highway vehicles had been driving into the mine, posing a threat to human safety, as well as to any bats inhabiting the mine. No Indiana bats were observed in the mine, however other species were documented. A mist net survey was conducted at the Brushy Mine in June. Bats were captured, but no Indiana bats were netted. A bat-friendly gate was installed at the mine in June, after the mist net survey, to protect the bats from human disturbance.

Mist net surveys were conducted in June and July on the Marietta Unit (37 sites) and the Ironton Ranger District (13 sites). No Indiana bats were captured (Meade, 2004)).

Relative humidity and temperature data loggers were installed in the Priority III hibernaculum in September to monitor microclimate trends over time.

In late-September, an adult female Indiana bat was captured at an entrance to an abandoned underground coal mine in Monkey Hollow (Athens Unit) during a fall-swarming survey (L. Andrews, pers. comm.).

2005 A follow-up February survey of the Priority III hibernaculum found approximately 333 Indiana bats inside the mine (Schultes, 2005).

The temperature and relative humidity data loggers in the Priority III hibernaculum were downloaded and reset in August 2005. Data have not been analyzed to date.

Fall swarming surveys are planned to occur in September 2005 at specific open mine portals on the Athens Unit.

Numerous nights of mist netting have been completed over the years to ascertain the species distribution across the WNF. To date, these survey efforts suggest its distribution across the area may not be scattered or random, but instead focused in at least two areas of the action area (Figures 3-5). One area is located on the Ironton Ranger District where past limestone mining and quarrying occurred, along with some underground coal mining. This area, nicknamed the Bear Run area, contains the Priority III hibernaculum. The second area is in the southwest part of the Athens Unit in an area heavily impacted by underground clay and coal mining. Both of these areas have reforested since the peak mining era, and possibly offer both winter and summer habitat for the Indiana bat.

Suitable Habitat in the Action Area

Winter Habitat

On the WNF, one abandoned limestone mine serves as a Priority III winter hibernaculum for Indiana bats. Numerous mines are located on Federal and non-Federal lands in the Athens Unit and the Ironton Ranger District as a result of past underground coal and limestone mining, however the majority of limestone mines are found in the Ironton Ranger District. These limestone mines may provide additional hibernacula for Indiana bats; however, surveys have not yet confirmed this. Characteristics of mines that may become Indiana bat hibernacula in the future include a large, unobstructed opening, air movement, and no signs of flooding such as sticks and debris at or near the ceiling of the mine.

Less is known in general, about the use of abandoned coal mines as bat hibernacula. Biologists continue to conduct fall swarming surveys, and Indiana bats have been captured at portals leading to abandoned underground coal mines. Entry into underground coal mines is not permitted because of safety concerns; however, biologists believe Indiana bats may be using these mines as hibernacula. The majority of these mines were abandoned in the mid-1900s as the coal ran out; therefore, an assumption can be made that Indiana bats are likely expanding their winter distribution into the WNF by using some of these mines.

Figure 3. Bat netting sites in the Wayne National Forest, 1997-2004.

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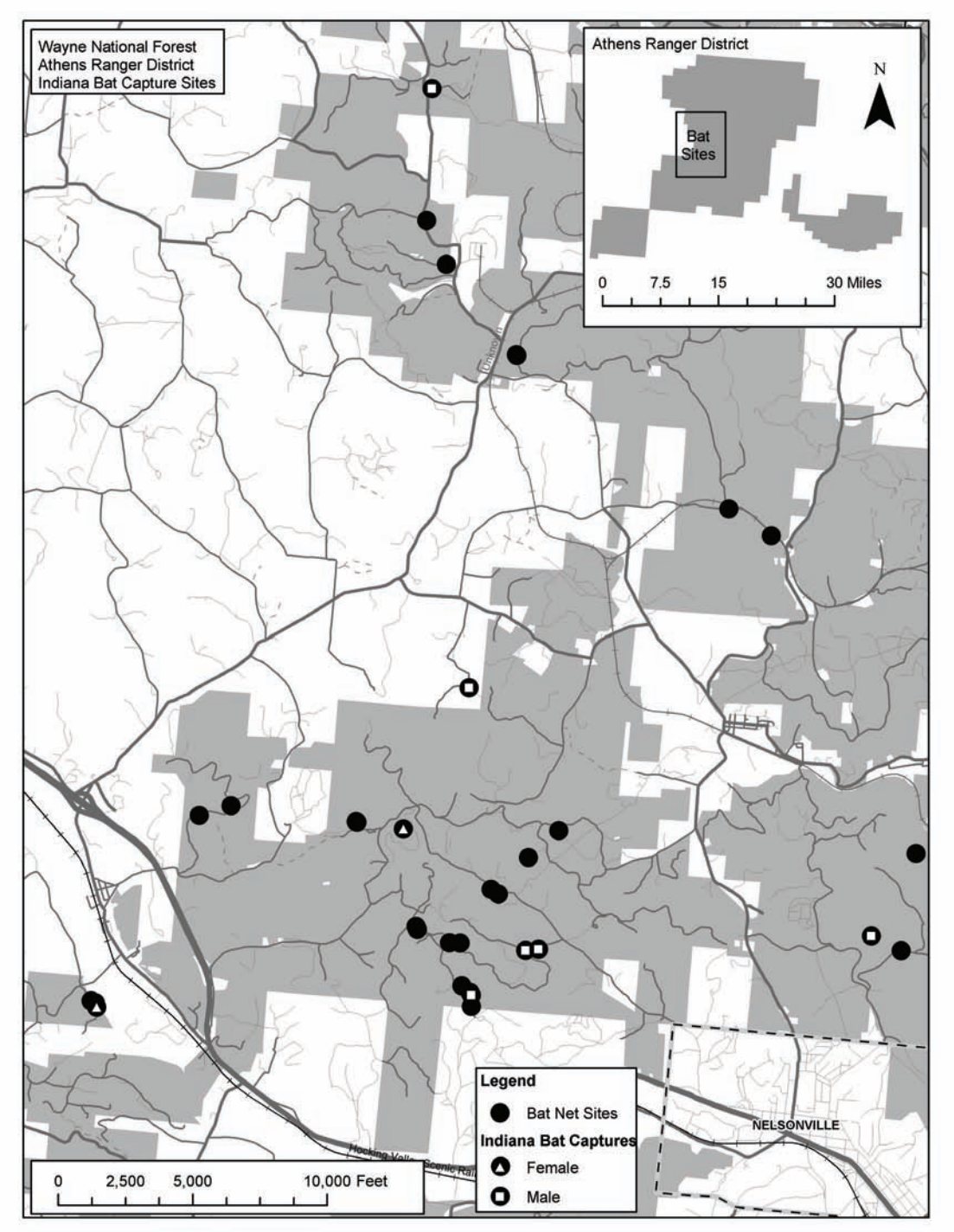


Figure 4. Locations of Indiana bat capture sites on the Athens Unit, 1997-2004.

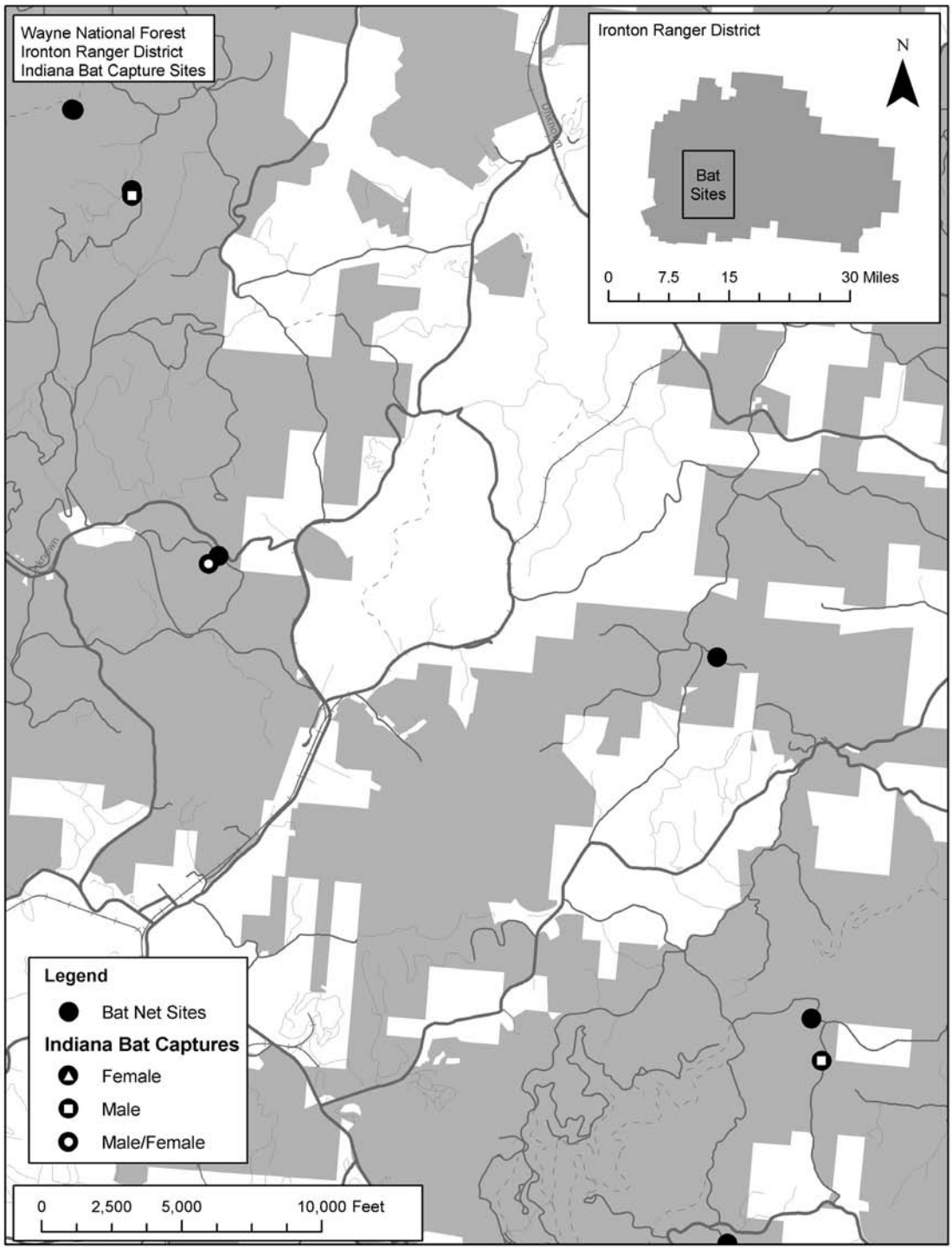


Figure 5. Locations of Indiana bat capture sites on the Ironton Ranger District, 1997-2004.

Summer Habitat

Female and male Indiana bats use the WNF during the summer, and likely use non-Federal lands in the action area. Maternity colonies have not been found on NFS lands during telemetry surveys conducted on the WNF. However, lactating and post-lactating females have been captured during summer surveys, which suggest the presence of at least one maternity colony on or within the vicinity of the WNF. Adult males have been captured and radio-tracked to summer roosts within and/or near the WNF.

The majority of recorded Indiana bat roost trees are hardwood species; however, individuals have also been found roosting in pine species (Rommé et al., 1995; Britzke et al., 2003). Ninety-four percent of the WNF is forested, and 93% of these forested lands are comprised of hardwood or hardwood-pine forest communities (Figure 6). Seventy-nine percent of the action area is forested (LandSat, 1994).

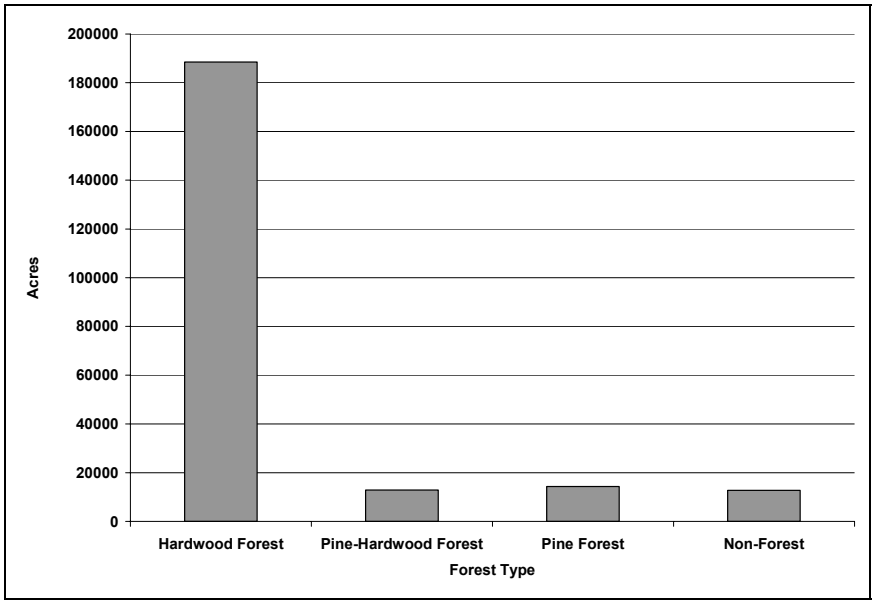


Figure 6. Distribution of general forest types on NFS lands.

While individual Indiana bats will use smaller diameter trees for roosts, the larger diameter trees (> 8 inches dbh) provide more optimal habitat for maternity colonies. Although dependant on site capability, trees generally increase in diameter as they age. As trees age, they are also more likely to begin exhibiting characteristics of known Indiana bat roost trees, such as broken tops, cavities and areas of sloughing bark.

The tree species found in the hardwood and hardwood-pine communities on the WNF reach physiological maturity at different ages (P. Perry, pers. comm.). For example, scarlet oak, red maple, sassafras, shortleaf pine, and Virginia pine reach physiological maturity as early as 70 years of age,

whereas hickory, sugar maple, and white oak are longer-lived species that may not reach physiological maturity until after 120 years or more. A general assumption can be made, based on the physical maturity of trees and experiences in the field by WNF foresters and biologists, that hardwood stands greater than 80 years old, and pine or pine-hardwood stands greater than 60 years old, contain larger trees with suitable roost characteristics.

An analysis of vegetation data for NFS land showed that nearly 40% of all hardwood stands were greater than 80 years old, with another 25% about to recruit into this older age class from the 60-80 year old classes; (Table 10; Figure 7). Pine and pine-hardwood communities are generally younger in age, but 38% of these communities were greater than 60 years old; almost 45% of the pine and pine-hardwood communities are between 40 and 60 years of age and are about to recruit into the older age class.

Table 10. Acres of forest types by age class on NFS lands*.

Age (years)	Pine	Pine - Hardwood	Oak - Hickory	Yellow Poplar	Lowland Hardwood	Maple-Beech	Upland Hardwood	Total
0-59	12,467	9,512	22,250	6,956	6,793	1,329	33,673	92,980
60-79	1,769	2,636	23,613	4,483	1,225	1,118	14,475	49,319
80+	85	705	61,674	1,476	440	1,832	7,176	73,388
Total	**14,321**	**12,853**	**107,537**	**12,915**	**8,458**	**4,279**	**55,324**	**215,687**

*Data do not include approximately 9,300 acres of NFS lands where a silvicultural examination is yet to be conducted.

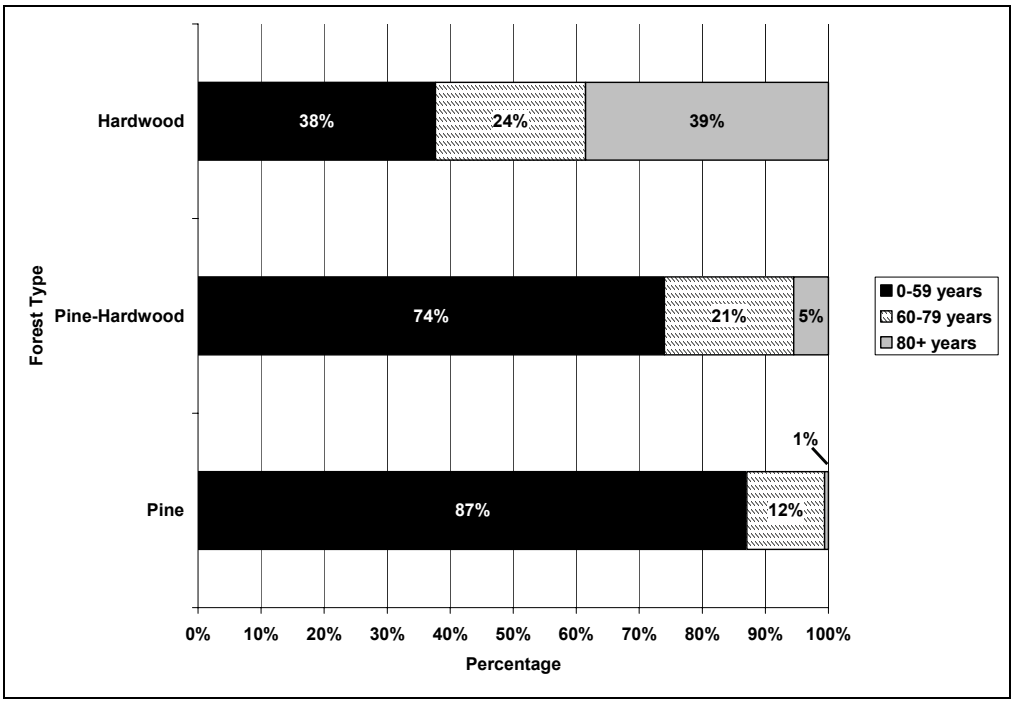


Figure 7. Comparison of general forest communities by age classes.

There has been an increasing trend for the amount of older hardwood stands on the WNF since 1985 (Table 11). Hardwood stands greater than 80 years old increased by almost 5% during the time period when the 1988 Forest Plan was being developed.

Table 11. Comparison of mature hardwood forest age classes in 1985 and in 2003 on NFS lands (Ewing 2003a).

Habitat Component	1985 (%)	2003 (%)	Percent Change (1985-2003)
Hardwood-Mast Producing			
(40-79 years)	33.0	35.8	+2.8
(80-99 years)	18.0	15.9	-2.1
(100+ years)	8.7	15.7	+7.0

In February 2003, a severe ice storm occurred in southern Ohio and northern Kentucky, including portions of the Ironton Ranger District. In its aftermath, approximately 132,675 forested acres within the Ironton Ranger District boundary were affected. Approximately 71,650 acres were affected on NFS lands. Individual or groups of trees were broken or toppled in these areas, with the severity depending generally on elevation and aspect. This natural disturbance resulted in an increase in potentially suitable Indiana bat roost trees across the western two-thirds of the Ironton Ranger District.

Indiana bats have been captured during their nightly foraging activities on the WNF. In their Habitat Suitability Index model, Rommé et al. (1995) assumed optimal foraging habitat for Indiana bats to include forest habitats with open understories and canopy closures of 50 to 70 percent; however, the species has been observed foraging in a variety of other habitats. Based on written accounts from early settlers and travelers in the Ohio Valley, forests were park-like with large, widely spaced overstory trees with relatively little undergrowth of woody vegetation. An analysis of the structure, composition, and condition of overstory trees in research plots located in southeastern Ohio suggests that today's forest is denser than that reported for old growth oak-hickory forests and for presettlement forests (Sutherland et al., 2003; Yaussy et al., 2003).

Water Sources

Aquatic habitat is important to the Indiana bat because it provides drinking opportunities and the production of desirable insect prey. The percent composition of ponds and lakes increased by 0.1 percent between 1985 and 2003. While the Forest Service only constructed 7 new acres of ponds and lakes during this time period, it purchased over 200 acres of

waterbodies through its land acquisition program (Ewing, 2003a). Numerous small lakes have been acquired through purchases of extensive tracts of mine lands. Some of these lakes are coal mine strip pits, limestone quarry ponds, or reclaimed coal mine impoundments.

The percent composition of wetlands increased by 0.18 percent between 1985 and 2003 (Ewing, 2003b). The Forest Service acquired several bottomland fields along Pine Creek, Symmes Creek, Monday Creek, Little Muskingum River and the Hocking River between 1988 and 2003. In cooperation with partners, 103 acres of previously tiled and ditched floodplain wetlands have been restored or enhanced since 1994.

Intermittent and perennial streams that provide habitat for aquatic insect production are numerous within the Action Area. Of the 200 miles of perennial stream that is in contact with NFS lands, 11 percent of those miles met Ohio water quality standards in 1998. About 41 percent of those miles were impaired and 48 percent had not been inventoried. Impairment of streams in this area is due to agriculture and abandoned mine lands (Ohio EPA, 2004). Watershed improvement activities targeting acid mine drainage is helping to improve downstream aquatic production areas. Private lands programs run through the Natural Resources Conservation Service are helping to reduce nutrient and sediment runoff into streams.

Factors Affecting Species Environment

Ongoing Non-Federal Actions

About 130,000 acres of New Page and Escanaba Timber Lands (i.e., used to be Mead Westvaco) are scattered across southern Ohio, and a paper mill is located in Chillicothe, Ohio. There are about 5,700 acres of New Page/Escanaba lands in the action area, the primary purpose of which is to ensure a long-term supply of fiber for the paper mill. On lands managed for hardwoods, New Page/Escanaba is testing ways to increase the oak component on the lands it will be harvesting, but no operational procedures are in place. The company is increasing the pine component on its lands with a target of approximately 23 percent of the corporate lands in pine. They are also encouraging private land owners to plant pine. Road construction and reconstruction occur in association with the timber harvesting.

About 25,450 acres of state-owned property is located within the action area. These properties include at least a portion of various state forests (Dean and Zaleski), wildlife management areas (Crown City, Trimble, and Waterloo), and state parks (Strouds Run, Burr Oak, and Jackson Lake). State forests and wildlife areas are generally managed for game and nongame species. To manage these areas, some timber is harvested and some silvicultural work may be conducted (e.g., prescribed fire). In 2003, the Ohio Division of Wildlife completed its *Indiana Bat Management*

Strategy, and its guidance is incorporated into forest management on state properties (ODNR, 2003a). In state parks, vegetation management occurs only in and around recreation facilities for public safety and scenery. Most of the lands in the state park system will continue to grow older.

The Nature Conservancy has recently acquired some land within the Ironton Ranger District. The organization would like to see the land added to the Wayne National Forest in the future, but for now has entered into a partnership agreement with the Ohio Division of Wildlife to cooperate in management of wildlife populations on their property. About half of their land consists of open reclaimed coal mine land, while the other half consists of hardwoods. At this time, the Nature Conservancy is not actively managing this property, with the exception of trying to reduce trash dumping.

Other private lands in and around the WNF is managed for a wide variety of purposes. Some timber harvesting is occurring on private lands, and these primarily involve high grading. Forest land is being cleared for new home sites and associated improvements. For example, the Pine Creek Watershed Assessment showed an increase in urbanization of rural areas around Wheelersburg, Ohio that has occurred in recent times (USDA Forest Service, 2001). The same is occurring around other areas of the WNF.

There are no known tribal actions ongoing within the action area.

Ongoing Federal Actions

FHA - The Federal Highways Administration completed consultation and a Final EIS on the Nelsonville Bypass. Construction is not expected to start until 2007 on the 8.5 mile bypass. According to the Biological Opinion for this project, a 768 acre linear corridor could be impacted, including all staging, waste, and borrow areas, and ancillary connector roads. About 275 acres (or 50%) of this disturbance could occur on NFS lands. Project engineers will likely make design refinements to further reduce disturbance.

APHIS - The emerald ash borer is an exotic pest that has been introduced to the United States, and an infestation was recently reported north of Columbus, Ohio. This insect has the potential to affect the composition of thousands of acres of forest land in the Midwest; the current treatment is to cut down all ash trees within a certain distance of an infected tree. Green ash is considered a Class I Indiana bat preferred roost tree. Ash trees are scattered in stands on NFS lands, but are not a predominant species. The USDA (APHIS) is working on an EIS and programmatic Biological Assessment for treatment of emerald ash borer infestations.

A Final EIS was issued for gypsy moth management in 1995. Mating disruption is an ongoing effort on the Wayne National Forest where

pheromone flakes are aerially applied over targeted forest areas. Gypsy moth outbreaks have the potential to defoliate trees (oaks especially) and can kill them. While additional dead trees could be beneficial to the Indiana bat, a large and long-lasting outbreak could alter forest composition and preferred roost tree species availability.

USFWS - The U. S. Fish and Wildlife manages the Ohio River Islands National Wildlife Refuge. Six islands within the action area are in the refuge system (Williamson, Wells, Grandview, Grape/Bat, Middle, and Broadback). The Fish and Wildlife Service has developed a management plan for the refuge, and it contains activities that are beneficial to the Indiana bat. These include the reforestation of bottomland hardwoods and wetlands, creating snag habitat, and conducting summer mist net surveys. Implementing the management plan is an ongoing effort.

Forest Service - Since receiving the 2001 Programmatic Biological Opinion, as amended in 2004, from the Fish and Wildlife Service for the 1988 WNF Land and Resource Management Plan, the Forest Service and Fish and Wildlife Service have implemented a tiered consultation approach. The Forest Service has tracked management activities that have the potential to affect the Indiana bat through permanent loss of habitat or alteration of habitat.

Since 2001, a total of 1455.5 acres of potentially suitable Indiana bat habitat has been altered, while 21.08 acres of potentially suitable Indiana bat habitat has been permanently lost (Table 12). Some projects that have gone through this consultation process have not been implemented to date (August 2005). For example, projects that could result in the loss of 74.46 acres of potentially suitable habitat have been planned, but projects amounting to only 21.08 acres have been implemented on the ground. Similarly, projects that could alter 7,739.95 acres of potentially suitable habitat have been planned, but only 1,455.50 acres have been affected on the ground.

While some of these accomplishments are categorized as “alteration of habitat”, the prescribed fire and the Bluegrass/Markin Fork timber harvest projects were considered beneficial to the Indiana bat since the understory was opened up with fire and the canopy opened up through single-tree selection harvesting. The Beech Grove pine thinning project, which is ongoing is another example where forest habitat is being altered, but the result will be beneficial to the Indiana bat. In this case, dense pine communities are thinned to allow hardwoods to regenerate.

Table 12. Potentially suitable Indiana bat summer habitat affected on the WNF, October 2001 - August 2005.

Type and Amount of Incidental Take Allowed in BO* through September 30, 2006	Amount of incidental take accounted for upon completion of the NEPA and FWS concurrence processes, October 2001-August 2005	Actual amount of incidental take (i.e., potentially suitable Indiana bat habitat affected on-the-ground), October 2001-August 2005
Permanent Loss of Habitat (acres)		
Coal Strip Mining (2,100 acres)	0	0
Road Construction (94 acres)	48.86	12.88
Trail Construction (160 acres)	11.75	2.45
Oil/Gas Well Development (25 acres)	10.35	2.95
Special Use Permits (125 acres)	3.55	2.80
Total (2,504 acres)	**74.46 Acres** (3% of Incidental Take)	**21.08 acres** (0.8% of Incidental Take)
Alteration of Habitat (acres)		
Timber Harvest (7,365 acres)	2,415	136
Timber Stand Improvement (2,500 acres)	0	0
Prescribed Fire (9,527 acres)	5,260	1,282
Creation of Wildlife Openings (352 acres)	4.50	0
Closing Underground Mine Entrances (250 acres)	60.45	37.50
Hazard Tree Removal (125 trees)	20	20
Total (19,994 acres/125 trees)	**7,739.95 Acres** (39% of Incidental Take) **20 Hazard Trees** (16% of Incidental Take)	**1,455.50 acres** (7% of Incidental Take) **20 Hazard Trees** (16% of Incidental Take)

**As amended in 2004 (USFWS, 2004)*

Direct and Indirect Effects of the Selected Alternative

Activities with No Effect

Some management activities projected to occur in the first decade would have no effect on the Indiana bat or its habitat. These activities do not affect or reduce winter or summer habitat, nor are they likely to disturb individuals.

- Grape vine control
- Site prep for native pine
- Spot treatment of stump sprouts and NNIS with herbicides
- Control of NNIS with mechanical or biological methods
- Maintenance of permanent forest openings
- Special use permits allowing hay production and grazing on existing openland

Activities Likely to Not Adversely Affect: Beneficial Effects

Mature forest habitat will be maintained over the short-term (next ten years) and the long-term (next 100 years) in Alternative E_{mod}. The structure and composition of mature forest will differ based on whether it results from natural succession, uneven-aged management, even-aged management, or from Historic Forest prescriptions.

Natural Succession

The FOF and FOFM management areas were developed, in part, for species that depend on larger and older forest communities. 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. Natural succession would also be allowed to 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.

For purposes of this effects 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 Indiana bat. 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 coarse woody debris on the forest floor. Most 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.

An estimated 76,610 acres would undergo natural succession with implementation of Alternative E_{mod}. This includes the 52,694 acres of management areas that would be categorized as not suitable for timber production (CA, DR, FOF, FOFMA, SA, RNA, and TRL) and about 23,916 acres that are found in management areas that allow timber production, but are not suited for harvesting projects (e.g., land is too steep, not accessible). Alternative E_{mod} would result in a slightly greater amount of lands that would undergo natural succession than Alternative E because an area of Future Old Forest was added to the Ironton Unit.

Historic Forest Management Prescriptions

The HF and HFO management areas are expected to provide mature forest habitat dominated by oak and hickory species. The prescription for the HF

and HFO management areas calls primarily for the use of uneven-aged vegetation management combined with prescribed fire to create forest communities with more open understory conditions and which are dominated by oak and hickory species. This forest structure would be similar to that which occurred in the late-1700s and early-1800s (Hutchinson et al., 2003). Based on the Indiana bat habitat suitability model (Rommé et al., 1995), the open to semi-open character of the forest stands may be optimal for Indiana bats. In addition to a high abundance of oak and hickory species, the trees would be widely spaced and the understory would be relatively open. The HF and HFO management areas were placed on the landscape in or near the two areas on the WNF with Indiana bat captures.

At this time, there are no forest stands that exhibit the structure and composition desired for the HF and HFO management areas in the future. During the first decade of implementation, up to 7,398 acres of NFS land could be improved for Indiana bat roosting and foraging using the historic forest prescriptions. Over the long-term, implementation of Alternative E_{mod} could result in up to 41,650 acres of mature forest resulting from HF and HFO prescriptions.

Uneven-aged Management

Implementation of uneven-aged management methods could provide structural habitat conditions favorable to the Indiana bat because each entry opens gaps in the canopy and has the potential to improve foraging habitat. 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. It will take several decades to achieve a truly uneven-aged condition

Opening the canopy directly benefits the Indiana bat because it 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 a shaded location (Schultes, 2002). Opening the canopy with the use of uneven-aged harvest methods may also improve foraging habitat for the Indiana bat. It forages among the tree canopy; foraging habitat declines as

canopy cover approaches 100%, but is assumed to be optimal when canopy cover is between 50-70% (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 is not favorable for the Indiana bat because oak-hickory species possess exfoliating bark. It is possible that in the long-term, uneven-aged management without other silvicultural tools (e.g., prescribed fire, herbicides) may result in forest stands that have denser understories than that desired by the Indiana bat.

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 this species, especially as the first entries are made into the stands. During the first decade, up to 7,157 acres of NFS land could be treated with uneven-aged management prescriptions (i.e., likely 70% group selection and 30% single tree selection). After a period of 100 years, about 66,360 acres of the WNF would be managed by uneven-aged methods; some stands may have had only one entry while others may have had as many as three entries.

Even-aged Management Prescriptions

Today's forest communities were primarily derived from forest communities that were harvested with even-aged management techniques in the past century. Even-aged vegetation management may have both short-term adverse effects and long-term beneficial effects on the Indiana bat and its habitat. The adverse effects are disclosed in the following section, but in terms of beneficial effects, even-aged management is used to regenerate oak and hickory species. 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 would have long-term benefits to this species. Oaks and hickories are considered to be shade intolerant, meaning that they require sunlight to successfully sprout and mature. Even-aged management removes a major part of the canopy which allows sunlight to reach the forest floor and encourage sprouting and growth of oak-hickory.

Currently there are 73,388 acres of mature hardwood forest (> 80 years old) on NFS lands. These mature forest acres originated in the late 1800's and early 1900s as the iron furnace era came to a close, and farms were being abandoned. In other words, today's mature forests originated from even-aged events.

Even-aged management could occur on approximately 52,450 acres of NFS lands, based on management area prescriptions and habitat composition objectives. Over the next decade, up to 1,725 acres of mature

hardwood forest habitat could be treated with even-aged management techniques, or about 3 percent of these acres. Over time, age classes of forest stands in management areas that allow even-aged prescriptions will become regulated to the 120 year rotation scheme. When true regulation occurs, about 32% of these forest stands would be 60-99 years and 20% would be greater than 120 years. In 100 years, it is estimated that 6,453 acres would be at least 80 years of age, or about 12% of the acres where even-aged management could occur. A 120-year rotation was chosen to ensure mature forest habitat would be available, as well as diverse mast crops.

While it will take more than 100 years to achieve regulation, it is clear that implementing even-aged timber management techniques will provide mature forest habitat both now and in the future. Even-aged management is allowed in the DCF, DCFO, FSM, GFM, and RC management areas, and therefore mature forest resulting from even-aged methods will be well distributed across the landscape of the WNF.

Mature Forest Summary

The estimated amounts of mature forest resulting from natural succession, Historic Forest prescriptions, uneven-aged management, and even-aged management are shown in Table 13. Currently, about 31% of the forest stands on the WNF are mature and offer potentially suitable Indiana bat habitat. Mature forest habitat on the WNF would likely increase by more than 119,000 acres after 100 years of implementation of the Selected Alternative. About 81.2% of the WNF would be covered by mature forest habitat that varies in both structure and species composition. The Selected Alternative ensures that potentially suitable Indiana bat habitat is available and well-distributed across the WNF, both now and into the future.

Table 13. 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 Hardwood Forest Habitat	(a) Natural Succession	(b) Historic Forest	(c) Managed Uneven-aged Management	(d) Even-aged Management (80+ years)	Total*	Change from Current Levels
E_{mod}	73,388	76,610	41,650	66,358	8,740	193,358	+119,970

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

Other management activities included in Alternative E_{mod} may benefit the Indiana bat and its habitat. Please refer to Table 7 for the upper limits of these management activities that may occur over the first decade.

- **Reforestation** would eventually create roosting and foraging habitats for the Indiana bat as the trees mature.
- **Crop tree release** often involves the girdling of small-diameter trees (i.e., less than 6 inches dbh) to open the canopy for neighboring trees; girdling could create additional snags for roosting.
- **Construction of waterholes, ponds, and lakes and restoration of wetlands** creates drinking water sources for Indiana bats as well as habitat for insect breeding, its food source.
- **Land exchange and acquisition** creates larger, contiguous areas of public ownership and thus reduces potential disturbance to roosting or hibernating Indiana bats from activities on private lands.
- The construction and maintenance of recreation **trails** may provide a travel corridor for foraging bats. Biologists often set mist nets across a trail when surveying an area for Indiana bats, especially if a water source is nearby. These trail corridors vary from 5-10 feet in width and maintain a forested canopy when the trail occurs in a forested setting.
- **Riparian and aquatic habitat restoration** includes activities that decrease the input of sediment and acid mine drainage into streams, as well as direct improvements such as placement of large woody debris and reconstruction of the natural dimension, pattern, and profile of streams. All of these activities result in improved aquatic habitat which may lead to increased insect production (Indiana bat food source) and improved drinking water sources.
- **Stabilization of disturbed areas**, including such sites as abandoned mine lands and orphan or depleted oil and gas wells, returns areas to an herbaceous or forested cover.
- **Road decommissioning** eliminates unneeded stream crossings (potential site for sediment introduction into streams) and it reverts sites to a forested condition.
- **Installation of bat-friendly gates** protects individuals from human disturbance and maintains suitable microclimate parameters.

Activities Likely to Not Adversely Affect: Insignificant Effects

Some management activities may result in a potential impact to the Indiana bat and its habitat, but the impact would not reach the scale where take would occur. Established Forest-wide standards and guidelines minimize the scale of the potential impact to a point where it cannot be detected.

Disturbance of Winter Habitat

Human disturbance and modifications of hibernacula has been attributed to the rangewide decline of the Indiana bat population. Inappropriate barriers can limit access or can modify temperature or humidity in the hibernacula. Past underground mining has left many open mine portals on NFS lands. One underground limestone mine on the Ironton Ranger District has been categorized as a Priority III hibernaculum and has been protected through the installation of a bat-friendly gate.

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. Alternative E_{mod} incorporates measures to protect known hibernacula.

- A Forest-wide objective (5.1.1a) calls for the installation of bat-friendly gates on hibernacula discovered on NFS lands to prevent unauthorized human entry.
- An established Forest-wide standard (TES-1) deters human access to areas surrounding known hibernacula by closing or relocating trails that lead to or pass within easy viewing distance of the site.
- Forest-wide standard (TES-2) prohibits new road and trail construction and surface occupancy for exploration or development of federally owned minerals within one-quarter mile of known hibernacula.
- Prescribed fire burn plans are to specify weather conditions that would prevent smoke dispersal into known hibernacula (TES-4).

Alternative E_{mod} incorporates the same measures to protect known fall swarming sites associated with underground coal mines. Use of these openings 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 Alternative E_{mod} 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).

Activities Likely to Not Adversely Affect: Discountable Effects

Some activities have discountable effects on potentially suitable habitat, which are effects that are extremely unlikely to occur. Land exchange is a primarily beneficial activity because it aids in consolidation of NFS lands, which provides more opportunity for landscape level forest management. There could be a situation where a tract of land with potentially suitable Indiana bat habitat is proposed for exchange. Biologists would be involved in the review of all land exchange proposals, and evidence of suitable habitat would be noted and brought to the attention of Forest Service managers. While it is possible suitable roost trees could be exchanged, the probability is low that known maternity roosts, known hibernacula or known swarming sites would be exchanged.

Activities Likely to Adversely Affect

There are some activities, or components of activities, projected to occur within the first decade that could negatively impact Indiana bats. The following activities may include the need to fell one or more trees to accomplish the activity. Numerous species of trees have been identified as possible roost trees because of their structural characteristics (i.e., exfoliating or sloughing bark). Established Forest-wide standards minimize the potential for removal of current suitable roost trees (TES-10), and facilitate the maintenance of future roost tree availability (TES-12) in forest stands being treated with any timber harvesting methods. There is a possibility, however slight, that individuals could be roosting in an undetected roost tree, and the removal of the tree during the non-hibernation season could result in the accidental take of one or more individuals.

Each of the following activities also have the potential to modify Indiana bat foraging habitat, either for a short period of time or permanently.

Permanent Roads and Trails

Silvicultural prescriptions for uneven-aged and even-aged management require multiple entries into the same stand to attain, and then maintain, the desired future habitat conditions. The road system in areas treated with uneven-aged management methods is generally larger than that needed in areas treated with even-aged management methods. While some road construction may be necessary in both situations, existing roads can be reconstructed and used in the future, keeping the road system footprint basically the same over time. In other words, permanent road construction would likely decrease over time, while road reconstruction would increase over time.

To bring roads up to the appropriate standard, trees are removed from the road bed and drainage structures are repaired or improved during reconstruction. Some of these reconstructed roads may be gated and

closed to vehicle use, or may be converted to recreational trails until they are needed once again to conduct timber harvesting or other management activities.

This road and trail construction acreage might appear substantial if it was to occur all in one contiguous block, however each road and trail project is typically small, linear and would only remove a small portion of an otherwise forested landscape (Table 14).

Established Forest-wide standards protect current suitable roosting habitat, but permanent road and trail construction or road reconstruction could result in the loss of future roost trees or maternity colony trees.

Road and trail construction and road reconstruction activities could also affect the Indiana bat by reducing the amount of foraging habitat. These activities will result in narrow and linear corridors through the forest, but forest canopy cover over the road or trail surface should not be affected. For example, the greatest majority of permanent roads constructed or reconstructed would have a clearing width of 22 feet, with a road surface of 12 feet. Only access roads to recreation facilities or administrative sites have two lanes and have a clearing width of 30 feet and a surface width of 20 feet. Few access roads are likely to be needed. A clearing width of 10 feet is used for OHV, mountain bike and horse trails but the actual tread width is less than 50 inches. A five foot width is cleared for hiking trails, but the tread width is 24 inches.

Past mist net surveys on the WNF 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. Menzel et al. (2005) found Indiana bats foraging along roads in a relatively high frequency, and the authors suggested that the roads create a vertical foraging edge that can possibly reduce the energetic demands associated with flight, and may provide landscape orienting clues.

Table 14. Acres of permanent road and trail construction, and road reconstruction during the first decade.

Management Activity	Alternative E_{mod}
Permanent Road Construction	74
Permanent Road Reconstruction	318
OHV Trail construction	150
Hiking Trail Construction	18
Horse Trail Construction	61
Mountain Bike Trail Construction	36
Total	**657**
Percent of NFS Lands	**0.28**

Temporary Roads, Skid Trails and Log Landings

Temporary roads are necessary to accomplish various projects. These roads are constructed to the minimum standard necessary to accomplish the tasks at hand and ensure safety of workers. The clearing width can be as wide as 22 feet, with a surface width of at least 10 feet. The road is revegetated and after a period of a few years, trees are likely to be present again. The same is true for skid trails and log landings used in timber harvesting operations. These three activities could temporarily alter suitable foraging habitat but could also create conditions beneficial for foraging individuals (Table 15). The temporary roads and skid trails are narrow and linear in shape and the forest canopy is retained, which could make them suitable travel corridors especially if a water source is located nearby. A log landing is small in size, but may create a gap in the canopy. All three activities would open the canopy and understory, thereby moving localized conditions closer to optimal foraging habitat conditions.

Table 15. Acreages of NFS lands projected to be affected by temporary roads, skid trails and log landings.

Management Activity	Alternative E_{mod}
Temporary Road Construction (acres)	146
Skid Trails and Landings (acres)	740
Total (acres)	**886**
Percent of NFS Lands	**0.37**

Timber Harvesting

Timber harvesting is a tool used to achieve desired future terrestrial and riparian habitat conditions, and to maintain a component of oak-hickory in the landscape. It can improve short-term and long-term foraging habitat for the Indiana bat, but at the same time, it can alter the condition of forest

stands to where optimal foraging conditions are reduced for a period of time.

Uneven-aged methods can open the canopy to a desired level to improve foraging. An uneven-aged stand has trees of three or more distinct age classes, either intimately mixed or in small groups. Single-tree selection is the act of harvesting single trees to achieve and maintain a specific diameter distribution. Group selection is 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 2 acres in size. An established Forest-wide standard (TES-8) directs the Forest Service to maintain at least 60% canopy cover in all hardwood cutting units treated with uneven-aged methods to promote quality foraging habitat.

Trees that do not grow as fast as the others become weakened and increasingly less competitive for sunlight, water, nutrients, and/or space. Harvesting some trees in a stand that has been regenerated by even-aged methods reduces the density of trees on the site, and encourages healthier and larger individual trees. Pre-commercial thinning (i.e., occurs when a stand is about 20-30 years old) and commercial thinning (i.e., occurs when a stand is around 50 years old) are used to decrease stem density in forest stands that have been treated with even-aged methods in the past. Foraging habitat is likely limited in stands treated with these methods because of the high density of trees.

Even-aged management is beneficial for a variety of shrub and early forest species, and is a primary tool used to regenerate oak and hickory. The majority of forest stands that exist on the WNF today originated from even-aged timber harvests beginning as far back as the late-1800s. As stated above, certain oak and hickory species provide important roosting habitat for the Indiana bat. 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. Different even-aged methods include:

- **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 seedlings

- **Two-aged system** - regenerates a timber stand and maintains two age classes. Optimal foraging habitat may be reduced with even-aged methods, but the effect is not permanent. As the stand regenerates and matures, it would once again provide optimal foraging habitat for the Indiana bat.

Even-aged timber harvests would generally range from 2-30 acres in size, however the harvest sizes could vary among the management areas. For example, harvest areas may be about 2 to 20 acres in size in DCF and DCFO management areas to ensure optimal habitat is available for early successional species, while maintaining suitability for mature forest birds during the post-breeding season (Ewing, 2003c, 2003d; Vitz, 2003). An established Forest-wide standard (TES-7) directs the Forest Service to retain forested flight corridors within and between stands treated with even-aged methods. Existing suitable roost trees, as well as trees left for future roost recruitment in the treated stand, would receive added solar heating from the open condition of the stand, something beneficial to females and young.

Table 16 summarizes projected timber harvesting levels for the first decade for the Selected Alternative.

Timber harvest, especially even-aged management methods, could temporarily reduce optimal foraging habitat conditions (up to 50 years). Shelterwood, two-age and clearcut with reserves would retain more trees on the site than a clearcut. MacGregor et al. (1999) reported male Indiana bats were roosting, during the autumn pre-hibernation period, in forest stands that were harvested by the two-age timber harvesting methods 0-5 years prior to the study. Even-aged management would be concentrated in the FSM and FSMO management areas, although small amounts could occur in the GFM, RC, and DCF management areas.

Alternative E_{mod} incorporates even-aged management prescriptions that encourage oak regeneration and it also incorporates Historic Forest prescriptions to create forest communities with more open understory conditions and which are dominated by oak and hickory species. Based on an analysis of projected acres of even-aged and Historic Forest treatments that could occur over the next 100 years (based on SPECTRUM model results), there would likely be a declining trend in oak-hickory on NFS lands with the implementation of Alternative E_{mod}, but this trend would be not be as severe as in the no action alternative.

Oak and hickory trees would likely remain scattered across the WNF as individuals, or found in small groups on ridges and southwest facing slopes. Extensive oak and hickory communities would also be concentrated on the landscape where the HF and HFO management areas are located.

Table 16. Projected levels of timber harvest during the first decade.

Management Activity	Alternative E_{mod}
Historic Forest Prescriptions	7,398
Uneven-aged Hardwood and Mixed Hardwood Timber Harvest (acres)	7,158
Thinning (acres)	1,460
Even-aged Hardwood Harvest (acres)	1,725
Even-aged Pine Harvest (acres)	200
Total Harvested	**17,941**
Percent of NFS Lands Treated	**7.5**
Percent of Action Area Treated	**1.6**

Crop Tree Release

Crop tree release is a release treatment performed during the sapling stage to free selected trees from competition of overtopping trees of comparable age (or woody vines and shrubs), and to favor the trees that are needed to meet wildlife habitat or other management objectives. This method involves the felling or girdling of individual trees (less than 6 inches dbh) to improve growing conditions for certain tree species. The forest canopy is left intact. Trees that are felled are not removed from the stand.

Crop tree release is performed in a young, dense stand that is not likely to possess Indiana bat foraging habitat. Trees cut or girdled are smaller-diameter trees, but SFW-TES-10 would be applied to ensure protection of any existing trees that possess Indiana bat roosting habitat. Alternative E_{mod} has incorporated a Forest-wide guideline (VEG-16) that encourages the girdling, rather than felling, of any trees that could provide some quality snag habitat. Still, there is a possibility, albeit extremely small, that an unknown Indiana bat could be roosting in a tree that is cut as part of a crop release project.

Prescribed Fire

While prescribed fire can be a beneficial tool to aid in the regeneration of oak-hickory and to open up the understory for improved foraging habitat, prescribed fire may have direct and indirect effects on the species.

Fire, heat or smoke could directly affect roosting individuals. Indiana bats leave their hibernacula by mid-April and begin to travel to their summer habitat, but the timing could be earlier or later depending on weather. Females become pregnant and give birth to their single pup during early summer. The female can only carry the pup for a short period of time, after which time the pup must remain at the maternity roost until it can fly on its own. It is during this time period is when smoke and heat could have the greatest negative effect on these immobile individuals (i.e., early summer through late-summer).

Indiana bats are insectivores. Prescribed fire can create vegetation conditions favorable for increased insect production or activity. Yet, the abundance of organisms in the leaf litter and upper soil layers can be reduced in sites treated with prescribed fire, although they recolonize the

area as it revegetates (Boerner, 2000). Recolonization of the site by insects may be in part due to changes in the plant community after a prescribed fire. Hutchinson and Sutherland (2000) reported that long-term studies of forest communities subjected to prescribed fire show the understory vegetation 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.

Carter et al. (2000) reported that fires that cause overstory mortality can create canopy gaps which can allow for more effective foraging. They also noted that depending on fire intensity, tree species susceptibility, and tree canopy position, roosting cavities can be created. However, snags serving as bat roosts could be consumed in the fire.

The primary prescribed fire season generally occurs during the late-winter and early spring, often times ending by mid-April when the forest vegetation begins to leaf out. Depending on environmental conditions, a minimal amount of prescribed fire could occur as late as the end of April. However, the "spring green-up" that occurs by mid-April limits the use of fire. The secondary prescribed fire season runs from fall and through the winter if weather conditions are appropriate. However, secondary season prescribed fires could be conducted as early as late-summer if weather permits.

Prescribed fire activities also include construction of firelines. Both hand lines and dozer lines are used as fire breaks. Hand lines are narrow segments where firefighters use rakes, leaf blowers and ATV mowers to remove fuels. Dozer lines are constructed on old, existing roads. Hazard trees represent the biggest danger to firefighter safety, so hazard trees are felled along firelines. Some of these trees could provide current or future roosting habitat.

The use of prescribed fire is projected to increase from current levels during the first decade. A total of 69,819 acres could be burned within the first decade, but because some of the same acres of land could be burned twice, the actual affected area on the ground is less (Table 17).

More or less than a quarter of the WNF could be treated during the first decade, which averages to about 5,000-7,000 acres or 2-3 percent of NFS lands annually. Prescribed fire would occur across the planning area in management areas that allow treatment of habitat with fire, rather than being concentrated in one area.

Prescribed fire can improve Indiana bat habitat, but could adversely affect individuals if conducted when individuals are less mobile (i.e., hibernating and generally during birth until pups are strong enough to fly on their own to avoid smoke and heat). An established Forest-wide standard (TES-4) requires that all prescribed fire burn plans specify weather conditions that

would prevent smoke dispersal into known hibernacula, which is especially important during spring burns when individuals are preparing to leave the hibernacula and during fall burns when individuals may be involved in fall swarming. Another established Forest-wide standard prohibits the use of prescribed fire during the secondary fire season until after August 15th to provide time for juveniles to strengthen their flying skills and to account for possible late birth events resulting from colder spring weather (TES-11).

Table 17. Acreages of prescribed fire that may occur during the first decade.

Primary Purpose	Alternative E_{mod}
Non-native Invasive Species Control	200
Maintenance of Grassland and Herbaceous – Shrub Habitat*	1,500
Oak Regeneration	46,215
Hazardous Fuels Reduction	21,904
Cumulative Total (acres)	**69,819**
Total Acres Affected	**62,467**
Percentage of NFS Lands Affected**	**26.2**
Percentage of Action Area Affected**	**5.6**

**Some acres treated for oak regeneration would be treated twice in the first decade.*
***Some of the same acres of NFS lands are projected to be treated with prescribed fire more than once during the first decade. Figures in this row reflect the percentage of NFS lands treated with fire, rather than the cumulative acreage figures reported above.*

Development of Permanent Forest Openings

A small percentage of the WNF is comprised of relatively small openings in the forest (generally 1-5 acres in size), or on the periphery of larger tracts of forested land. Some of these open areas contain rare plant or insect populations, while others serve as foraging areas for various mammals and birds. The herbaceous and shrubby mix of vegetation offers an array of soft mast and insects for these animals. Trees present in and at the edge of openings could provide suitable roosting habitat to Indiana bats because of the increased sunlight. Indiana bats could find the edge of these openings beneficial for insect foraging (Sparks et al., 2004). Up to 500 acres of openings could be created during the first decade.

While forest openings were historically developed by removing trees within forested areas, today Forest Service managers rely primarily on the designation of existing open land on acquired properties to serve as permanent forest openings. Similarly, development of agreements with utility companies would continue to be pursued to manage utility corridors as quality permanent forest openings. While it could occur, the probability is low that forested area would be converted to a permanent forested opening. For example, log landings have been designated as openings after a timber harvest was completed, and then maintained.

Energy Minerals Development – Oil and Gas Resources

About 121 acres of NFS land could be affected by the construction of access roads, well pads, and tank batteries. The development of access roads, well pads, and tank batteries could result in the removal of suitable roost trees or alter foraging habitat.

The removal of trees for facilities associated with the well are permanently converted to non-forest cover, however forest canopy cover is generally maintained over the access roads and pipelines. Small openings in the canopy may result from the development of the well pad and tank battery. The removal of trees for these activities may provide flight corridors for foraging and may open the canopy to a level preferred by the Indiana bat.

Construction of access roads and well pads could result in the removal of current and future suitable roost trees. All activities on federal oil and gas leases are subject to certain stipulations, and operations cannot proceed otherwise. These stipulations (based on laws, regulations, and executive orders) are provisions that modify standard lease rights and are attached to, and made part of, a new lease. They provide for greater protection of identified resources, as well as mitigation of negative effects. A No Surface Occupancy stipulation prohibits the use or occupancy of the land surface for oil and gas exploration and development to protect desired values, and it has been placed on NFS lands within one-quarter mile of known Indiana bat hibernacula (MIN-9). A Controlled Surface Use stipulation identifies specific areas on the ground where operations can or cannot occur on federal leases and it has been placed on NFS lands within riparian areas and wetlands (MIN-10). A Controlled Surface Use stipulation prohibits the cutting of snags (trees with less than 10% live canopy), shagbark or shellbark hickories, or trees that are hollow and/or have major splits or broken tops, except during the Indiana bat hibernation season (September 15 to April 15) (Revised Forest Plan, Appendix H). If such trees are a safety hazard, they may be cut anytime they pose an imminent threat to human safety, but if cut in the non-hibernation season the Forest Service biologist must be notified in advance. This stipulation applies only to trees over six inches in diameter

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

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

Runoff from production wells could contaminate nearby aquatic resources, which may be used by the Indiana bat for drinking or feeding. Brine spills could occur during oil and gas well development; however the operator is required to construct berms around the wells to contain any spills. The brine is required to be removed by tank truck.

Energy Minerals Development – Surface Mining

Activities associated with surface mining could remove current suitable roost trees and trees that could recruit into future roost trees in potentially large areas. If currently suitable roost trees are removed during the non-hibernation season (April 15 to September 15), one or more Indiana bats could be directly harmed. Foraging habitat could be permanently converted to non-forest cover for an undetermined period of time. Reclamation of a surface mine site to forest cover is not guaranteed since the character of the soil is changed and compaction occurs during the mining and reclamation process. At best, foraging and roosting habitat would be lost for several decades.

The Surface Mining Control and Reclamation Act of 1977, as amended, prohibits surface mining of coal on any federal lands within the boundaries of any National Forest east of the 100th meridian (located in central Texas) subject to valid existing rights and certain exceptions. Therefore, as a general rule, deposits of coal underlying NFS lands may be mined only by underground methods.

The Forest Service has recently approved a Plan of Operation for a coal exploration drilling program in the Corning, Ohio area on private minerals on the Athens Unit. The initial phase will result in approximately 33 holes being drilled with another 60 to 80 test holes planned over the next couple of years. Some of the test holes will be drilled in an area that would be designated as a FOF management. If exploration results are encouraging, a prospecting permit to drill about 95 acres of Federal coal may be requested from the BLM, which in turn could lead to an application to lease Federal coal. An additional 245 acres may also be involved in the same operation when the minerals (including coal) revert back to the United States in 2010. The long-term plans of the coal company are to underground mine an extensive area east and north of Corning, much of which will be under

WNF. The company is currently working on its plan of operation, and has unofficially proposed to use about 25 acres of WNF surface for storing about 600,000 cubic yards of overburden from their underground operations, as well as a haul road, a conveyor belt, and a sediment pond. At last report, they were in the process of writing an EA with the intent of applying for a compatibility determination from OSM. They have alternatively talked about storing the overburden on private land, but are still proposing the road, conveyor belt, and the sediment pond on National Forest System lands. Should OSM, through ODNR (in consultation with the Forest Service), allow the storage of the overburden, it would affect 23 acres for a period of 20 to 30 years. The haul road would affect about 0.37 acre (1000 feet long - 16 feet wide), the conveyor belt would affect less than 0.01 acre (four 3'x 6' piers within a span of 1000 feet), and the sediment pond would affect about 1 acre.

On the Ironton District, one company holds valid existing rights to strip mine coal on approximately 1,200 acres of land. The company is planning to conduct coal exploration drilling to determine the quality and quantity of the coal with the possibility of strip-mining in the future. Because of legal problems, it is unclear at this point if the company will actually proceed with the coal operations in the next ten years. If they do, it will severely disturb approximately 1,200 acres of NFS lands located north of the Bear Run area, which appears to be an important area for the Indiana bat on the Ironton Ranger District.

Hazardous Fuels Reduction – Mechanical Methods

The increased density of forests, combined with fire suppression and natural disturbances like the 2003 ice storm, have led to an increase of woody material on the forest floor. Experts who study fire behavior suggest this increased amount of material could pose a wildfire risk to human health and safety, and therefore projections for 10,181 acres of mechanical fuels reduction could occur in the first decade. Reducing the risk of wildfire not only benefits wildlife in general, it would benefit the Indiana bat. An uncontrolled wildfire burns hotter and could occur at any time of the year depending on environmental conditions.

Treatment of hazardous fuels is expected to occur primarily in pine stands where fuels appear to be greater than other areas on the WNF. The work involves the lopping and scattering of smaller woody material on the ground. However, it is possible that a leaning or standing tree would be felled and bucked up or removed, either as part of the fuels reduction work or to protect workers from a potential hazard tree. There is a possibility, however slight, that individuals could be roosting in such a tree, and if removed during the non-hibernation season one or more Indiana bats could be unintentionally harmed.

Utility Corridors

The removal of current or future suitable Indiana bat roosting or foraging habitat could occur with the construction of utility corridors. Utility companies apply for a special use permit to construct corridors for transmission of water, electricity, or other utilities to private lands across NFS lands. Requests for special use permits for these activities occur periodically, and no long-term utility corridor plans are available from the utility companies. Development of privately-owned inholdings is generally the driver for such construction projects.

Utility corridors are linear, and vary in width. Many are generally narrow in width and are placed in road right-of-ways. Some traverse the forest, but are generally narrow enough to where forest canopy cover can be maintained over the corridor. A few corridors could be larger transmission lines where a linear canopy gap occurs through the forest. The Forest Service estimates about 50 acres of NFS lands could be impacted during the first decade.

Construction of Administrative or Recreation Sites and Parking Lots

The removal of current or future potentially suitable Indiana bat roosting or foraging habitat could occur with the construction of administrative or recreation sites. Such sites are usually kept in a park-like setting and are generally small (about 5 acres each). About 50 acres of NFS lands could be converted to administrative or recreation sites during the first decade. About 10 acres could be converted to small roadside parking areas. The effect of these activities would be the same as described for roads, trails, and oil and gas well developments.

Closure of Open Mine Portals and Subsidences and AMD Treatment

In places, the thin limestone cap is collapsing into underground mine chambers. These subsidences are not only a public safety concern, they are points where surface water can enter underground chambers and recharge acid mine drainage. Some entrances to old mines remain open, and also pose a public safety concern. In both cases, the Forest Service projects to close a portion (i.e., up to 155) of the hundreds of subsidences and open portals that exist currently. Closing them could involve backfilling or installation of bat-friendly gates. Bat-friendly gates are usually installed when a biologist determines there could be potentially suitable habitat in the mine and acid mine drainage recharge is not a factor.

In addition to the potential for the need to remove one or more trees to access these sites, closure of such mine features could adversely affect the Indiana bat if they are used as hibernacula. Closure could eliminate a hibernaculum or could modify the microclimate of a larger underground complex making it no longer suitable for individuals. Mine safety regulations do not allow for the survey of such open mine features to check for hibernating individuals. To minimize the potential for adverse

effects, an established Forest-wide standard (TES-5) calls for the surveys for bat presence during the fall swarming period to assess whether bats are indeed using the feature.

Remediation of AMD is beneficial for the Indiana bat, however during construction of source treatments, some trees may need to be removed.

Hazard Tree Removal

An activity that is common to all management activities conducted on the WNF is the management of hazard trees. These trees sometimes possess Indiana bat roost tree characteristics. Protection of the public and Forest Service workers, contractors, partners and volunteers is of great importance. Periodically, a hazard tree will be present within a work site and will need to be removed to ensure safety.

The Forest Service estimates that up to 2,550 hazard trees with potential Indiana bat roost habitat may be removed during the first decade to ensure human safety based on trends for recent years. The Forest Service has a record of trying to plan ahead and remove such trees prior to the non-hibernation season, but there is a chance that these trees will not be noticed during the hibernation period. For example, only 20 hazard trees that had Indiana bat tree characteristics have been removed from work sites during the non-hibernation season between September 2001 and August 2005. Therefore, the majority of these hazard trees would be removed during late-fall through winter when the Indiana bat is hibernating.

The Forest Service is careful in implementing its hazard tree program; however it must follow Forest Service directives. These directives require that trees, with a crown that is greater than 50% dead, be removed from developed recreation sites. These directives also require such trees to be removed at dispersed recreation concentration points. These areas include trail intersections or sign information areas. Along trail corridors, trees that are leaning over the trail are removed. In the event a hazard tree needs to be removed from a high human use area (i.e., recreation-associated area) during the non-hibernation season, an emergence survey would be conducted at the hazard tree prior to its removal (TES-10).

The largest number of hazard tree removals may occur on the Ironton Ranger District because the 2003 ice storm affected thousands of acres of forest, and individual trees that were affected are still dying and falling along trails and roads and in recreation areas. This figure may seem high, but a broad analysis of WNF vegetation data shows that on the average, a mature stand has about 15 trees with current Indiana bat roost tree characteristics (K. Flegel, pers. comm.). If that figure was expanded out to the more than 73,000 acres of mature forest on NFS lands, at least 1.1 million trees are likely to exist that possess current Indiana bat roosting habitat. This figure is likely conservative since it does not take into

account the number of trees affected by the 2003 ice storm or what is present on non-NFS lands.

Hickory Tree Removal

Many roost trees with optimal roost characteristics are dead or dying, but living shellbark and shagbark hickories trees are especially important because they offer optimal roost characteristics for decades. Hickory trees also provide benefits to many other wildlife species.

Alternative E_{mod} recognizes the importance of these trees as potential roost sites by incorporating a Forest-wide guideline to retain all shellbark and shagbark hickories (TES-9). This differs from existing direction in the 1988 Forest Plan, as amended, that allows the removal of shagbark and shellbark hickory trees during the hibernation season. During the implementation of the projected management activities, many of which would result in long-term benefits to the Indiana bat and its habitat, some hickory trees may need to be removed to enable the project to proceed without causing adverse effects to other resources important to the Indiana bat. Removal of such trees would be done during the hibernation season, when possible.

As an example, a shagbark hickory may be located on an old road that needs to be reconstructed to conduct habitat improvements for the Indiana bat or other plant or animal species. Avoidance of the hickory tree could result in the need to construct a new road, or may cause engineers to have to cut into unstable hillsides. Removal of the hickory would result in less soil disturbance or potential soil erosion, thereby benefiting water quality and potential Indiana bat drinking and feeding sources.

According to WNF timber markers and Forest Inventory and Assessment data, shagbark and shellbark hickory trees are usually scattered about in most stands that occur on drier sites, sometimes single or in small groups (M. Freidhof, pers. comm.). An analysis using data from current management projects and expertise from WNF forestry technicians, up to 1,141 shagbark and shellbark hickory trees greater than 6 inches dbh (i.e., suitable roost size for individuals) may need to be removed over the first decade to avoid long-term resource effects.

Summary of Direct and Indirect Effects

Alternative E_{mod} includes management activities that could benefit the Indiana bat, but others that may cause potentially adverse effects to the Indiana bat, either from the permanent loss of habitat or the alteration of habitat for a period of time (Table 18).

Table 18. Estimates for management activities that could result in the permanent loss or alteration of Indiana bat habitat on NFS lands during the first decade.

	Alternative E_{mod} (acres)
Permanent Loss of Habitat	
Permanent Road Construction - Reconstruction	392
Recreation Trails	265
Recreation Facilities & Parking Lots	60
Surface Mining	1,250
Oil & Gas Well Development	121
Total Loss of Habitat	**2,088**
Percent NFS lands affected	**0.87**
Percent action area affected	**0.19**
Alteration of Habitat	
Timber Harvest	17,941
Crop Tree Release	2,113
Prescribed Fire	69,819
Temporary Roads, Skid Trails and Log Landings	886
Hazardous Fuels Reduction – Mechanical Methods	10,181
Development of Permanent Openings	500
Utility Corridor Development	50
Closure of Mine Features	232
AMD Treatments	270
Total Alteration of Habitat	**101,992**
Percent NFS lands affected	**42.8**
Percent action area affected	**9.2**
Hazard Tree Removal	2,550
Hickory Tree Removal	1,142

Over the first decade of Forest Plan implementation, it is estimated that 2,088 acres of potentially suitable Indiana bat habitat could be permanently lost (Table 18). However, these activities would result in the permanent loss of less than 1% of potentially suitable habitat on the WNF and in the action area.

- Forest-wide standards are in place 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.
- Approximately 657 acres 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, and they could actually provide travel corridors or could open up the canopy to a more optimal level for foraging.

- Development of oil and gas wells converts forest land into non-forest land, but leaves a similar mark on the landscape as do roads and trails. Access roads could serve as travel corridors and the small gaps in the canopy created by the well pad could improve localized forest canopy conditions to a range more suitable for Indiana bat foraging.
- 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% canopy, so it is possible they could use such areas for foraging.
- Surface mining activities projected could result in the largest potential loss of habitat during the first decade, about 57 percent of all acres affected by activities that could result in the permanent loss of habitat. As described above, the potential for the 1,200 acre surface mine at the Ironton Ranger District to occur is not certain.

Over the first decade of Forest Plan implementation, it is estimated that 101, 992 acres of potentially suitable Indiana bat habitat could be altered (Table 18). These activities would alter 42.8 percent of NFS lands and 9.2 percent of the action area, however many of the activities could actually improve Indiana bat roosting and foraging habitat over the short-term or long-term (or both). This acreage may seem substantial, but consider the following:

- When done properly, experts consider forestry practices to be compatible with Indiana bat conservation; however, silvicultural methods need to maintain structural features important for roosting and foraging, such as snags, small openings, and edge habitats (BCI, 2001). Forest-wide standards are in place 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. In addition, shagbark and shellbark hickories are retained, unless removal is needed to ensure long-term resource protection important to the Indiana bat.

- Uneven-aged timber harvest, Historic Forest prescriptions, thinning, crop tree release and prescribed fire are designed to improve foraging habitat for the Indiana bat, both for the short-term and the long-term. About 87,950 acres could be affected by these activities, but could result in improved foraging habitat conditions. 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 or be conducted in a short amount of time.
- 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 period of time (i.e., not permanently), plays a role in regenerating oak species and their retention in the landscape over time. Even-aged management is focused within the FSM, FSMO, and GFM management areas, but could occur in small amounts in other management areas.
- 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). These sites may provide foraging opportunities for the Indiana bat (Sparks et al., 2004). Researchers are discovering that foraging habitats may include upland, bottomland, and riparian woodlands, as well as forest and cropland edges, fallow fields, agricultural lands, residential areas and areas of impounded water (Kiser and Elliott, 1996; Carter et al., 2002; Farmer et al., 2002; Miller et al., 2002; Murray and Kurta, 2004).
- Utility corridors are narrow and linear. Those located in road right-of-ways would not change the condition existing along a road. Those that occur through forest areas remain in some vegetated condition, thereby providing a potential foraging site, albeit less optimal than areas with forest canopy.
- Approximately 886 acres could 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 generally 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 Alternative E_{mod}.

- The total acreage of potentially suitable Indiana bat habitat that may be altered could actually affect less acres on-the-ground when activities are implemented. For example, the effects analysis pointed out that some acres of prescribed fire would actually occur on the same patch of ground (Table 17). As another example, an uneven-aged timber harvest may account for 50 acres. Some of the temporary roads, landings and all of the skid trails would occur on the same acres as the actual harvest. Project-level analysis would identify actual disturbance acreages.

Cumulative Effects of the Selected Alternative

The WNF plays a role in the recovery of the Indiana bat, albeit possibly a smaller role than other National Forests and public/private ownerships within the species range. A Priority III hibernaculum and known fall swarming sites indicate that winter habitat is present on the WNF. As of 2005, at least 333 individuals were known to be hibernating on the WNF. A large part of the WNF has been surveyed for the presence of the Indiana bat, but surveys completed to date suggest that two areas in the action area are especially important. The southwestern part of the Athens Unit (an area bounded by Haydenville – Dorr Run – Snake Hollow – Monkey Hollow) and the Bear Run area of the Ironton Ranger District include fall swarming sites or a known hibernaculum, and known foraging habitat. Lactating or post-lactating females have been captured in both areas, indicating maternity colonies may be in or near these two areas.

Cumulative effects were analyzed within the 1,108,199 acre action area (see *Location and Ecological Setting of the Proposed Action* for a description of the action area) rather than the WNF proclamation boundary because:

a. The action area contains all anticipated direct and indirect effects of implementing Alternative E_{mod};

b. Smoke generated from prescribed fire activities (potential direct effect on roosting bats) is likely to travel the farthest off-site from NFS lands. Smoke dissipates into the air column and detectable levels are minimal at a distance of one-mile from the fire (K. Moore and A. Acheson, pers. comm.). Therefore, if a prescribed fire was conducted on NFS lands on the edge of the WNF proclamation boundary, the additional mile should be adequate to

encompass direct and indirect effects for this species.

c. The action area is large enough to contain the summer foraging range of any local individual bats using the WNF. Males and females will travel variable distances from roosts to forage, with some documented as traveling over 2.5 miles to forage. If the southwestern part of the Athens Unit and the Bear Run area of the Ironton Ranger District are assumed especially important to this species, the cumulative effects analysis area is more than large enough to incorporate a typical foraging range around these areas.

Winter Habitat

Winter habitat is limited in the action area since karst systems (limestone caves) do not occur here. An abandoned underground limestone mine is being used by the species, and mist netting indicates that individuals are using some underground coal mines in the Monkey Hollow, Snake Hollow, and Dorr Run areas of the WNF during fall swarming. Due to safety regulations, biologists cannot access theses coal mines to verify if they are being used as winter hibernacula.

Underground mining occurred in portions of the action area in the past, primarily on the Athens Unit and on the western half of the Ironton Unit. An abandoned mine inventory conducted by the Forest Service resulted in the location of 1,467 underground mine portals and 220 subsidences on NFS lands in the Pine Creek and Monday Creek watersheds, about half of which are open. Not all of these openings lead to suitable winter habitat, but the Forest Service evaluates portals for human safety hazards and for use by bats. Where the two overlap, the Forest Service evaluates the portal for gating. To date, 8 open portals have been gated on NFS lands, and 20 open subsidences have been closed.

It is unknown how many open coal mine portals or subsidences are on private lands, but the figure is probably less than that for NFS lands. Most abandoned mine lands in the Monday Creek watershed are on NFS lands and about half are on NFS lands in the Pine Creek watershed. Open mine portals on private lands are not regulated. Some people modify them, while others leave them alone. The Ohio Division of Mineral Resources has a reclamation program to help landowners alleviate health and safety threats from open portals. To date, this agency has closed or gated 382 mine entries statewide. The Division assesses each opening as to its potential for providing winter habitat, and gates opening if it may be present. This program would likely continue into the future if the abandoned mine program is reauthorized.

In the next few years, the Federal Highway Administration will begin construction of a bypass around Nelsonville, Ohio. There are numerous mines in the area, including one about 600 feet from the future disturbance area where an Indiana bat was captured. Blasting near the mine could

cause the mine to collapse which could kill or trap hibernating bats, and vibrations generated from the use of equipment and blasting could cause bats to awaken during hibernation thus decreasing their fitness (USFWS, 2005a). Monitoring will be conducted at this portal during construction, and because monitoring would detect immediate threats to the mine, the Fish and Wildlife Service does not anticipate the blasting would approach a level which could cause the mine or portal to collapse. In addition, the Fish and Wildlife Service did not believe the noise from construction would pose a detectable response from hibernating bats based on several studies that have been done to assess the effects of noise on Indiana bats (USFWS, 2005a).

Using a cumulative effects analysis time period of ten years (i.e., typical Forest Plan cycle), as many as 555 mine openings could be closed in the action area. The Division of Mineral Resources could possibly close about 370 openings (based on their 2004 accomplishments). The Forest Service may close 155 portals and subsidences on NFS lands (i.e., same amount for the no action alternative and for Alternative E_{mod}). In addition, 20-30 mine openings may be gated on the WNF.

There should be no adverse cumulative effects on potentially suitable winter habitat from Forest Service actions because conservation measures have been incorporated into Alternative E_{mod} to remove the risk of affecting winter habitat. These measures include Forest-wide direction that encourages pre-gating and post-gating mist net surveys at mines where bat-friendly gats are installed (GFW-TES-6), and fall swarming surveys at any mine openings that may be backfilled (SWF-TES-5).

The Forest Service has also included measures to limit as much as possible the potential for disturbance of individuals at known hibernacula and known fall swarming sites (see Forest-wide standards and guidelines SFW-TES-1 through SFW-TES-4).

Summer Habitat

Land use activities fall into two categories – they either alter suitable Indiana bat habitat for a period of time until it once again is suitable, or they result in the permanent loss of habitat. Cumulative effects of these activities will be discussed separately.

Analysis of cumulative effects that may alter summer habitat proceeded from the current forest age class and composition, through the next 50 years. This timeframe was chosen because of all direct and indirect effects that could affect summer habitat, even-aged timber harvesting could alter foraging and roosting habitat for up to 50 years. At about this time, stands are beginning to open up and trees are growing larger in diameter, both of which may offer foraging and roosting habitat once again. Cumulative effects of activities that could result in the permanent loss of habitat will be addressed over a ten year period for two reasons:

(1) the transportation system needed to manage forest resources should be mostly in place after a period of ten years, and (2) activity levels on private lands after this period are difficult to estimate.

Alteration of Summer Habitat

Past

Mature forest with canopy gaps and open understories is important to this species, both during the summer and during the swarming period; however forest structure has changed over time. Researchers believe that the action 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. Native American people utilized fire to clear forest from around their camps, clear brush for improved hunting and for better visibility for protection against enemy attacks (Fralish, 2004). The action area was a mosaic of early-, mid-, and late-successional forest habitats.

As European immigrants moved into the action area in the late-1700s, the forest was cleared for home sites, agriculture, lumber and mining. By 1940, only about 15% of the forest cover was still present in Ohio, and this trend was likely similar for the action area (Ohio Division of Forestry, 2004). Active fire suppression began in the 1920s.

Present

Today, the Ohio Division of Forestry estimates that almost 30% of Ohio is now covered by forest once again, and the trend is similar for areas of Kentucky and West Virginia within the Southern Unglaciated Allegheny Plateau (Ewing, 2003a). An estimated 79 percent of the lands within the action area are forested today, based on Landsat TM (1994).

While forest cover has increased, it has a different structure and composition than what occurred here before Europeans first started moving into the area. Based on written accounts of early settlers and travelers in the Ohio Valley, forests were described as being park-like with large, widely spaced overstory trees and relatively little undergrowth of woody vegetation. Chestnut-oak forests dominated the landscape until the early 1900s, but these changed to oak-hickory forests after the chestnut blight occurred. 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 presettlement 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 greater abundance in the forest understory and midstory (Abrams, 1992; Abrams, 1998). There is no scientific information available at this time to know whether the increasing density of forest communities is a contributing factor to the Indiana bat's decline.

Forested lands within the action area are managed in a variety of ways, creating a mosaic of habitat conditions across the action area. National Forest System lands account for 21 percent of the action area and 94 percent of these are forested. Tables 2, 10, and 11, and Figures 6 and 7 provide detailed information about the current age class and species composition distributions of forest stands on NFS lands.

Based on knowledge gained by WNF field-going staff, about 50% of the private lands in the Ironton Unit have been logged over the past 20 years. About 95 percent of the treatments were considered high-grading or diameter-limit cutting. These private lands are now in various stages of regeneration, from sapling to pole sized trees. This scenario is most likely similar for the Athens and Marietta Units. These harvesting methods deliberately harvest mature trees and/or thin intermediate age classes, regenerating a new age class to replace the old. However, landowners frequently partially cut stands as a harvesting method without the deliberate effort to thin immature age classes or to regenerate a new crop. These partial cuttings often take the form of diameter-limit cuttings in which all trees of a specified diameter and larger are cut. A second type of partial cutting removes only the large, higher quality trees of sawtimber size, leaving an irregularly spaced residual stand without any particular balance or design. Both of these types of cuttings are undesirable because they "high grade" the woods. That is, the largest, best formed, and most valuable species are removed, leaving a forest stand of lower value and generally lower vigor (Pope et al., no date).

Please refer to the Environmental Baseline for the Indiana bat and the subsection titled, *Factors Affecting Species Environment*, for further descriptions of ongoing forest management activities on other ownerships or by other agencies in the action area.

Future

Timber harvesting is likely to continue on New Page/Escanaba Timber lands. The forest lands are up for sale, but it is the company's intent to sell to a single entity that will maintain sustainable forest products for the Chillicothe Mill. It is not known exactly what stands of timber may be harvested during the next decade, but perhaps about 10 percent could be harvested, primarily with even-aged methods, each decade. This would equate to about 2,500 acres in a 50 year period.

A mixture of even-aged and uneven-aged timber harvests may occur on Dean and Zaleski State Forests. It is not known for certain how much harvesting could occur on these lands in the next 50 years, but for

purposes of this analysis, an assumption of 500 acres will be made. Very little of Zaleski is in the action area, and much harvesting has occurred at Dean State Forest over the past two years as a result of the 2003 ice storm.

For the most part, logging on private lands may decrease over the next 50 years due to immature age and poor accessibility of much of the remaining timber. If an assumption is made that timber harvesting on private lands decreases to one-third of past logging rates (i.e., ~8 percent per decade), then some type of harvest activity could occur on about 40% of private lands over the next 50 years. Similar to present times, high grading is expected to occur on the majority of private lands. This harvest method does not result in optimal foraging conditions for the Indiana bat, and tends to remove trees with future roost value.

Little to no prescribed fire or herbicide applications are used in combination with timber harvests on private or industrial timber lands.

Effects from potential gypsy moth and emerald ash borer infestations cannot be estimated; however it is possible that some parts of the action area could be affected in the next 50 years. A gypsy moth infestation could result in additional snags for roost habitat. An emerald ash borer infestation may result in the felling and removal of ash trees, which would reduce potential future roost trees.

The Forest Service would employ different timber harvest prescriptions in various management areas over the next 50 years. Of the treatments that could be implemented, immediate improvements to Indiana bat foraging and roosting habitat could occur on about 84,800 acres of NFS land.

- Uneven-aged harvest methods may be used on 45,300 acres over the next 50 years, of which some acres would be treated so the stands can progress towards a true uneven-aged stand. Single-tree and group selection methods are used to open up the canopies which can help warm roost trees and create canopy foraging gaps. This method does not promote regeneration of oak and hickory, so it is possible that the forest composition in these treated stands could move toward more shade tolerant species.

- Historic Forest prescriptions could be applied to about 33,900 acres in the next 50 years, of which some acres could be treated twice. The combination of thinning and prescribed fire (and possibly herbicides) would create open understories for foraging, and could improve environmental conditions around roost trees. This treatment encourages oak and hickory regeneration and the stands would be dominated by these species, thereby providing an abundance of future roost trees.

- Thinning may be done on 5,680 acres over the next 50 years. It decreases stem density in forest stands that have been treated with

even-aged methods in the past. Foraging habitat is likely limited in stands treated with these methods because of the high density of trees, so thinning can improve foraging habitat.

- Even-aged management (two-age, shelterwood, and clear cut) could occur on about 15,100 acres in the next 50 years. Even-aged management methods could temporarily reduce optimal foraging habitat conditions (up to 50 years). Shelterwood, two-age and clearcut with reserves would retain more trees on the site than a clearcut. MacGregor et al. (1999) reported male Indiana bats were roosting, during the autumn pre-hibernation period, in forest stands that were harvested by the two-age timber harvesting methods. The Forest-wide standards and guidelines (SFW-TES-10 and SFW-TES-12) require that trees with existing roosting characteristics be left during harvests, and at least 30 live trees per acre for roost tree recruitment be retained. While foraging habitat may be affected for as many as 50 years, some roosting habitat would be available to the species in areas treated with even-aged methods. Even-aged management on NFS lands could have short-term adverse effects on the availability of suitable habitat, but over time these stands would mature and once again become suitable.

In the next ten years, about 8 percent of forested non-Federal lands could be harvested, and about 17,941 acres of NFS lands - or 2 percent of the forested action area, could be harvested. Based on these future scenarios, it is possible that about 54 percent of the forested action area could be harvested in some manner over the next 50 years. Cumulatively, the timber harvesting on NFS lands during the 50 year time period would account for 11 percent of the harvesting, however 85 percent of these harvested acres could result in immediate and long-term foraging and roosting improvements for the Indiana bat. Only 1.7 percent of the action area would be affected by even-aged management treatments on NFS lands over these five decades, yet even those treatments could result in some foraging and roosting opportunities. Based on the habitat needs of this species, these timber harvesting strategies incorporated in Alternative E_{mod} could have greater beneficial cumulative effects than that of the no action alternative.

Construction of utility corridors and temporary roads may occur to some degree on other ownerships, but are not likely to increase over current levels. Prescribed fire, temporary roads, creation of forest openings and reduction of hazardous fuels are projected to occur during the first decade and to some degree will likely occur out into future decades. These activities have short-term direct and indirect effects (i.e., less than a decade) that may be adverse, but can provide benefits to this species over the long-term.

Cumulative effects from implementing Alternative E_{mod} would be mitigated through protective Forest-wide standards and guidelines and should not jeopardize the continued existence of the Indiana bat. These cumulative effects would also be reduced by the fact that these activities would be distributed spatially and temporally across the WNF in management areas that prescribe such activities. Some of these activities will be occurring on the same acres of land, thereby reducing the overall effects. Activities such as uneven-aged and even-aged timber harvest, prescribed fire, and hazardous fuels reduction may have short-term adverse cumulative effects, but in the long-term they may benefit the species. These activities would open dense understories and could reduce canopy cover to levels thought to be more optimal for Indiana bat foraging. Any adverse cumulative effects would be mitigated to the degree possible through protective Forest-wide standards and guidelines.

Loss of Summer Habitat

The action area is located in a very industrialized area with a high population. It is rich in mineral resources. Today, about 2 percent of the action area is comprised of roads, industrial sites and residential areas. Most of the industry is located along the Ohio River corridor, or along major transportation routes through the action area. Oil and gas wells are scattered within forest land, primarily in the Athens and Marietta Units. Some coal mining occurs today, primarily on the Athens Unit.

As people move away from urban centers, forest land is cleared for homes and other improvements. It is unknown how many total acres of suitable habitat could be permanently lost on private and other public lands within the proclamation boundary in the next ten years, but it is expected that some new oil and gas wells, roads, home sites, and industrial and commercial sites will be constructed in the planning area on these other ownerships. It's estimated that the number of people in the action area could increase by 8.5 percent by 2020 (DEIS, page 3-254).

The Federal Highways Administration completed consultation and a Final EIS on the Nelsonville Bypass. Construction is not expected to start until 2007 on the 8.5 mile bypass. According to the Biological Opinion for this project, a 768 acre linear corridor could be impacted, including all staging, waste, and borrow areas, and ancillary connector roads. About 275 acres (or 50%) of this disturbance could occur on NFS lands. Project engineers will likely make design refinements to further reduce disturbance.

Permanent road construction and reconstruction, trail construction, oil and gas development and surface coal mining are the activities in the Selected Alternative which could result in the loss of Indiana bat habitat over the first decade (i.e., 2,088 acres). Alternative E_{mod} could result in the loss of 157 more acres than would the no action alternative. This loss equates to less than 0.2 percent of the action area. These activities are expected to occur as small projects that are distributed across the planning area.

A possible surface coal mine, which would be located north of the Bear Run area on the Ironton Ranger District, accounts for 57 percent of the NFS lands that could be permanently converted to non-forest habitat for many decades. The area has not been surveyed for the presence of Indiana bats, but it is located just north of where individuals have been captured. The Forest Service has no authority over private mineral rights; however it can use the project level planning process to consider how Forest Service management activities might influence short-term and long-term available habitat in this part of the Ironton Ranger District.

Determination of Effect and Rationale

Table 19 presents a summary of the effects of Alternative E_{mod} on the Indiana bat and its habitat that may occur in the planning area.

A **Likely to Adversely Affect** determination is made for the Indiana bat. 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 habitat as well as summer habitat that is currently unknown. Implementation of management activities that require the removal of trees may accidentally cause direct take through the removal of an undetermined roost tree during the non-hibernation season. Although the potential for this take is extremely small considering 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 may be affected, adverse impacts from Alternative E_{mod} are not likely to impede recovery of this species. The Forest Service has incorporated both proactive conservation actions as well as protective measures into the Selected Alternative to aid in the recovery of this species:

1. The Selected Alternative incorporates conservation approaches or measures to proactively protect and conserve Indiana bat habitat.

    - A Conservation Plan for Federally Listed Species was developed and included in the revised Forest Plan (see Appendix 1 of this Biological Assessment). This 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 the1983 Indiana bat recovery plan objectives (USFWS, 1983a): (1) prevent disturbance to important hibernacula; (2) maintain, protect, and restore foraging and nursery habitat; (3) monitor population trends; (4) public education; and (5) research needs; and addresses the 1999 Agency Draft Recovery Plan objectives (USFWS, 1999): (1) conduct research necessary for the survival and recovery of the Indiana bat; (2) obtain

information on population distribution, status and trends; (3) protect and maintain Indiana bat populations; (4) provide information and technical assistance outreach; and (5) coordinate and implement the conservation and recovery of the Indiana bat.

- As a conservation approach, Alternative E_{mod} incorporates habitat management tools to provide a diversity of mature forest habitats, which may be favorable to the Indiana bat (Table 13). Over 81 percent of NFS lands would be covered by mature forest in 100 years, a net increase of 119,000 acres. This forest would possess a more diversified structure and composition than what the no action alternative prescribes.
- The Selected Alternative proactively addresses the importance of oak and hickory species to the Indiana bat by incorporating a Historic Forest management prescription. Through thinning and the use of prescribed fire and/or herbicides, the structure of the resulting forest would be more open and it would be dominated by oak and hickories, preferred trees for roosting. This management area was placed near the two areas of importance for this species (Bear Run area and southwestern part of Athens Unit).
- The importance of protecting winter habitat and existing summer roost trees, and providing a plentiful supply of future roost trees is recognized in the Selected Alternative. A Forest-wide goal (5.1.1) was incorporated that guides the Forest Service to retain or develop Indiana bat roosting and foraging habitat and protect all known Indiana bat hibernacula. A Forest-wide objective (5.1.1a) ensures proactive management of any additional Indiana bat hibernacula discovered on NFS land.

2. The Selected Alternative incorporates various activities that may adversely affect the Indiana bat (see table below). However, those activities that could result in the loss of habitat would affect less than 1 percent of NFS lands. About 42 percent of the WNF could be affected by activities that may have short-term adverse effects, but long-term beneficial effects. These short-term adverse effects are minimized by Forest-wide standards and guidelines:
    - Forest-wide standards and guidelines in Section 5 – Endangered, Threatened and Sensitive Species (SFW-TES-1 through GFW-TES-14) apply directly to the Indiana bat (see Appendix 1).
    - Section 2-Watershed Health addresses how to stabilize disturbed areas, which promotes healthy aquatic habitats. This ensures long-term aquatic insect production and drinking supplies.
    - Section 3 –Aquatic and Riparian Resources provides guidance on the use of filterstrips, road-stream crossings, pipeline-stream crossings, removal of material from streams, and guidance on the

restoration of riparian corridors, wetlands, springs, and ponds. This ensures long-term aquatic insect production and drinking supplies.

- Section 4 – Wildlife and Plants includes guidance on prescribed burning in mosaic patterns and creation of upland waterholes. Both of these are included to address insect production for the Indiana bat.
- Section 6 – Vegetation includes guidance on girdling trees during crop tree release to create future snags (GFW-VEG-16).
- Section 10 – Minerals includes a standard to enact a no surface occupancy stipulation in areas within one-quarter mile of Indian bat hibernacula

Projected management activities during the first decade	Alternative E_{mod} (acres)
Permanent Loss of Habitat	
Permanent Road Construction - Reconstruction	392
Recreation Trails	265
Recreation Facilities & Parking Lots	60
Surface Mining	1,250
Oil & Gas Well Development	121
Total Loss of Habitat	**2,088**
Percent NFS lands affected	**0.87**
Percent action area affected	**0.19**
Alteration of Habitat	
Timber Harvest	17,941
Crop Tree Release	2,113
Prescribed Fire	69,819
Temporary Roads, Skid Trails and Log Landings	886
Hazardous Fuels Reduction – Mechanical Methods	10,181
Development of Permanent Openings	500
Utility Corridor Development	50
Closure of Mine Features	232
AMD Treatments	270
Total Alteration of Habitat	**101,992**
Percent NFS lands affected	**42.8**
Percent action area affected	**9.2**
Hazard Tree Removal	2,550
Hickory Tree Removal	1,142

3. 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.

Table 19. Summary of effects determinations for the Indiana bat.

Projected Management Activity	Alternative E_{mod}
Vegetation Management	
Even-aged Hardwood Timber Harvest	A
Even-aged Pine Timber Harvest	A
Uneven-aged Timber Harvest	A
Thinning	A
Crop Tree Release	A
Grape Vine Control	N
Site Prep for Native Pine	N
Reforestation	B
Prescribed Fire	A
Herbicide Application	N
Development of Permanent Forest Openings	A
Maintenance of Permanent Forest Openings	N
Control of Non-Native Invasive Species-Mechanical	N
Control of Non-Native Invasive Species-Biological	N
Wetland Restoration & Enhancement	B
Waterhole Construction	B
Fishing Pond/Lake Construction	B
Restoration & Improvement of Aquatic/Riparian Habitat (Lentic)	B
Restoration & Improvement of Aquatic/Riparian Habitat (Lotic)	B
Installation of Bat-Friendly Gates on Mines	B
Recreation Management	
OHV Trail Construction	A
Hiking Trail Construction	A
Horse Trail Construction	A
Mountain Bike Trail Construction	A
Recreation Facility & Parking Lot Construction	A
Transportation Management	
Temporary Road Construction	A
Permanent Road Construction	A
Permanent Road Reconstruction	A
Road Decommissioning	B
Disturbance related to Timber (Skid Trails, Landings)	A
Energy Minerals Management	
Surface Coal Mining Activities	A
Reclamation of Depleted or Orphan Wells	B
Oil & Gas Well Development	A
Special Uses Management	
Utility Corridor Development & Maintenance	A
Agricultural Crop Production & Grazing	N
Watershed Management	
Treatment of AMD	B
Surface Mine Reclamation	B
Closure of Open Mine Portal/Subsidence	A
Stabilization of Disturbed Areas	B
Fire Management	
Reduction of Hazardous Fuels - Mechanical	A
Lands Acquisition Management	
Land Acquisition	B
Land Exchange	D
N = No Effect; **B** = Not Likely to Adversely Affect, Beneficial Effects; **I** = Not Likely to Adversely Effects, Insignificant Effects; **D** = Not Likely to Adversely Affect, Discountable Effects; **A** = Likely to Adversely Affect	

Bald Eagle

Status of the Species

Species Description

Rangewide

The bald eagle was listed as an endangered species in most of the United States in 1978, (it was listed as threatened in five states). Because of population losses to pesticide pollution, hunting, and habitat destruction, a recovery program was launched to restore it to non-endangered status. Bald eagles have recovered due to the implementation of Fish and Wildlife Service programs. They were downlisted to threatened status in 1995 and were proposed for delisting in July of 1999. They would continue to be protected under the Bald and Golden Eagle Protection Act of 1962, as amended, the Migratory Bird Treaty Act of 1918 and the Lacey Act of 1900, if delisted.

Species Range in Ohio

The bald eagle's numbers in Ohio have grown significantly. In 1979, there were four known nesting pairs in Ohio. As of 2004, there were 108 nests (a modern day record) that started incubation and there were 74 nests with confirmed live young (ODNR, 2004a; 2005). Twenty-one new pairs were confirmed in Ohio - 3 in Sandusky County, 2 each in Ashtabula, Erie, Ross, and Wyandot, and 1 each in Hardin, Harrison, Huron, Knox, Muskingum, Ottawa, Pickaway, Putnam,

Common Name: Bald eagle
Scientific Name: *Haliaeetus leucocephalus*
Family: Accipitridae
Group: Birds
Historic Range: North America south to northern Mexico
Population to Which Status Applies: U.S.A., conterminous (lower 48) States.
Current Status: Threatened, Proposed for De-listing
Date First Listed: March 11, 1967
Critical Habitat: NA
Special Rules: 17.41(a)
Recovery Plan? Yes
Lead Region: Great Lakes-Big Rivers Region (3)
Current Range: AL, AR, AZ, CA, CO, CT, DC, DE, FL, GA, IA, ID, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NE, NH, NJ, NM, NV, NY, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VA, VT, WA, WI, WV, WY

Source: Fish and Wildlife Service

Richland, and Seneca counties. See Figure 8 for a county distribution of nesting bald eagles in Ohio, as of 2004. Preliminary results for 2005 indicate that there may have been 85 successful bald eagle nests in Ohio (ODNR, 2005).

Although generally concentrated along western Lake Erie, wintering bald eagles were sighted in 2003 around the mouth of the Sandusky River, as well as the Kokosing, Scioto, and Muskingum rivers. Clermont, Scioto, and Gallia counties along the Ohio River were the southern-most locations of eagle sightings. A preliminary total of 352 bald eagles were observed during the midwinter bald eagle surveys, including 271 mature bald eagles and 81 immature eagles (birds less than 5 years old). In 2002, 304 bald eagles were identified during the mid-winter survey, a group composed of 167 mature and 137 immature birds. In 2004, 127 eaglets fledged from a record 108 nests (ODNR, 2005)

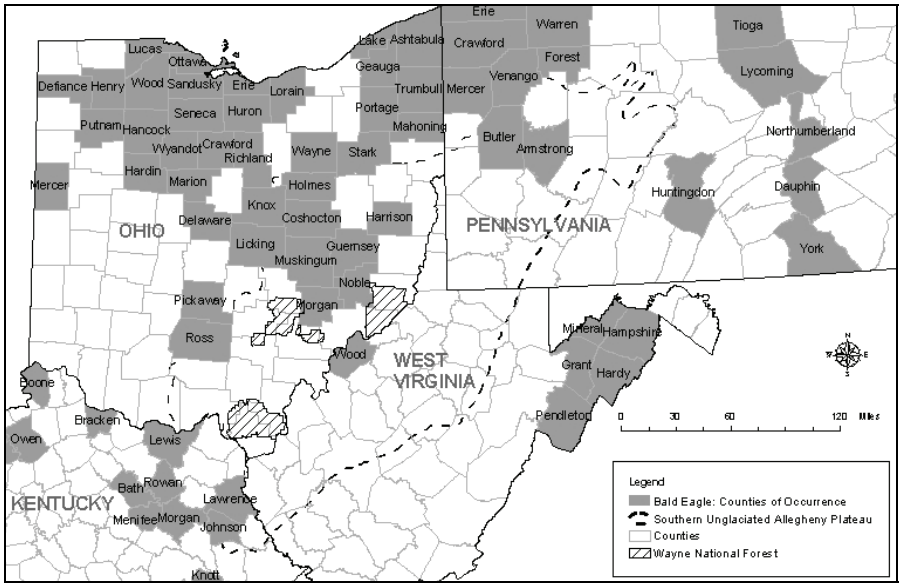


Figure 8. County occurrences of the bald eagle in the Southern Unglaciated Allegheny Plateau, 2004.

Life History

The bald eagle is a large, long-lived bird of prey that occurs only in North America. The adults have brown bodies with white heads and tails. The young are all brown, and can be distinguished from young golden eagles by their lower bare legs (golden eagles have feathered legs all the way to their feet). They do not take on the coloring of the adults or reach sexual maturity until age four.

In Ohio, the female lays one to three eggs, approximately 36 hours apart, in mid-February to late March. Both she and her mate spend time on the

nest incubating. This process usually lasts 35 days, with the young hatching in late March through early May. The eaglets will stay in the nest 10 to 12 weeks and both parents share the feeding responsibilities. The eaglet(s) begin limb hopping as they strengthen their wings. The fledging process continues for four to eight weeks; all the while the eaglets slowly broaden their range from the nest, but continue to depend on their parents for food. The young birds generally become independent at 17 to 20 weeks of age and will disperse from Ohio in November or December (ODNR, 2003b).

Many bald eagles do not breed for the first time until they are 5 to 6 years of age or older (NatureServe, 2004). The time period before sexual maturity is a time of significant mortality, and many eagles do not reach two years of age. After the first couple of years, chances for survival improve, and eagles are thought to live up to thirty years (USFWS, 1983b).

The bulk of the bald eagle's diet is fish; however they will also feed on waterfowl, small mammals, and carrion, especially in winter (USFWS, 1983b).

It is believed that eagles mate for life, but there is little documentation to substantiate this claim. In the event that the mates are separated, new mates likely are found. Pairs of eagles usually raise one to two young per season, originating from one to three eggs. The entire breeding cycle from initial breeding activity to fledging is about six months.

When the nesting period is over, the wintering period begins. At this time, the eagles generally leave their nest site for more protected locales with abundant food supplies. According to the 1981 eagle count done by the National Wildlife Federation, during the months between November and March bald eagles make their way into all of the contiguous 48 states. As with their nests, the eagles revisit many of the same wintering sites. The sites are chosen for their shelter from the wind to reduce energy use. The wintering population of eagles is split between large groups that congregate at recurring communal sites, and those that have smaller gatherings. Both the large and small wintering meeting and roosting sites are equally important to the survival of the species. In addition to shelter from the weather, roost sites provide isolation from humans. When human disturbance of a night roost occurs, eagles may abandon the location (USFWS, 1983b).

Population Dynamics

Survival of individual bald eagles, particularly those in their first year of life, depends heavily on conditions they encounter during the wintering period. In previous studies, it was thought that their reproduction rate was the most important dynamic for the preservation of the species, but it is

now believed that their survival rate may play a more crucial role. It appears likely that eagle populations may be more successful with lower reproduction rates and higher survival rates, than vice versa (USFWS, 1983b).

A 1963 National Audubon Society survey reported an average of 0.59 young produced per active nest, whereas in 1994 the average number of young produced per occupied territory was 1.17 (USFWS, 1995). The number of occupied breeding territories has increased by 462% since 1974, and since then the species is doubling its breeding population every 6 to 7 years (USFWS, 1995).

Status and Distribution

Because of population losses to pesticide pollution, hunting, and habitat destruction, a recovery program was launched to restore it to non-endangered status. In the early 1960s, there were fewer than 450 nesting pairs of bald eagles in the lower 48 states. Efforts at captive rearing and restocking wild populations in specific areas of the country, hacking, habitat protection, and banning of DDT, bald eagle populations increased to 6,471 nesting pairs in 2000 in the lower 48 states (USFWS, no date).

Rangewide Threats

The use of DDT as a pesticide from 1940 through the 1960's caused the drastic decline in the bald eagle. Consumption of DDT contaminated prey resulted in eggshell thinning and nesting failures. With the banning of DDT and strong enforcement of recovery measures, the eagle has successfully recovered.

Destruction and degradation of habitat is a major threat to the species. Their habit of returning to the same nesting and winter roosting sites, as well as their tendency to congregate makes each site of great importance to the entire population of bald eagles. Habitat degradation occurs as a result of direct cutting of trees for shoreline development, human disturbance associated with recreational use of shorelines and waterways, and contamination of waterways from point source and non-point sources of pollution (USFWS, 1995). In the Chesapeake Bay Recovery Region, Buehler et al. (1991 in USFWS, 1995) found that feeding and resting use of the Chesapeake Bay shoreline was directly related to the distance of development from the shoreline. Eagles avoided shorelines with nearby pedestrian or boat traffic. In the Great Plains Recovery Region, wintering areas have been lost through development of riparian areas for recreational, agricultural, and urban uses (USFWS, 1995). Cottonwood regeneration is affected by grazing and water level fluctuations of impoundments.

Disease is a factor in some bald eagle deaths. Avian cholera, avian pox, aspergillosus, tuberculosis, and botulism may affect individual eagles, but

are not considered to be a significant threat to the population (USFWS, 1995). The Mexican chicken bug, when abundant, is known to kill young in the southwestern region (USFWS, 1995). According to the National Wildlife Health Center in Wisconsin, only 2.7% of bald eagles submitted to the Center between 1985 and 1990 died from infectious disease (USFWS, 1995).

Even though the widespread elimination of DDT and reduction of other pesticides has been greatly successful, other contaminants exist on a localized level. They can affect the survival and reproductive success and health of bald eagles. The abundance and quality of prey may be seriously affected by environmental contamination. While compounds implicated in reduced reproductive rates and direct mortality are no longer used, contaminants continue to be a major problem in some areas. (USFWS, 1995). Lifetime exposure to contaminants may limit an eagle's reproductive capabilities, alter their behavior and foraging abilities, and increase their susceptibility to diseases and other stresses (USFWS, 1995).

The Fish and Wildlife Service (1995) reports that eagle productivity is being depressed by PCBs and DDE, mostly in the coastal areas of Lakes Michigan and Huron. DDE residue concentrations have dropped in Lake Superior eagle eggs to a level considered to be the "no effect concentration" (4 ppm). Mercury poisoning is a concern in Maine and in the southeast (USFWS, 1995). High levels of mercury affect eagles with a variety of neurological problems where flight and other motor skills are altered, and reduce hatching rates of eggs.

Pesticides, in recent times, have not impacted the bald eagle population; however individual poisonings do occur (USFWS, 1995). Poisonings seem to occur indirectly through the eagle's prey. Carcasses baited with poison for target species like coyotes, may attract eagles. Crop insecticides may be taken up by prey species and result in eagle mortality (USFWS, 1995).

Shootings, disease, human disturbance, electrocution and vehicle collisions are also continuing threats to the eagle (USFWS, 2003a).

Action Area Threats

Of the rangewide threats described above, habitat degradation resulting from of direct cutting of trees for shoreline development and contamination of waterways from point source and non-point sources of pollution are within the control of the Forest Service on NFS lands. If nesting or roosting were to occur within the planning area, the Forest Service could manage human disturbance associated with recreational use of shorelines and waterways on NFS lands

Environmental Baseline

Species Range in the Action Area

Bald eagles have been occasionally sighted on or near the WNF, mostly in the winter, along the Ohio River, around Burr Oak Lake and Lake Vesuvius, and in Hocking and Morgan counties. During summer months, bald eagles are sighted along the Ohio River near the Ironton and Marietta units. No nests have been found in the area. Thus, at this time, bald eagles on the WNF are probably migrating through or wintering here. The bald eagle is expanding its nesting range, however, and individuals initiated nesting in nearby Morgan and Noble counties in 2004 (ODNR, 2004b).

Suitable Habitat within the Action Area

There are no known nesting sites in the action area.

Nesting Requirements

Eagles select areas with low human disturbance, suitable forest structure, and abundant prey for nesting sites. Eagles usually nest near large bodies of water (within 0.5 miles), 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. Although there are reports of nests on the ground or on cliff faces, the majority of eagles build their nests in supercanopy trees with large diameters and canopies (USFWS, 1983b). They construct the nests of sticks and add to them each year (USFWS, 1983b). Nesting almost never occurs farther than 1.8 miles from water (Gerrard and Bortolotti, 1988 in USFWS, 1995). Nest sites are usually in large trees along shorelines in relatively remote areas. The trees must be sturdy and open to support a nest that is often 6 to 9 feet across and more than 1 m thick (Bent, 1938 in USFWS 1995).

Suitable nest 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.

Foraging Habitat

Eagles will forage along rivers, streams, lakes, and marshes. Suitable foraging habitat exists along the larger river systems and lakes in the WNF. Wetlands on the WNF are not managed to maintain populations of fish, therefore they offer limited foraging opportunities for the eagle.

Roosting Habitat

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 are used by an individual bald eagle 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 (USFWS, 1983b). In relatively flat terrain where few trees are present, eagles usually roost in trees that are clumped or screened from the prevailing wind by other vegetation (USFWS, 1983b).

Suitable roosting habitat may be found with the WNF near larger watercourses or waterbodies.

Factors Affecting Species Environment

The Ohio Division of Wildlife has an active monitoring program throughout the state. Mid-winter bald eagle surveys are conducted and reported on every year. Nesting attempts are monitored for success and reported on statewide.

The U. S. Fish and Wildlife Service manages several islands in the action area as part of the Ohio River Islands National Wildlife Refuge. The refuge's management plan includes programs such as bottomland hardwood restoration and wetland restoration, both of which would benefit the eagle. The agency conducts a 29 mile long mid-winter bald eagle survey in the willow Island pool annually.

Please refer to the *Factors Affecting Species Environment* for the Indiana bat for activities that are occurring which may affect forest habitat.

Within the action area, several groups have formed and are working to improve water quality of mine-impacted streams. These include the Monday Creek Restoration Project and the Little Raccoon Restoration Group. Their efforts will provide benefits to the eagle over the long-term as aquatic health is restored.

Direct and Indirect Effects of the Selected Alternative

Activities with No Effects

There are some activities that do not pose a risk of degrading habitat (direct cutting of trees for shoreline development) or contaminating waterways (from point source and non-point sources of pollution). These activities include:

- Crop tree release
- Grape vine control

- Herbicide application
- Development of permanent openings
- Maintenance of permanent openings using mechanical methods
- Control of non-native invasive species using herbicides, mechanical or biological methods
- Waterhole construction
- Fishing pond and lake construction (these sites are generally small in size)
- Installation of bat-friendly gates
- Reduction of hazardous fuels using mechanical methods
- Special use permits allowing hay production and grazing on existing openland

Activities Not Likely to Adversely Affect - Beneficial Effects

The creation of the River Corridor MA was developed, in part, with the bald eagle in mind and should provide long-term direct benefits to this species as it expands its range in Ohio. The purpose of the River Corridor MA is to retain, restore and enhance the inherent ecological processes and functions associated with riverine systems.

The River Corridor MA is located on Symmes Creek, Hocking River, Little Muskingum River, and along the Ohio River on the Marietta Unit.

The creation of the Timbre Ridge Lake MA should also have direct benefits to this species. The desired future condition of this 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. The management area would provide feeding opportunities as well as suitable roosting or nesting habitat.

Other management activities included in the Selected Alternative may benefit the bald eagle:

- Efforts to **restore riparian and aquatic habitats** on NFS lands should have long-term direct and indirect benefits to the bald eagle. The Selected Alternative include Forest-wide Goals 2.1 and 3.1 that strive (1) to restore water quality and soil productivity to improve health of watersheds impaired by past land use practices and mining activities, (2) to protect and improve riparian corridors to sustain ecological processes and functions, and (3) protect aquatic habitat from potential upland disturbances. These goals, in association with Forest-wide objectives 2.1(a-c) and 3.1(a-d)

should promote conditions that sustain food sources for the bald eagle, as well as roosting and nesting sites along rivers and large water bodies.

- **Reforestation** of newly acquired NFS lands, particularly those in floodplains of larger streams and rivers that were once farmed, will provide long-term benefits to the bald eagle. Riparian areas that are reforested will eventually mature and provide suitable roosting and nesting habitat.
- **Restoration of wetlands** provides a future foraging area.
- **Riparian and aquatic habitat restoration** includes activities that decrease the input of sediment and acid mine drainage into streams, as well as direct improvements such as placement of large woody debris and reconstruction of the natural dimension, pattern, and profile of streams. All of these activities result in improved aquatic habitat which may lead to increased fish production.
- **Stabilization of disturbed areas**, including such sites as abandoned mine lands and orphan or depleted oil and gas wells, returns areas to an herbaceous or forested cover.
- **Road decommissioning** eliminates unneeded stream crossings (potential site for sediment introduction into streams) and returns sites to a forested condition.
- The taxonomic experts involved in the species viability evaluation process noted that **land acquisition** along rivers is a key management strategy that will have long-term benefits for the species (Ewing, 2003e). It is possible that bald eagle nesting or roosting habitat could be acquired in the future, and it is possible that acquisition/exchange of lands could reduce disturbance to any future roosting or nesting bald eagles from activities on private lands.

Activities Not Likely to Adversely Affect – Insignificant Effects

The following activities are expected to have insignificant effects on potentially suitable habitat. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs.

Removal of trees is associated with several management activities (timber harvesting, road construction, road reconstruction, trail construction, parking lot construction, recreation facility construction, pond or lake construction, surface coal mining, oil and gas well development, and utility corridor development. The risk of removing suitable bald eagle roosting or nesting habitat is low. Alternative E_{mod} includes a Forest-wide goal to protect bald eagle communal night roosts, daytime concentration areas, and occupied breeding territories (Goal 5.1.2) and a Forest-wide

objective to identify such areas by conducting mid-winter eagle searches (Objective 5.1.2a). In addition, established Forest-wide standards and guidelines protect any night roosts, nests or concentrations found during mid-winter searches and other field surveys (TES-16), protect super canopy trees (TES-18), and provide guidance on construction of roads, trails or facilities in riparian areas (ARR-4, ARR-5, and ARR-6).

When regenerating native pine, the forest floor must be opened to full sunlight and soil must be exposed so that native pine seeds can germinate and survive. In most cases, soil disturbances from logging or removal of leaf litter during prescribed fire will be enough to allow seeds to contact soil. However, in certain sites, it may be necessary to scarify the soil (**site prep for native pine**) to facilitate the appropriate environment for seed germination. The objective is to create small, scattered patches of exposed soil, but ground cover would remain on 75 percent or more of the treatment area. Filterstrips would minimize the potential for sediment introduction into streams from such activities (ARR-5 and 6).

Smoke from prescribed fires could cause eagles to temporarily flee their nesting or roosting areas. Prescribed fire activities are projected to increase above current levels. The likelihood of smoke affecting eagles is low because Alternative E_{mod} incorporates conservation measures that prohibit prescribed fire within one-half mile of occupied bald eagle sites (TES-19). While no occupied bald eagle sites occur on NFS lands at present, the discovery of occupied roosts, concentrations or nests would require the Forest Service to follow protection guidelines outlined in the Northern States Bald Eagle Recovery Plan (TES-16).

The bald eagle is a scavenger, but fish makes up the majority of its diet. Many management activities integrated into the Selected Alternative have the potential to cause soil disturbance and could affect the eagle's forage base. Soil erosion can increase turbidity levels in lakes or streams, and can settle out onto stream substrates. Turbidity and sedimentation can, in turn, affect feeding and reproduction of aquatic organisms, including fish. The use of filterstrips (ARR-5) and soil stabilization methods (WSH-8) are established conservation measures integrated into Alternative E_{mod} that reduce the potential for introduction of soil into water bodies. Filterstrips also reduce the risk for water quality degradation from nutrient enrichment resulting from potential runoff from agricultural or grazing permits.

Activities Not Likely to Adversely Affect – Discountable Effects

Some activities have discountable effects on potentially suitable habitat, which are effects that are extremely unlikely to occur. Land exchange is a primarily beneficial activity because it helps consolidate NFS lands, which provides more opportunity for landscape level forest management. There could be a situation where a tract of land with suitable eagle habitat on it is

proposed for exchange. Biologists would be involved in the review of all land exchange proposals, and evidence of suitable habitat would be noted and brought to the attention of Forest Service managers. While it is possible that potentially suitable, but unoccupied roost trees could be exchanged, it is unlikely that occupied roost trees, nests or concentration areas would be exchanged.

Cumulative Effects of the Selected Alternative

No nesting bald eagles are known to occur in the action area, but individuals have been observed during winter. The Wayne National Forest can play a role in the recovery of the bald eagle, especially as its population expands.

Cumulative effects were analyzed within the 1,108,199 acre action area (see *Location and Ecological Setting of the Proposed Action* for a description of the action area) rather than the WNF proclamation boundary because:

a. The action area contains all anticipated direct and indirect effects of implementing Alternative E_{mod};

b. Smoke generated from prescribed fire activities (potential direct effect on bald eagles) is likely to travel the farthest off-site from NFS lands. Smoke dissipates into the air column and detectable levels are minimal at a distance of one-mile from the fire (K. Moore and A. Acheson, pers. comm.). Therefore, if a prescribed fire was conducted on NFS lands on the edge of the WNF proclamation boundary, the additional mile should be adequate to encompass direct and indirect effects for this species.

Forest cover has increased across Ohio from about 15 percent in 1940 to almost 30 percent today (Ohio Division of Forestry, 2004). The trend is similar for the Southern Unglaciated Allegheny Plateau (Ewing, 2003e). Almost 80 percent of the lands (public and private) within the action area are forested (Ohio Land Use Cover, based on Landsat TM 1994). Riparian corridors within the proclamation boundary are primarily forested (i.e., 72.5 percent) (National Landcover Database, 1992).

These reforestation trends have benefited the bald eagle by increasing roosting or nesting habitat, and have played a role in improved water quality conditions within the action area over time. Eagle populations continue to increase in Ohio and observations of eagles are occurring within counties containing NFS lands. In 2004, eagles were observed in Scioto and Gallia counties during mid-winter eagle searches (ODNR, 2004c).

Development of private lands along the Ohio River will likely continue in the future since it is considered a major transportation route for industry. Inland, within the WNF, riparian corridors on private lands could remain in their existing condition (i.e., forested or under agricultural production) or could be impacted by an increasing trend for development of private residences "out in the country", although the impact would be minimal since floodplain development is discouraged by local zoning commissions. Effects of these possible activities on bald eagle foraging habitat may be reduced since any activities that could impact streams or wetlands would be regulated by the Ohio EPA and possibly the U. S. Army Corps of Engineers.

No adverse cumulative effects should occur as a result of implementing the Selected Alternative because of the protective Forest-wide standards and guidelines incorporated into it. Furthermore, the allocation of the RC and TRL management areas provide long-term cumulative benefits to the species.

Determination of Effect and Rationale

Table 20 presents a summary of the effects of the Selected Alternative on the bald eagle and its habitat that may occur.

A **Not Likely to Adversely Affect** determination is made for the bald eagle. This determination is based on the following rationale:

1. The Selected Alternative incorporates conservation approaches or measures to proactively protect and conserve bald eagle habitat.

    - A Conservation Plan for Federally Listed Species was developed and included in the revised Forest Plan (see Appendix 1 of this Biological Assessment). This 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 the1983 bald eagle recovery plan objectives: (1) determine current population and habitat status; (2) determine population and habitat needed to achieve recovery; (3) protect, enhance, and increase bald eagle populations and habitats; and (4) establish and maintain communication to coordinate and conduct recovery efforts.

    - As a conservation approach, Alternative E_{mod} incorporates two management areas that should provide availability of nesting or roosting habitat for the long-term. The River Corridor and Timbre Ridge Lake management areas will provide forest cover adjacent to high quality aquatic systems.

- The Forest Service recognizes the importance of protecting nesting or roosting or concentration sites by incorporating Forest-wide Goal 5.1.2 into the Selected Alternative. In addition, a Forest-wide objective (5.1.2a) enables the Forest Service to cooperate in population monitoring efforts that aid in the recovery of this species.

2. Forest-wide standards and guidelines incorporated into the Selected Alternative prevent risks to individual eagles or their habitat. These include SFW-TES-15 through SFW-TES-20 (see Appendix 1). Other protective measures that benefit the bald eagle include:

    - Section 2-Watershed Health addresses how to stabilize disturbed areas, which promotes healthy aquatic habitats. This ensures long-term forage.
    - Section 3 –Aquatic and Riparian Resources provides guidance on the use of filterstrips, road-stream crossings, pipeline-stream crossings, removal of material from streams, and guidance on the restoration of riparian corridors, wetlands, springs, and ponds. This ensures long-term forage.
    - Federal oil and gas lease-specific notifications and stipulations that aim to protect floodplains (Appendix H, Notification #2; Stipulation #15, #16), federally listed species and their habitat (Appendix H, Notification #3; Stipulation #12), steep slopes and unstable soils (Appendix H, Notification #4; Stipulations #8, #9, #17).

Table 20. Summary of effects determinations for the bald eagle.

Projected Management Activity	Alternative E_{mod}
Vegetation Management	
Even-aged Hardwood Timber Harvest	I
Even-aged Pine Timber Harvest	I
Uneven-aged Timber Harvest	I
Thinning	I
Crop Tree Release	N
Grape Vine Control	N
Site Prep for Native Pine	I
Reforestation	B
Prescribed Fire	I
Herbicide Application	N
Development of Permanent Forest Openings	N
Maintenance of Permanent Forest Openings	N
Control of Non-Native Invasive Species-Mechanical	N
Control of Non-Native Invasive Species-Biological	N
Wetland Restoration & Enhancement	B
Waterhole Construction	N
Fishing Pond/Lake Construction	I
Restoration & Improvement of Aquatic/Riparian Habitat (Lentic)	B
Restoration & Improvement of Aquatic/Riparian Habitat (Lotic)	B
Installation of Bat-Friendly Gates on Mines	N
Recreation Management	
OHV Trail Construction	I
Hiking Trail Construction	I
Horse Trail Construction	I
Mountain Bike Trail Construction	I
Recreation Facility & Parking Lot Construction	I
Transportation Management	
Temporary Road Construction	I
Permanent Road Construction	I
Permanent Road Reconstruction	I
Road Decommissioning	B
Disturbance related to Timber (Skid Trails, Landings)	I
Energy Minerals Management	
Surface Coal Mining Activities	I
Reclamation of Depleted or Orphan Wells	B
Oil & Gas Well Development	I
Special Uses Management	
Utility Corridor Development & Maintenance	I
Agricultural Crop Production & Grazing	N
Watershed Management	
Treatment of AMD	B
Surface Mine Reclamation	B
Closure of Open Mine Portal/Subsidence	B
Stabilization of Disturbed Areas	B
Fire Management	
Reduction of Hazardous Fuels - Mechanical	N
Lands Acquisition Management	
Land Acquisition	B
Land Exchange	D
N = No Effect; **B** = Not Likely to Adversely Affect, Beneficial Effects; **I** = Not Likely to Adversely Effects, Insignificant Effects; **D** = Not Likely to Adversely Affect, Discountable Effects; **A** = Likely to Adversely Affect	

American Burying Beetle

Status of the Species

Species Description

Rangewide

The American burying beetle was designated as Endangered in its entire range in 1989 (54 Fed. Reg. 29,652 (July 13, 1989)).

The historical range, since identified and described by Olivier in 1790, can be roughly described as most of temperate eastern North America. Records from the edge of its range demonstrate the large size of its historic range: Nova Scotia, Montana, Nebraska, Michigan, and Texas (USFWS, 1991a). More records exist from the Midwest and northeastern states than from the Appalachian, southern Atlantic and Gulf of Mexico coastal plain (USFWS, 1991a).

Common Name: Beetle, American burying (=giant carrion)
Scientific Name: *Nicrophorus americanus*
Groups: Animals, Insects
Current Status: Endangered
Lead Region: 5
Date First Listed: July 13, 1989
Critical Habitat: None
Special Rules: None
Recovery Priority: 5C
Approved Recovery Plan? Yes
Historic Range: U.S.A. (eastern States south to FL, west to SD and TX), eastern Canada
This Status Likely To Occur In: AR, MA, MI, NE, OH, RI, SD Canada (Ont.)

Source: Fish and Wildlife Service

The historic range of the American burying beetles has decreased by over 90 percent. Historic records for the American burying beetle include 150 counties in 35 states in the eastern United States and southern Canada. Today, this species is known to occur in Arkansas, Massachusetts, Michigan, Nebraska, Ohio, Oklahoma, Rhode Island, South Dakota and Canada (Ontario).

The American burying beetle is the largest member of the group of beetles that breed and raise their larvae on carcasses of vertebrates (mammals and birds). It is 1 to 1.75 inches in size with a shiny black body and is the only one of the genus *Nicrophorus* with an orange-red marking on the first thoracic segment (pronotum). Each of the front wings (elytra) has two scalloped orange-red markings and the antennae are red-orange tipped. It is often covered with phoretic mites with which it shares a symbiotic relationship (USFWS, 1991a).

Species Range in Ohio

The last known naturally-occurring collection was a single beetle near Old Man's Cave in Hocking County in 1974 (Horn, 1998). The Ohio Division of Wildlife and The Ohio State University initiated a reintroduction program in Ohio in July 1998 (ODNR, 2003c). A total of 85 pairs and 17 individual beetles were released from 1998-2000 at the Waterloo Wildlife Research Station (Horn, 1998; Horn and Keeney, 1999; Horn and Keeney, 2000). While no releases occurred during 2001 and 2002, intensive pitfall trapping surveys occurred to locate previously released beetles (Horn and Keeney, 2002). In 2002, a captive colony of beetles, representing only the second in the country was established at The Ohio State University. In July 2003, an additional 98 pairs of captively reared beetles were released (ODNR, 2003c). Seventy-eight adult pairs were released at the Waterloo Wildlife Research Station on 01 July 2004 and 125 larvae were found in 20 sampled burial sites on 14 July 2004 (S. Selbo, pers. comm.). Figure 9 displays the likely distribution of this species in Ohio (USFWS, 2004).

Reproduction has been documented after these releases. Five broods of 2nd and 3rd instar larvae were found on carcasses in fall 1998, and four broods were found in 1999 (Horn, 1998; Horn and Keeney, 1999). In addition, one freshly emerged adult female was recovered in September 1998 (Horn, 1998). Horn and Keeney (2000) trapped a single male about ½ mile northeast of the 1999-2000 release sites, and based on lack of tags it was likely an individual produced from a released pair.

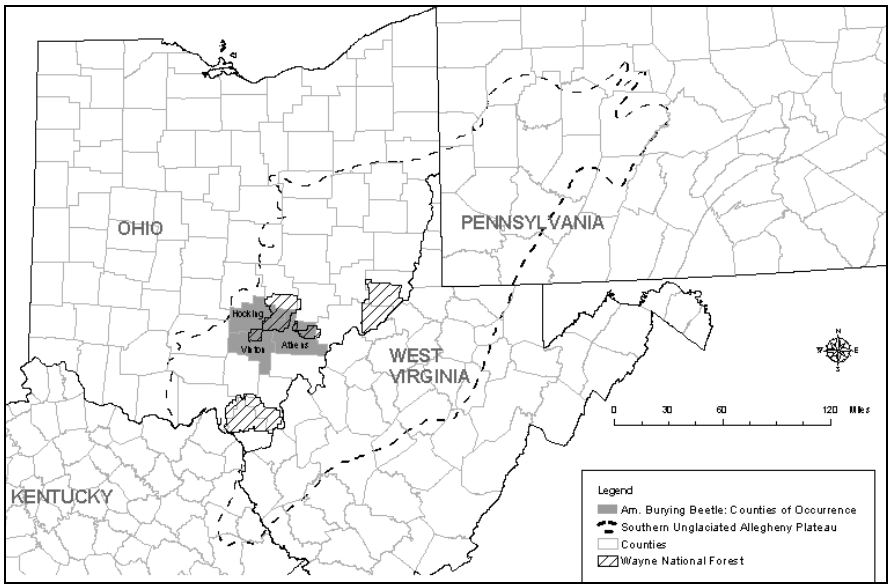


Figure 9. County occurrences for the American burying beetle in the Southern Unglaciated Allegheny Plateau.

Life History

The American burying beetle uses larger carrion, both birds and mammals of about 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 six days and the larvae require 12 to 16 days to develop. Both parents initially defend and guard the eggs, and usually the female will remain with and feed the larvae until pupation. The male typically leaves within 10 to 15 days (USFWS, 1991a).

The adults themselves feed on carrion and also consume live prey. They are nocturnal and active when the temperature is above 60^{o} F, usually from April to September, although biologists in Arkansas and Oklahoma have recently noted some activity occurring at temperatures as cool as 55^{o}F (F. Rothwein, pers. comm.). The beetle spends the winter months below ground. They lay their eggs on the buried carcass in June or July. Prey carcass size is more important than prey species. The carcass must be of the optimal size and weight to raise a maximum brood. American burying beetles will raise a brood on carcasses as small as 1.2 ounces, but research has shown them to raise a smaller number of larvae on the reduced food supply (USFWS, 1991a).

Research has shown that teneral adults in the Block Island population (New York) emerge in July and August, overwinter, and reproduce the following summer season, however teneral adults in Oklahoma may be reproductively active during their first summer (USFWS, 1991a). In other

words, some populations produce one brood, but others are capable of producing two broods prior to death. Laboratory and field studies have shown that brood size ranges up to about 30 individuals (USFWS, 1991a). Sex ratio studies in Arkansas, Oklahoma, and Nebraska documented that females slightly outnumber males (Lomolino et al., 1995; Creighton and Schnell, 1998; Bedick et al., 1999).

Population Dynamics

NatureServe (2005) has given a global rank of G2G3 and a national rank of N2N3 to the American burying beetle: Imperiled to Vulnerable – uncertainty exists as to whether it is at high risk or moderate risk of extinction due to a restricted range. These ranks are based on the belief that there are more than 5 and possibly fewer than 20 extant populations.

Status and Distribution

The American burying beetle has exhibited a dramatic range collapse in recent times, having been reduced to less than 10% of its original range and probably much less than 1% of its original occupied habitat (NatureServe, 2005).

A handful of captive colonies exist now, including ones at The Ohio State University and the St. Louis Zoo. A project was funded in 2005 to establish a propagation facility at The Wilds in Ohio.

Rangewide Threats

There has been considerable controversy about the cause of the American burying beetle decline. It has been pointed out that the extirpation of the species in most areas preceded the widespread use of pesticides. An unknown disease vector specific to the American burying beetle cannot be totally ruled out, but no other species of the genus are affected. The lack of optimal sized carcasses for reproduction of the species is now seen as the primary cause for the species precipitous decline (USFWS, 1991a).

The prevailing theory for its decline is that because they are the largest species in the genus, and require the largest carcasses, they have been more adversely affected than other members of their genus by habitat fragmentation. As stated in the recovery plan, “fragmentation of large areas of natural habitat that historically supported high densities of indigenous species (exacerbated by the direct taking of birds and other vertebrates) may have been a contributing factor in the decline of *N. americanus* by changing the species composition and lowering the reproductive success of prey species required for optimum reproduction.” In locations where the American burying beetle has been extirpated or greatly reduced in population, other species of the genus *Nicrophorus* have increased. Bedick et al. (1999) reported that fierce competition

among *Nicrophorus* beetles occurs, as evidenced by injuries such as missing appendages. Kozol et al. (1988 in Bedick et al., 1999) found there were no *Nicrophorus* beetle competitors that won against the American burying beetle; however Bedick et al. (1999) theorizes that *N. carolinus* could prove to be a worthy adversary in prairie habitats on the western edge of its range.

It has been noted that some of the species that once probably provided important carcasses for the beetle are now rare. The passenger pigeon is extinct, and greater prairie chicken is much less common than they once were. Scavengers including dogs, cats, and coyotes always increase at forest edges and where civilization occurs and now competes with the American burying beetle for prey. A scavenger can also consume the beetle as the carcass is consumed (Ewing, 2003f).

With increasingly localized populations, the American burying beetle's genetic variability that is important for adapting to changing habitat would have been further reduced by genetic drift. Data resulting from Creighton and Schnell (1998) showed beetles move great distances, and they stated that this can have implications on reintroduction programs. Individuals could disperse from a release site and create a dilution effect, making it harder to establish a stable population.

Creighton and Schnell (1998) hypothesized that a number of factors could come into play to threaten population viability. They noted that Lomolino and Creighton (1996) found breeding success is greater in forested areas, but if large areas of forest were altered the breeding success could be lowered. They found in their study that beetles are capable of moving great distances in a short time to find food, but such movement could introduce them to other threats like predation, insecticides, insect traps and nocturnal light pollution, especially in more developed areas.

Action Area Threats

The lack of optimal sized carcasses for reproduction of the species is now seen as the primary cause for the species precipitous decline. The Forest Service has control over the management of forest communities on NFS lands that provide habitat for prey species. Forest fragmentation is also a threat, in that scavengers including dogs, cats, and coyotes may increase at forest edges and where civilization occurs and now compete with the American burying beetle for prey. Loss of potentially suitable habitat resulting from compaction of soils, as well as insect traps, insecticides, and nocturnal light pollution may threaten the species.

Environmental Baseline

Status of Species in the Action Area

Species Range in the Action Area

The American burying beetle is not currently known to occur in the action area, although the Waterloo Wildlife Research Station reintroduction site is located in close proximity to the edge of the action area. Three pitfall trap surveys have been conducted on the Athens Unit (L. Andrews, pers. comm.). Surveys in Snake Hollow and in the Peabody reclaim area resulted in the capture of other burying beetle species, but no American burying beetles. Predators (i.e., most likely a raccoon) destroyed the bait in the Jobs Hollow survey area, so no beetles of any kind were captured.

The Forest Service is currently conducting an analysis for the reintroduction of the American burying beetle. Potential reintroduction sites were selected primarily by soil type and secondarily by understory condition. Loose soils and an open understory were identified as criteria for site selection. Two potential sites have been located in the Long Hollow and Wildcat Hollow areas of the Athens.

The Fish and Wildlife Service lists the counties of Athens, Hocking and Vinton as having occurrences or possible occurrences of the species. Portions of the Athens Unit of the WNF are found in these counties.

Suitable Habitat within the Action Area

American burying beetles have been found in pastures, pasture/forest transition areas, old fields, open woodland and forests, specifically oak-hickory forests, and grasslands (USFWS, 1991a). According to American burying beetle researchers at The Ohio State University, the beetles will concentrate in ravines and wooded areas, but also use oak parkland and savannah-like habitats. It may be more of a forest edge species than previously thought. They base this idea on experiences with beetle releases (i.e., the beetles head for openings once they are released) and the fact that American burying beetles were first collected when Ohio had forests with a more open condition. While just speculative, these experts consider that maturation of the forests of Ohio may have contributed to the species decline in this area. The Ohio beetle reintroduction sites at the Waterloo Wildlife Research Station are edge habitats with maintained openings (Ewing, 2003f). The beetle does prefer upland ridgetop areas versus riparian areas, since carrion found in the uplands are typically warmer and have a greater odor plume (Keeney, 2000).

While the American burying beetle forages in a variety of habitat types within its range, species experts suggest that suitable breeding habitat is more narrowly defined (USFWS, 1991a; Lomolino and Creighton, 1996). After studying the beetle in Oklahoma, Lomolino and Creighton (1996)

concluded that viable populations of the American burying beetle may be restricted to sites with deep, loose soils and a substantial layer of litter. With these microhabitat conditions, the beetle can quickly bury carcasses and avoid competition from other scavengers. Data from a study in Oklahoma and Arkansas suggest that the American burying beetle may be a generalist when it comes to finding carcasses, but may be more specific in selecting sites for carcass burial (Lomolino et al., 1995). Level topography, well-drained soils and a well-formed detritus layer are characteristics noted at American burying beetle sites (USFWS, 1991a).

Given the habitat preferences of the American burying beetle, suitable foraging habitat may exist throughout the WNF in each of the three units. The amount of suitable habitat for reproduction may be more limited because of past mining activities in the landscape, and because forest communities are denser than they were historically. The reintroduction sites at the Waterloo Wildlife Research Station are adjacent to the southern border of the Athens Unit. Since the American burying beetle has the capability to travel two to four miles on an average day and the known record for beetle travel is 10 miles within a 24-hour period, it is possible for the beetle to become established on the WNF as a result of efforts at Waterloo.

Factors Affecting Species Environment

As described above, an ongoing American burying beetle reintroduction effort is occurring at the nearby Waterloo Wildlife Research Station.

Please refer to the *Factors Affecting Species Environment* for the Indiana bat for activities that are occurring which may affect forest habitat.

Direct and Indirect Effects of the Selected Alternative

Activities with No Effects

There are some activities projected to occur within Alternative E_{mod} that would have no effect on American burying beetle habitat. These activities do not fragment the forest or alter forest communities:

- Grape vine control
- Herbicide application
- Control of non-native invasive species using herbicides, mechanical or biological methods
- Wetland restoration or enhancement
- Restoration and improvement of riparian and aquatic systems (lentic and lotic systems)
- Installation of bat-friendly gates

- Treatment of AMD
- Closure of open mine portals or subsidences
- Special use permits allowing hay production and grazing on existing openland

Activities Not Likely to Adversely Affect - Beneficial Effects

Alternative E_{mod} incorporates a Forest-wide Goal (5.1.3) that guides the Forest Service to cooperate in efforts to reintroduce the American burying beetle to NFS lands. At this time, the Forest Service is working with researchers at The Ohio State University to identify potential release sites on the Athens Unit. Reintroduction may occur during the first decade of this planning cycle.

The species appears to be a generalist when it comes to foraging because it has been found in open and forested habitats. The allocation of management areas in Alternative E_{mod} will result in a diversity of forest communities with different structure and composition. Alternative E_{mod} will ensure suitable foraging habitat is available and well-distributed for the American burying beetle.

It is one thing to have suitable foraging and breeding habitat, but another to have a supply of carcasses. American burying beetle experts stated that management of the WNF to promote a variety of early to late successional habitats benefits the wild turkey and ruffed grouse, and could therefore benefit the American burying beetle (Ewing, 2003f). The young of these two bird species represent optimal-sized carcass sources for breeding American burying beetles. A percentage of juvenile turkeys and grouse succumb to adverse environmental conditions in the spring and summer, which coincides with American burying beetle reproduction periods. A total of 54,580 acres of the WNF were allocated to the Forest and Shrubland Mosaic MA, a management area that was developed to optimize habitat conditions for early successional forest species, like the ruffed grouse.

A Forest-wide objective (11.2e) calls for the closure of at least 20 miles of illegal OHV trail. Such trails pose a direct and indirect threat to the American burying beetle because they compact soils.

Other management activities integrated in Alternative E_{mod} may benefit the American burying beetle:

- **Prescribed fire** may have both adverse and beneficial effects on beetle habitat. As for beneficial effects, some animals may succumb to the fire and provide a carrion source for the beetle.

- **Stabilization of disturbed areas**, including such sites as abandoned mine lands and orphan or depleted oil and gas wells, returns areas to an herbaceous or forested cover.
- **Road decommissioning** could reduced compacted soils and revert sites to a vegetated condition.
- **Land exchange and acquisition** creates larger, contiguous areas of public ownership and provides more opportunity to manage forest communities for beetle prey sources.
- American burying beetle experts indicated that an open to semi-open forest may be more optimal for the beetle. **Uneven-aged timber harvesting, thinning, crop tree release, and Historic Forest management prescriptions** could result in short-term and long-term habitat improvements for the species.
- Beetles at the Waterloo Wildlife Research Station moved toward forest openings after they were released. **Development and maintenance of permanent forest openings** may benefit individuals, possibly during foraging.

Activities Not Likely to Adversely Affect - Insignificant Effects

There are no known populations of the American burying beetle on the WNF. However, there may be undiscovered populations that could be impacted by activities that occur on NFS lands. The following activities are expected to have insignificant effects on potentially suitable habitat. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs.

- Lomolino et al. (1995) studied carrion beetle populations in Oklahoma and Arkansas, and their data suggest that the American burying beetle will use a variety of habitats when foraging. However Lomolino and Creighton (1996) pointed out that they avoided clearcuts during that study. **Even-aged management** may reduce foraging and breeding habitat for a period of time until the forest becomes open once again (possibly about 50 years, when it is thinned for the second time). On the other hand, even-aged management is beneficial for production of prey species (i.e., turkey and grouse chicks).
- When regenerating native pine, the forest floor must be opened to full sunlight and soil must be exposed so that native pine seeds can germinate and survive. In most cases, soil disturbances from logging or removal of leaf litter during prescribed fire will be enough to allow seeds to contact soil. However, in certain sites, it may be necessary to scarify the soil (**site prep for native pine**) to facilitate the appropriate environment for seed germination. The

objective is to create small, scattered patches of exposed soil, but ground cover would remain on 75 percent or more of the treatment area. Soil disturbance would affect the litter layer, something that appears to be important for breeding. However, this action is likely to cause only insignificant effects because native pine are more likely to be present on dry sites where soils may not be deep and loose (i.e., deep and loose soils possibly associated with breeding sites).

- The USFWS (1991a) suggested that increased habitat fragmentation created more edge habitat, which would likely lead to more habitat for mammal and bird scavengers. These scavengers could directly compete for carrion with the beetle. **Roads and trails** could provide scavenger access to areas of the National Forest. Road and trail projects are not likely to be concentrated in one area, but rather spread out across the planning area. As suggested by researchers who study nest predation of bird species, the highly forested landscape, like the WNF may contribute to a lower abundance of predators. (Chalfoun et al., 2001; Stephens et al., 2003).
- **Construction of roads, trails, parking areas, recreation facilities, oil and gas wells, and log landings** compact the soil and eliminate potential areas for carcass burial.
- American burying beetles use grassland areas in the western part of its range, but grassland areas in the action area resulted from surface mining activities. **Surface mining** and the subsequent reclamation efforts often leave soils that are more compacted. These areas are likely to be less suitable for carcass burial.
- Construction of **utility corridors** could result in ground disturbance, especially if the utilities are buried. The corridor would be vegetated, and could provide foraging habitat.

Table 21 displays the management activities that could affect the availability of prey sources or burial sites.

Only a portion of these activities in Table 21 would likely occur on the Athens Unit, which is located within the range of the American burying beetle in Ohio. For example, the possible 1,200 acre surface mine would be located on the Ironton Ranger District. If the other projected activities were distributed evenly across the three units, about 641 acres of NFS lands on the Athens Unit may be affected by activities that affect the availability of prey sources or burial sites. This acreage is likely much smaller because all road and trail acreages were calculated using the clearing width rather than the surface or tread width. The areas along roads, within the clearing width, are generally not compacted.

Table 21. Projected amounts of activities (for a ten year period) that could affect carrion sources or eliminate carcass burial habitat.

	Alternative E_{mod}
Permanent Road Construction and Reconstruction (acres)	392
Temporary Roads, Skid Trails and Log Landings	886
Recreation Trails (acres)	265
Recreation Facility & Parking Lot Construction (acres)	60
Surface Mining (acres)	1,250
Oil & Gas Well Development (acres)	121
Total acres affected	**2,974**
Percentage of NFS lands affected	**1.25**
Percentage of action area affected	**0.27**

One study showed that the American burying beetle exhibited a strong preference for forested sites and avoided clearcuts (Lomolino and Creighton, 1996). Alternative E_{mod} allows for 1,725 acres of hardwood and 200 acres of pine even-aged management during the first decade, which equates to only 0.8 percent of NFS lands, or 0.17 percent of the action area. All even-aged management methods would retain trees to ensure short-term and long-term Indiana bat habitat is available, and some methods may require more trees to be left in the stand than what is considered the minimum necessary for the Indiana bat. Therefore, some even-aged methods may result in an open stand condition, possibly favorable to the American burying beetle. These even-aged timber harvests may reduce habitat for a period of time, but habitat would once again become suitable for this species. Harvest areas would be distributed across the landscape, but would be generally be located in FSM and FSMO management areas during the first decade.

Prescribed fire would help to create an open under and midstory, which may be favorable to the American burying beetle. However, it may reduce the litter layer, something that beetle experts believe may be important in the reproduction cycle. Prescribed fire is likely to occur periodically and leaf fall during non-fire years would replenish the litter layer. Beetles become active when air temperatures are at least 60^{o}F. Prescribed fire activities are likely to occur during times of the year when air temperatures are above the 60^{o} F mark. If the beetle was present on NFS lands, fire could overtake individual beetles. However, beetles are very mobile and could fly away from the fire. No information was found in the literature on effects of fire to this species; however no impacts were found to occur to other species of burying beetle at an ongoing prescribed fire study in Vinton and Lawrence counties, Ohio (Ewing, 2003f). Projections for prescribed fire activities are displayed in Table 22.

The use of prescribed fire is projected to increase from current levels during the first decade. A total of 69,819 acres could be burned within the first ten years. More or less than a quarter of the WNF would be treated, which averages to about 5,000-7,000 acres or 2-3 percent of NFS lands annually. Prescribed fire may be used twice in the first decade to treat NFS lands in HF and HFO management areas.

Table 22. Acreages of prescribed fire that may occur during the first decade.

Primary Purpose	Alternative E_{mod}
Non-native Invasive Species Control	200
Maintenance of Grassland and Herbaceous – Shrub Habitat*	1,500
Oak Regeneration	46,215
Hazardous Fuels Reduction	21,904
Cumulative Total (acres)	**69,819**
Total Acres Affected	**62,467**
Percentage of NFS lands affected**	**26.2**
Percentage of action area affected	**5.6**

**Some acres treated for oak regeneration would be treated twice in the first decade.*
***Some of the same acres of NFS lands are projected to be treated with prescribed fire more than once during the first decade. Figures in this row reflect the percentage of NFS lands treated with fire, rather than the cumulative acreage figures reported above.*

Activities Not Likely to Adversely Affect - Discountable Effects

Some activities have discountable effects on potentially suitable habitat, which are effects that are extremely unlikely to occur. Efforts to slow the spread of gypsy moth are currently ongoing in parts of the planning area (i.e., the Ironton Ranger District). The insecticide B.t. is not currently used on NFS lands. There is a possibility it may be necessary in the future if a gypsy moth epidemic arose. B.t. is a biological insecticide that affects Lepidoptera (i.e., butterflies and moths), and would not be expected to harm the American burying beetle. If it was deemed necessary to use this insecticide, a site-specific analysis would be conducted and effects to resources, including the American burying beetle, would be identified.

American burying beetle experts suggest that lights and insect traps could affect individuals. Although no beetles have been found on NFS lands, it is possible that beetles from the Waterloo Wildlife Research Station release site could travel to NFS lands. Lights attract the beetle and although unlikely, individual beetles could succumb to predators feeding in the lighted areas. Similarly, bug zappers (a form of insect trap) could kill a beetle. Few to no lights exist in the Forest Service campground facilities on the Athens Unit because most sites are dispersed and undeveloped. Campers may use bug zappers, but most of these products require electricity to run. The campground areas on the Athens Unit do not

have electricity at this time. Still, a Forest-wide guideline (TES-21) reduces the potential for mortality from bug zappers.

Land exchange is beneficial primarily because it aids in consolidation of NFS lands, providing more opportunity for landscape-level forest management. Biologists would be involved in the review of all land exchange proposals, and evidence of suitable habitat would be noted and brought to the attention of Forest Service managers. While it is possible that potentially suitable, but unoccupied habitat could be exchanged, it is unlikely that known occupied sites would be exchanged.

Cumulative Effects of the Alternatives

Cumulative effects were analyzed within the 1,108,199 acre action area (see *Location and Ecological Setting of the Proposed Action* for a description of the action area).

Modifications to forest habitat through timber harvesting and associated activities (i.e., prescribed fire, herbicides, crop tree release) could positively or negatively affect the American burying beetle, and these modifications could be immediately felt by individuals. Similarly, loss of potentially suitable habitat resulting from modifications to soil structure would be immediate. Therefore, the cumulative effects analysis period will extend over the first decade of the planning period.

The area within the action area has increased in forest cover since the 1940s, where almost 80 percent of the lands are forested today. Scientists believe the forest is denser than it was before European settlement, most likely because fire and timber harvesting have diminished in the last 75 years. American burying beetle experts believe that the beetle may be more of a forest edge species than previously thought (Ewing, 2003f). They base this idea on experiences with beetle releases (i.e., the beetles head for forest openings once they are released), and the fact that American burying beetles were first collected when Ohio forests had a more open condition. While just speculative, beetle experts in Ohio considered maturation of the forests of Ohio could have contributed to the species decline in this area.

Timber harvesting will likely continue to occur on other public and private lands in the proclamation boundary over the next ten years. Some even-aged management may occur on New Page/Escanaba lands and state-owned lands. Based on knowledge gained by WNF field-going staff, about 50% of the private lands in the Ironton Unit have been logged over the past 20 years. About 95 percent of the treatments were considered high-grading or diameter-limit cutting. These private lands are now in various stages of regeneration, from sapling to pole sized trees. This scenario is most likely similar for the Athens and Marietta Units.

These harvesting methods deliberately harvest mature trees and/or thin intermediate age classes, regenerating a new age class to replace the old. However, landowners frequently partially cut stands as a harvesting method without the deliberate effort to thin immature age classes or to regenerate a new crop. These partial cuttings often take the form of diameter-limit cuttings in which all trees of a specified diameter and larger are cut. A second type of partial cutting removes only the large, higher quality trees of sawtimber size, leaving an irregularly spaced residual stand without any particular balance or design. Both of these types of cuttings are undesirable because they "high grade" the woods. That is, the largest, best formed, and most valuable species are removed, leaving a forest stand of lower value and generally lower vigor (Pope et al., no date). The result is a more dense stand, opposite of what the American burying beetle requires.

For the most part, logging on private lands may decrease over the next decade due to immature age and poor accessibility of much of the remaining timber. Little to no prescribed fire or herbicide applications are used in combination with timber harvests on private or industrial timber lands.

In the no action alternative, a small amount of uneven-aged management would be used solely to improve wildlife habitat and maintain healthy forest communities (i.e., 5,000 acres). This type of harvesting may or may not be optimal for the beetle. It does open up the forest stand, but the understory would likely become denser where gaps in the canopy occurred within 2-3 years.

In comparison, Alternative E_{mod} incorporates the Historic Forest MA, which combines thinning, and prescribed fire and/or herbicides to create a more open, oak-dominated forest. Short-term adverse effects may result because fire can reduce leaf litter temporarily, until leaf fall occurs once again, but Historic Forest prescriptions would have an overall beneficial cumulative effect in the long-term for beetle habitat quality. A total of 47,552 acres of NFS lands are allocated to this type of management. In addition, it also allocates 47,552 acres of NFS land to the FSM management area, which would provide optimal habitat for prey species like the ruffed grouse and wild turkey. One study showed that the American burying beetle exhibits a strong preference for forested sites and avoids clearcuts (Lomolino and Creighton 1996). Even-aged management on NFS lands could have short-term adverse effects on the availability of suitable habitat, but over time these stands would mature and once again become suitable. Based on the habitat needs of this species, these forest management strategies incorporated in Alternative E_{mod} could have greater beneficial cumulative effects than that of the no action alternative.

After studying the beetle in Oklahoma, Lomolino and Creighton (1996) concluded that viable populations of the American burying beetle may be

restricted to sites with deep, loose soils and a substantial layer of litter. With these microhabitat conditions, the beetle can quickly bury carcasses and avoid competition from other scavengers. Data from a study in Oklahoma and Arkansas suggest that the American burying beetle may be a generalist when it comes to finding carcasses, but may be more specific in selecting sites for carcass burial (Lomolino et al., 1995). Much of the Athens Unit has been affected by surface and underground coal mining activities. Surface mining can modify soil structure and chemistry. Underground mining resulted in gob piles and areas of leaching acid mine drainage across the landscape. Soils that contain favorable structure for carcass burial may be limited in distribution in the Athens Unit, but more plentiful in other parts of the action area. Surface mining activities on NFS lands, could have long-term adverse cumulative effects on American burying beetle habitat.

Construction of roads and trails, parking lots, recreation facilities, oil and gas wells, and potential surface mining may eliminate potential burial habitat for carcasses. About 2,248 acres of NFS lands could be affected by these activities in the no action alternative, and about 2,853 acres could be affected in Alternative E_{mod}.

Similar activities may occur on other ownerships in the proclamation boundary. The Nelsonville Bypass could affect up to 768 acres of land in the southwestern part of the Athens Unit, some of which has not been mined.

Of the 2,853 acres that could be affected on NFS lands, only a portion (about 560 acres) might occur on the Athens Unit, which is within the range of the beetle in Ohio. The majority of this acreage is due to road or trail construction, and the area affected could actually be less if road acreages were calculated using only surface or tread widths. When considering similar activities that may occur on other ownerships, including the Nelsonville Bypass, these activities are likely to have minimal cumulative effects on suitable beetle habitat. Designated trails or logging roads are localized in nature and experts consider the threat to the beetle minimal (Ewing, 2003f). American burying beetle experts believe these activities should be selective in nature in areas occupied by the beetle (Ewing, 2003f). Therefore, if the beetle is found on NFS lands or reintroduced to NFS lands, project-level analyses for these types of projects will need to consider overall habitat availability in the context of similar activities on other ownerships. Alternative E_{mod} contains Forest-wide guidelines to minimize soil disturbance from earth-disturbing activities (i.e., GFW-TES 22, GFW-TES-24, and GFW-TES-25).

Fire may be beneficial, in that some animals may succumb to the fire and provide a carrion source for the beetle (Ewing, 2003f). Prescribed fire may reduce leaf litter, a component that researchers have noted as possibly important in successful carcass burial sites (Lomolino and Creighton,

1996). But, leaf litter soon accumulates on sites that have been burned. American burying beetle experts reported that prescribed fire appears to have little effect on other burying beetles (Ewing, 2003f). Prescribed fire is unlikely to occur on any private lands in the proclamation boundary, but could occur in small amounts on other public ownerships. The no action alternative and Alternative E_{mod} both allow for a total of 69,819 acres of prescribed fire in the first decade. About a third of that could occur on the Athens Unit. For example, about 2,300 acres could be burned annually in the Athens Unit, but not burned again for at least ten years. There could be short-term cumulative effects on beetle habitat until leaf litter accumulated on burned acres again; however prescribed fire may likely have long-term beneficial cumulative effects because it can help reduce the density of forest communities.

Determination of Effect and Rationale

A **No Effect** determination is made for the American burying beetle. This determination is based on the fact that there are currently no known populations of the beetle on NFS lands at this time. A reintroduction effort is ongoing at the Ohio Division of Wildlife's Waterloo Wildlife Research Station, located near the Athens Unit.

Table 23 presents a summary of the effects of the alternatives on American burying beetle habitat. A **Not Likely to Adversely Affect** determination is made for American burying beetle based on:

Although habitat may be affected, adverse impacts from Alternative E_{mod} are not likely to impede recovery of this species. The Forest Service has incorporated both proactive conservation actions as well as protective measures into the Selected Alternative to aid in the recovery of this species:

1. The Selected Alternative incorporates conservation approaches or measures to proactively protect and conserve American burying beetle habitat.

    - The Forest Service is actively contributing to the recovery of the American burying beetle. It is working with The Ohio State University to reintroduce the species onto NFS lands. Potential reintroduction sites on the Athens Unit have been identified.

    - A Conservation Plan for Federally Listed Species was developed and included in the revised Forest Plan (see Appendix 1 of this Biological Assessment). This 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 1991 American burying

beetle recovery plan objectives: (1) conduct additional reintroductions.

- The Historic Forest management area was developed, in part, to provide open to semi-open mature woodlands for species like the American burying beetle. The Selected Alternative allocates 47,522 acres to this management area.

2. Some activities may affect American burying beetle habitat, however measures are in place to minimize impacts. In addition, these activities would be spread across the WNF in time and space over the first decade.

    - Timber harvesting and prescribed fire activities may have short-term adverse effects on habitat quality, but over time these activities should improve forest stand conditions that would make them more suitable for the American burying beetle.

    - Roads, trails, and other activities that compact soils would occur on about 1% of NFS lands, and Forest-wide guidelines would be used to minimize adverse effects to habitat or individuals which may unknowingly move onto NFS lands from the Waterloo release site.

3. Surface mining activities may reduce available habitat for carcass burial because soil characteristics may be altered permanently. Surface mining activities are out of the control of the Forest Service; however the Forest Service can use the project level planning process to consider how projects might influence short-term and long-term available habitat in the area of surface mines.

Table 23. Summary of Effects Determinations for the American burying beetle.

Projected Management Activity	Alternative E_{mod}
Vegetation Management	
Even-aged Hardwood Timber Harvest	I
Even-aged Pine Timber Harvest	I
Uneven-aged Timber Harvest	B
Thinning	B
Crop Tree Release	B
Grape Vine Control	N
Site Prep for Native Pine	I
Reforestation	B
Prescribed Fire	I
Herbicide Application	N
Development of Permanent Forest Openings	B
Maintenance of Permanent Forest Openings	B
Control of Non-Native Invasive Species-Mechanical	N
Control of Non-Native Invasive Species-Biological	N
Wetland Restoration & Enhancement	N
Waterhole Construction	I
Fishing Pond/Lake Construction	I
Restoration & Improvement of Aquatic/Riparian Habitat (Lentic)	N
Restoration & Improvement of Aquatic/Riparian Habitat (Lotic)	N
Installation of Bat-Friendly Gates on Mines	N
Recreation Management	
OHV Trail Construction	I
Hiking Trail Construction	I
Horse Trail Construction	I
Mountain Bike Trail Construction	I
Recreation Facility & Parking Lot Construction	I
Transportation Management	
Temporary Road Construction	I
Permanent Road Construction	I
Permanent Road Reconstruction	I
Road Decommissioning	B
Disturbance related to Timber (Skid Trails, Landings)	I
Energy Minerals Management	
Surface Coal Mining Activities	I
Reclamation of Depleted or Orphan Wells	B
Oil & Gas Well Development	I
Special Uses Management	
Utility Corridor Development & Maintenance	I
Agricultural Crop Production & Grazing	N
Watershed Management	
Treatment of AMD	N
Surface Mine Reclamation	B
Closure of Open Mine Portal/Subsidence	N
Stabilization of Disturbed Areas	B
Fire Management	
Reduction of Hazardous Fuels - Mechanical	D
Lands Acquisition Management	
Land Acquisition	B
Land Exchange	D
N = No Effect; **B** = Not Likely to Adversely Affect, Beneficial Effects; **I** = Not Likely to Adversely Effects, Insignificant Effects; **D** = Not Likely to Adversely Affect, Discountable Effects; **A** = Likely to Adversely Affect	

Federally Listed Aquatic Species

Two native freshwater mussel species currently listed by the Fish and Wildlife Service as endangered occur in the vicinity of the WNF: the fanshell and pink mucket pearly mussel. These species have not been found in streams or rivers in the WNF.

Fanshell

Status of the Species

Species Description

Rangewide

The fanshell was listed as endangered on June 21, 1990 under provisions of the Endangered Species Act of 1973, as amended.

Historically, the fanshell occurred in the Ohio River and in many of its larger tributaries in Pennsylvania, West Virginia, Ohio, Indiana, Virginia, Alabama, Tennessee, Kentucky, and Illinois (USFWS, 1991b).

Currently, the fanshell is thought to be reproducing only in the Green and Licking Rivers of Kentucky, in the Clinch River in Tennessee and Virginia (NatureServe, 2004). One 2-year-old individual was located in a sand bar on the lower Tippecanoe River in Indiana, which indicates that reproduction may be occurring there as well (Ball and Schoenung, 1996).

Common Name: Fanshell
Scientific Name: *Cyprogenia stegaria (=irrorata)*
Groups: Animals, Clams
Current Status: Endangered
Lead Region: 4
Date First Listed: June 21, 1990
Critical Habitat: None
Special Rules: None
Recovery Priority: 5
Approved Recovery Plan? Yes
Historic Range: AL, IL, IN, KY, OH, PA, TN, VA, WV
This Status Likely To Occur In: AL, IL, IN, KY, OH,TN, VA, WV
Source: USDI Fish and Wildlife Service

Small, apparently non-reproducing populations may still exist in Illinois, Indiana, Ohio, West Virginia, Kentucky, and Tennessee (NatureServe, 2004). Fresh dead shells, aged 9 and 11 years of age were found by biologists near the backchannel of Muskingum Island, a part of the Ohio River Islands National Wildlife Refuge (USFWS, 1996a).

Species Range in Ohio

Historically, this species was widely distributed in Ohio's larger rivers, but live and fresh dead individuals have only been found in the lower Muskingum River and Ohio River in recent years (Hoggarth, 1993; Watters and Dunn, 1993-1994; Ecological Specialists, Inc., 2000; A. Zimmerman, USFWS, personal communication) (Figure 10).

The discovery of a few younger individuals during a 1988-1993 survey suggested that reproduction was still occurring in the lower Muskingum River in Morgan and Washington counties (Hoggarth, 1993). National Forest System lands in the Marietta Unit are primarily located within the Little Muskingum River watershed, the Duck Creek watershed, or within small tributary watersheds that flow directly into the Ohio River. Only 0.5% of the Marietta Unit is located within the Muskingum River watershed, but no NFS lands are located within it.

The fanshell has not been collected from the Walhonding River since the construction of Mohawk Dam. Hoggarth (1994) surveyed this river in 1994 and found only relic specimens of the fanshell, which may indicate that it has been extirpated from this river system.

Live and fresh dead individuals have been found in the Belleville and Racine pools of the Ohio River during surveys conducted between 1993 and 1997 (Ecological Specialists, Inc., 2000). These pools are located immediately downstream of the Marietta Unit. Based on information from the West Virginia Division of Natural Resources (2000), fanshell distribution in the Bellville pool is likely outside the action area because the Division reports it occurring in the Ohio River in Wood County, WV.

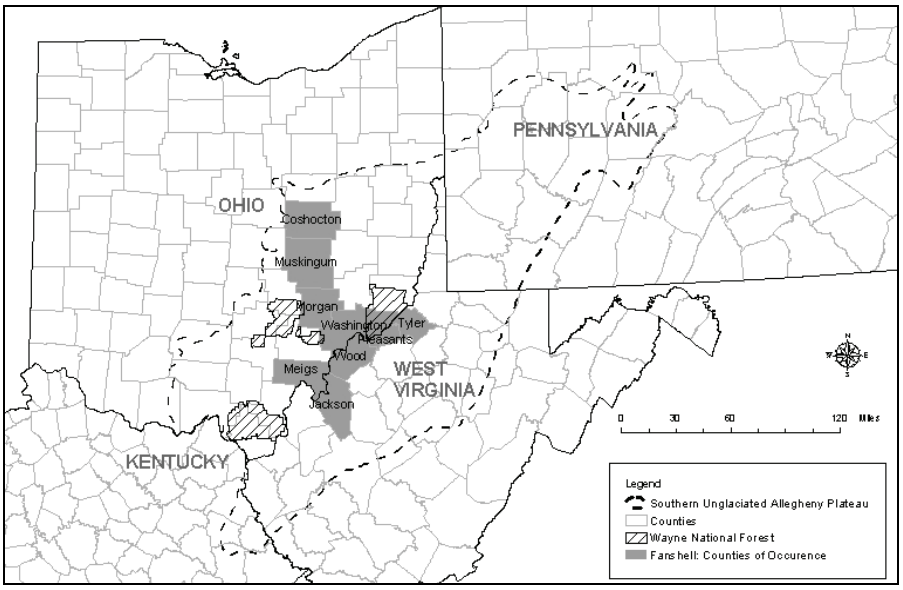


Figure 10. County occurrences of the fanshell in the Southern Unglaciated Allegheny Plateau.

Life History

Freshwater mussels are relatively long-lived animals. Cummings and Mayer (1992) reported that mussel lifespans range from 10 years to more than 100 years. Ages of 84 relic and fresh dead fanshell specimens from the Clinch River in Tennessee ranged in age from 6 years to 26 years (Jones and Neves 2001).

The fanshell, described by Rafinesque in 1820, is a freshwater mussel with a shell up to approximately three inches in length. The shell exterior is greenish or tan, with green rays, often broken or composed of small spots or lines (USFWS, 1991b; Watters, 1995). The inside of the shell is silvery white. The hinge and teeth of this mussel are well-developed, with the hinge being short and arched.

Based on study of four female fanshell mussels, Jones and Neves (2001) found they were gravid from late October to late May. They determined mean fecundity of these four individuals was 43,494 mature glochidia per mussel; the larger females contained the most glochidia.

The fanshell is considered to be a medium to large river species (Cummings and Mayer, 1992; Watters, 1995). It does not occur in small tributary streams. The fanshell inhabits shoals of coarse sand-gravel-cobble substrates, moderate currents, and depths to about one meter (Gordon and Layzer, 1989).

Its reproductive biology is not fully known, however it is believed to be similar to other bivalves where the sexes are separate (USFWS, 1991b). As described by Watters (1995), males release sperm into the water, and

females take in the sperm through their siphon while feeding and respiring. The female retains the fertilized eggs in specialized regions of the gills, known as marsupia. Small bivalved larvae, or glochidia, develop over a period of days to moths, depending on the species. The glochidia are shed by the female, and the glochidia must acquire a suitable vertebrate host within about 24 hours, or die. The glochidia attach to the host, either on the gills, fins or skin. The larvae will grow and transform into juveniles, then release themselves from the host and burrow into the substrate. The fanshell is reported to be a long-term breeder, or in other words it holds glochidia overwinter for spring release (NatureServe, 2004)

Nine fish hosts have been identified for the fanshell by Jones and Neves (2001): mottled sculpin (*Cottus bairdi*), banded sculpin (*Cottus carolinae*), greenside darter (*Etheostoma blennioides*), snubnose darter (*Etheostoma simoterum*), banded darter (*Etheostoma zonale*), tangerine darter (*Percina aurantiaca*), blotchside logperch (*Percina burtoni*), logperch (*Percina caprodes*), and Roanoke darter (*Percina roanoka*).

Freshwater mussels are generally sedentary, typically spending their lives very near to the site where they first successfully settled. Movement will occur in response to some stimulus, such as nearby water disturbance, exposure to conditions during low water or seasonal temperature change, and during spawning. Movement includes burrowing deeper into the substrate or horizontal movement of a few feet across the substrate (NatureServe, 2004). Through movements of the host fish, glochidia can be transported upstream and downstream from where the female is located.

Although the specific food habits of the fanshell are not known, its food habits are likely similar to other freshwater mussels, namely, filter feeding on diatoms, phytoplankton, zooplankton, and detritus (USFWS, 1991b).

Population Dynamics

There is no information available to estimate the population size of the fanshell throughout its range. NatureServe (2005) has given a global rank of G1 and a national rank of N1 to the fanshell: (G1) Critically Imperiled – At very high risk of extinction due to extreme rarity (often fewer than 5 populations), very steep declines, or other factors; (N1) Critically Imperiled – Critically imperiled in the nation because of extreme rarity (often 5 or fewer), or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation.

Status and Distribution

The fanshell has experienced tremendous declines, with only three reproducing populations known.

Rangewide Threats

Freshwater mussels, as a group, comprise a higher percentage of endangered, threatened, and rare species than any other single group in North America. The alteration of habitat through dredging and the creation of impoundments, combined with siltation, decreased water quality, and the invasion of exotic mussels has been responsible for 141 mussel species in North America being listed as extinct, endangered, or threatened (USFWS, 1991b; Williams et al., 1992)

Impoundments and navigation projects historically have been the most serious threat to riverine mussels (Lauritsen and Watters, 1986). These structures alter the morphology of the natural river, changing the flow, oxygen levels and substrates. They can also impede upstream and downstream passage of fish hosts. As an example, Hoggarth (1994) found only dead shells of the fanshell below a dam on the Walhonding River in Ohio, where live specimens had previously been collected before the dam was constructed. In addition, he found only silt-tolerant mussel species above the dams in that river.

Mussels are susceptible to pollution from various sources: runoff from coal mines; runoff containing pesticides, fertilizers, animal waste and heavy metals; and discharges of water with temperature extremes (Lauritsen and Watters, 1986). Siltation from mining, dredging, road construction, farming and logging can bury shells, impact feeding and respiration, and affect host-fish populations by smothering eggs or larvae, reducing food availability, or filling spawning beds.

Other potential threats to this species include reduction of water flows, runoff from oil and gas exploration, toxic spills, water development projects, and collectors in rivers where the fanshell remains (USFWS, 1990a).

A relatively new threat to this species is the zebra mussel, a non-native invasive species which has extended its range to the Ohio River basin. Berg et al. (1993) found that zebra mussels encrust native unionids and affect their fitness.

Action Area Threats

Of these rangewide threats, degradation of water quality is of concern in the action area. The effects of Alternative E_{mod} on water quality will be addressed in the analysis of effects.

Environmental Baseline

Status of Species in the Action Area

Species Range in the Action Area

Freshwater mussel surveys have been conducted in the major Ohio River tributaries within the proclamation boundary of the WNF (Watters, 1988; Hoggarth, 2001). There are no known populations of the fanshell within the WNF.

Surveys of the Bellville and Racine pools of the Ohio River have found some individuals downstream, but outside the Action Area.

Suitable Habitat within the Action Area

The fanshell is a river species, and occurs in moderate currents. It is found in relatively deep waters in a gravel or sand substrate (Watters, 1995).

Streams within the WNF are primarily small, headwater streams; however larger Ohio River tributaries do pass through the proclamation boundaries. These larger tributaries (i.e., Pine Creek, Storms Creek, Raccoon Creek, Hocking River, and Little Muskingum River) do not possess the habitat qualities desired by the fanshell.

The Ohio River along the Marietta Unit could possess potentially suitable habitat for this species.

While there is no suitable habitat for the fanshell within the WNF, four known host fish species occur within watersheds containing NFS lands (WNF Fish Database). The banded darter, greenside darter, and logperch are found in the Little Muskingum River watershed, Symmes Creek watershed, Pine Creek watershed, the Little Scioto River watershed, and portions of the Hocking River watershed. The mottled sculpin has a limited distribution, and has only been documented in the Hocking River watershed between Enterprise and Monday Creek.

The greenside darter, banded darter, and logperch could potentially travel between the Ohio River and WNF streams. It is unlikely that these host fish would contribute to the colonization of sites within the WNF since habitat is not suitable, but these host fish could play a role in the life cycle of the fanshell when occupying sites in the Ohio River.

Factors Affecting Species Environment within the Action Area

There are no known tribal actions ongoing within the action area that would affect this species. Ongoing State, local, or private actions occurring in close proximity to the Ohio River that could affect this species may include earth disturbing activities that result in sedimentation of aquatic habitat in the Ohio River (e.g., road construction, streambank

modifications, dredging). Activities that occur within the Ohio River or streams are generally regulated by the Corps of Engineers and State environmental agencies, therefore effects from these activities are often reduced or eliminated.

There are no known federal actions that have been completed informal or formal consultation that are affecting this species.

Beneficial activities are ongoing within the action area to reduce runoff of nutrients and pollutants. For example, reforestation of federal and non-federal lands is an ongoing activity; annual tree give-aways and tree sales are sponsored by the Ohio Division of Forestry, and local Soil and Water Districts. Several groups are working together to remediate acid mine drainage and other effects of past mining practices. State and federal agencies offer educational programs to landowners on best management practices.

Direct and Indirect Effects of the Selected Alternative

Activities with No Effects

Some activities projected to occur during the first decade would have no effect on downstream populations or habitat for the fanshell, or its host fish or their suitable habitat. These activities are not ground disturbing and would not pose a threat to increased sedimentation or changes in water quality.

- Crop tree release and grape vine control involving the manual treatment of individual vines and girdling or felling of individual trees
- Development and maintenance of permanent forest openings using mechanical methods (e.g., mowing, chainsaw work)
- Control or eradication on non-native invasive species using mechanical methods (e.g., brushing, mowing) or biological methods
- Restoration and improvement of ponds and lakes (e.g., placing underwater habitat structures)
- Herbicide application (i.e., spot treatment)
- Installation of bat-friendly gates

Activities Not Likely to Adversely Affect the Fanshell - Beneficial Effects

Since the fanshell is not found within the WNF, protection and improvement of watershed health is important to its host fishes and to

fanshell populations located downstream in the Ohio River. National Forest activities which protect and improve stream habitat and water quality would benefit downstream areas.

The RC Management Area was established to emphasize the retention, restoration, and enhancement of the inherent ecological processes and functions associated with riverine systems. Alternative E_{mod} allocate NFS lands to the RC Management Area along Symmes Creek, the Hocking River, the Little Muskingum River, and the Ohio River.

Alternative E_{mod} incorporates Forest-wide goals (2.1 and 3.1) and objectives (2.1a-c, 3.1a-d) which promote the restoration and improvement of riparian and watershed health. Alternative E_{mod} also includes numerous Forest-wide standards and guidelines that protect aquatic resources from potential sources of non-point source pollution.

Beneficial management activities that are projected to occur during the first decade of implementation of Alternative E_{mod} include:

- 500 acres of reforestation
- 150 acres of wetland restoration
- 20 miles of stream restoration and improvement
- 10 miles of road decommissioning
- reclamation of 128 orphan or depleted oil and gas wells (70 acres)
- treatment of 180 abandoned mine land features that contribute to acid mine drainage conditions (270 acres)
- closure of 155 open mine features that contribute to acid mine drainage conditions (232 acres)
- 20 acres of surface mine reclamation
- stabilization of 100 acres of disturbed areas
- land acquisition of up to 40,000 acres

Activities Not Likely to Adversely Affect the Fanshell - Insignificant Effects

Some management activities may result in a potential impact to fanshell populations or habitat downstream or to its host fish and their habitat, but the impact would not reach the scale where take would occur. Established Forest-wide standards and guidelines minimize the scale of the potential impact to a point where changes to water quality would not likely be detected.

- **Timber harvesting** (i.e., all methods) involves the felling of trees, removal of trees to a landing, and transport off-site. Mechanical

reduction of hazardous fuels may involve the dragging of trees and limbs across the ground. The act of dragging trees to the landing could result in some soil disturbance, but filterstrips minimize the potential for sediment introduction into streams (ARR-5 and 6). If any soil was to enter a stream during the removal of trees, it would likely be minimal and undetectable in mainstem habitats.

- When regenerating native pine, the forest floor must be opened to full sunlight and soil must be exposed so that native pine seeds can germinate and survive. In most cases, soil disturbances from logging or removal of leaf litter during prescribed fire will be enough to allow seeds to contact soil. However, in certain sites, it may be necessary to scarify the soil (**site prep for native pine**) to facilitate the appropriate environment for seed germination. The objective is to create small, scattered patches of exposed soil, but ground cover would remain on 75 percent or more of the treatment area. Filterstrips would minimize the potential for sediment introduction into streams from such activities (ARR-5 and 6).
- The **construction of firelines** using bulldozers for prescribed fire activities could result in soil disturbance, whereas firelines constructed by hand only affect the litter layer. The Forest Service attempts to use existing roads and fire breaks to avoid constructing fire line (FIRE-7). Furthermore, action would be taken to minimize the potential for sediment movement into streams (FIRE-12 and FIRE-13). If any soil were to enter the stream as a result of fireline construction, the amount would likely be minimal and undetectable in mainstem habitats.
- Surface erosion in relation to forest **roads/trails** is dependant on soils, road surfacing, road grade, and age of the road, traffic volumes, and the effectiveness and spacing of drainage structures. Proper design and placement of drainage structures are critical to minimizing the amount of surface flow and surface erosion.
- Road surfacing, maintenance and grade play a role in surface erosion. Some roads are surfaced with limestone aggregate or native material. When roads are not located, designed, or maintained properly to divert water from streams, aggregate or native material can move into streams during rainfall events. Movement of material into ditch lines and streams can be increased on roads with steeper grades. Grades of over 12% average slope are avoided unless there are stringent erosion control practices installed.

  Sediment delivery to streams may be higher during and just after construction, but raw ditch lines and road surfaces with little binder can also remain chronic sources of sediment. High volumes of traffic on roads with aggregate and native material have a

greater affect on the integrity of the road and surfacing than it does on asphalt-surfaced roads.

Road-stream or trail-stream crossings can accelerate inputs of sediment. Use of native materials or aggregate that contain sand or materials smaller than ½ inch in size for road surfaces can degrade channels by filling in pools downstream of crossings. This generally occurs where the road slope approaching the channel is steep. Surface erosion can occur on roads/trails that are located in the floodplain of streams, specifically with roads/trails surfaced with native materials or aggregate. Floodwaters can wash over the road/trail surface and carry material into the stream.

These roads and trails would be spread out across the landscape, rather than concentrated in one watershed. Forest-wide standards and guidelines are incorporated in Alternative E_{mod} to reduce the effects of roads on aquatic systems (i.e., filterstrips, stream crossings). The WNF, in all new construction and re-construction, is meeting or exceeding best management practices and professional engineering practices to reduce any effect the road system may have on soil transport (USDA Forest Service, 2003). Based on this, it is likely some sediment will enter the stream systems from roads and trails; however the amount is not expected to alter existing water quality or the composition of stream substrates.

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

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

  Brine or oil spills could occur during oil and gas well operations, although they are rare. The operator is required to construct berms around the wells to contain any oil leaks. The brine is required to be removed by tank truck. Forest-wide standards and guidelines require the installation of control valves on all pipelines crossing

streams so that supply and flow of oil and gas can be shut down immediately upon detection of a leak.

Up to 121 acres could be disturbed from oil and gas well development. Some sediment could enter the stream systems; however the amount is not expected to alter existing water quality or the composition of stream substrates.

- **Surface coal mines** could alter surface and subsurface hydrology, and subsequently degrade existing stream habitat. Approximately 1,250 acres of NFS land could be affected by surface mining in the future. The Forest Service has no control over this projected activity since private mineral rights are involved in these possible activities. However at a minimum, the operator would need to follow state regulations associated with protection of aquatic resources.
- Nutrient enrichment of localized stream reaches could occur as a result of **grazing allotments**. However, surface runoff from such operations would need to flow through filter strips, which are designed to decrease nutrient loading of streams.
- Construction of **utility corridors**, specifically those which contain buried transmission lines, causes ground disturbance. Forest-wide standards and guidelines for stream crossings for pipelines (ARR-13 to ARR-17), and filterstrips (ARR-5 and 6) would minimize the potential for sediment introduction into streams.
- Up to 400 acres of **land exchange** could occur in the first decade of the plan. Land exchange can be beneficial (e.g., acquiring frontage along occupied habitat). The exchange could be negative if degradation of aquatic or riparian habitat occurred after the tract was in private ownership. But, there is no certainty in how the landowner would mange the land after it is exchanged out of federal ownership.

Activities Not Likely to Adversely Affect the Fanshell - Discountable Effects

Some activities have discountable effects on potentially suitable habitat, which are effects that are extremely unlikely to occur. Land exchange is a primarily beneficial activity because it aids in consolidation of NFS lands, which provides more opportunity for landscape level forest management. Future management of the federal tract is uncertain once it is exchanged into private hands, and it is possible the private landowner could conduct activities that may result in sedimentation or modification of aquatic habitats.

Cumulative Effects of the Selected Alternative

While any direct and indirect effects that could potentially occur as a result of implementing Alternative E_{mod} would be contained in the action area, the cumulative effects analysis area includes the 31, 5th level watersheds that contain portions of the WNF proclamation boundary. To adequately assess cumulative effects as required by NEPA, watershed boundaries provide a better sense of what cumulative impact Forest Service activities could have on the two federally listed mussels found in the Ohio River. Other lands in these 31 watersheds also contribute to watershed integrity and water quality, as do NFS lands. Watersheds that contain part of the proclamation boundary, yet do not currently contain any NFS lands, were included because it is possible that land acquisition efforts could add up to 40,000 acres of NFS lands to these watersheds over the next decade.

The fanshell does not occur within the WNF, or within any of the 31 watersheds. No suitable habitat exists for it within the WNF. However, it occurs in the Ohio River, downstream of the Marietta Unit. The West Virginia Division of Natural Resources lists it occurring in the Bellville Pool in Wood County, which is outside the action area. Its host fishes could occur in tributary streams within the 31 watersheds during certain times of the year.

Throughout its range, fanshell populations have been impacted by alteration and degradation of stream habitat. Water quality and aquatic habitat have improved in many of the 31 watersheds in recent years, as evidenced by the mileage of streams that are attaining Ohio EPA's use designations. However, some streams remain impacted by past mining activities (i.e., primarily watersheds on the Athens Unit, but some streams in the Pine Creek watershed on the Ironton Ranger District), and from non-point source pollution (USDA Forest Service, 2001; 2002).

Ground disturbing activities occur on other lands and will likely to continue in the future. Timber harvesting occurs on private lands, but these activities are scattered across the watershed rather than being concentrated in one area. This trend is likely to continue in the future. An evaluation of logging best management practices on private lands indicated that best management practices were employed in at least 80% of all timber harvests and 95% of these best management practices were rated effective at minimizing sedimentation of streams (McClenehen et al., 1999).

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

Township and county governments are likely to continue maintaining existing roads, depending on funding. Maintenance primarily targets human safety, with environmental conditions secondary in concern. Some of the roads and road-stream crossings under these jurisdictions may continue to contribute to sedimentation or aquatic habitat modifications in the future.

The cumulative effects analysis period is for ten years, since concern for sedimentation of aquatic habitat diminishes as ground cover becomes established. Within southern Ohio, revegetation of disturbed areas can occur easily within one growing season. In terms of earth disturbing activities, Alternative E_{mod} has the potential to disturb about 12,975 more acres of NFS lands than Alternative A (the no action alternative; see Table 7), specifically in the timber harvest, hiking and horse trail construction, and roads/skid trails categories. This equates to 5.4 percent of NFS lands, or 0.5 percent of the cumulative effects analysis area. These activities would be distributed over the WNF in time and space, and application of the Forest-wide standards and guidelines incorporated within Alternative E_{mod} will further minimize the potential for any adverse cumulative effects to occur to downstream aquatic systems. Furthermore, efforts by the Forest Service, other state and federal agencies, conservation organizations, and private landowners continue to result in improved water quality conditions within the cumulative effects analysis area and action area.

Determination of Effect and Rationale

A **No Effect** determination is made for the fanshell. This determination is based on the fact that the fanshell does not occur within the WNF or in the action area. There is no suitable habitat within the WNF. The fanshell occurs in the Ohio River, downstream of the Marietta Unit and outside the action area.

Table 24 presents a summary of the effects Alternative E_{mod} on downstream fanshell populations and habitat, and to its host fishes and their habitat that may occur in the WNF and in the action area. A **Not Likely to Adversely Affect** determination is made for fanshell habitat. This determination is based on the following rationale:

1. The Selected Alternative incorporates beneficial elements that would protect, restore or improve water quality within and downstream of the WNF:

    - Allocation of the River Corridor Management Area along the Ohio River, Hocking River, Symmes Creek, and Little Muskingum River, a management area which emphasizes retaining, restoring, and enhancing the inherent ecological

processes and functions associated with riverine systems.

- An active watershed restoration program that is improving water quality in the WNF and in downstream aquatic systems. The Selected Alternative incorporates goals and objectives to protect and restore water quality and soil productivity (Section 2 – Watershed Health) and to promote healthy riparian and aquatic ecosystems (Section 3 – Aquatic and Riparian Resources).

- Improved guidance on the management of riparian corridors to maintain habitat diversity for aquatic and riparian-dependent species has been incorporated into Alternative E_{mod} (ARR-1 through ARR-4).

- Federal oil and gas lease-specific notifications and stipulations that aim to protect floodplains (Appendix H, Notification #2; Stipulation #15, #16), federally listed species and their habitat (Appendix H, Notification #3; Stipulation #12), steep slopes and unstable soils (Appendix H, Notification #4; Stipulations #8, #9, #17).

2. Ground disturbing activities could occur during implementation of some projects. Forest-wide standards and guidelines integrated into Alternative E_{mod} are expected to minimize adverse effects to water quality where take would not be expected to occur. This Forest-wide direction includes, but is not limited to stabilization of disturbed areas, use of filterstrips, and restrictions for placing improvements on steep slopes or unstable soils, and controlled use of floodplains and riparian areas for federal oil and gas leases.

Table 24. Summary of effects determinations for the fanshell.

Projected Management Activity	Alternative E_{mod}
Vegetation Management	
Even-aged Hardwood Timber Harvest	I
Even-aged Pine Timber Harvest	I
Uneven-aged Timber Harvest	I
Thinning	I
Crop Tree Release	N
Grape Vine Control	N
Site Prep for Native Pine	I
Reforestation	B
Prescribed Fire	I
Herbicide Application	N
Development of Permanent Forest Openings	N
Maintenance of Permanent Forest Openings	N
Control of Non-Native Invasive Species-Mechanical	N
Control of Non-Native Invasive Species-Biological	N
Wetland Restoration & Enhancement	B
Waterhole Construction	I
Fishing Pond/Lake Construction	I
Restoration & Improvement of Aquatic/Riparian Habitat (Lentic)	N
Restoration & Improvement of Aquatic/Riparian Habitat (Lotic)	B
Installation of Bat-Friendly Gates on Mines	N
Recreation Management	
OHV Trail Construction	I
Hiking Trail Construction	I
Horse Trail Construction	I
Mountain Bike Trail Construction	I
Recreation Facility & Parking Lot Construction	I
Transportation Management	
Temporary Road Construction	I
Permanent Road Construction	I
Permanent Road Reconstruction	I
Road Decommissioning	B
Disturbance related to Timber (Skid Trails, Landings)	I
Energy Minerals Management	
Surface Coal Mining Activities	I
Reclamation of Depleted or Orphan Wells	B
Oil & Gas Well Development	I
Special Uses Management	
Utility Corridor Development & Maintenance	I
Agricultural Crop Production & Grazing	I
Watershed Management	
Treatment of AMD	B
Surface Mine Reclamation	B
Closure of Open Mine Portal/Subsidence	N
Stabilization of Disturbed Areas	B
Fire Management	
Reduction of Hazardous Fuels - Mechanical	I
Lands Acquisition Management	
Land Acquisition	B
Land Exchange	D
N = No Effect; **B** = Not Likely to Adversely Affect, Beneficial Effects; **I** = Not Likely to Adversely Effects, Insignificant Effects; **D** = Not Likely to Adversely Affect, Discountable Effects; **A** = Likely to Adversely Affect	

Pink Mucket Pearly Mussel

Status of the Species

Species Description

Rangewide

The pink mucket was listed as federally endangered in June 1976. Historically, this species has been considered a strictly Ohioan or Interior Basin species with populations primarily in the Tennessee, Cumberland, and Ohio River basins and occasional specimens from the Mississippi River basin (USFWS, 1985).

Though geographically widespread, known from 25 river systems including the Muskingum, Scioto and Kanawha Rivers, it has never been found in large numbers at any one site. The pink mucket is now found in 16 river systems in three geographic regions with reproduction and frequent encounters of specimens occurring in the Tennessee, Paint Rock, Meramac, and Cumberland Rivers (USFWS, 1985). It is considered extirpated in Ohio, Pennsylvania, and Illinois (NatureServe, 2004).

Species Range in Ohio

Weathered shells were found in the lower Muskingum River during surveys in 1983 and 1992, but there is no evidence it is still living in the Muskingum River (Hoggarth, 1993; Watters and Dunn, 1993-1994).

The pink mucket pearly mussel has been found in the nearby Ohio River. Individuals (live-weathered) have been found in the Belleville, Racine, Gallipolis, and Greenup pools of the Ohio River during surveys conducted between 1980 and 1995 (ESI, 2000).

Because of its presence in the Ohio River, and the recent findings of

Common Name: Mucket, pink (pearlymussel)
Scientific Name: *Lampsilis abrupta (=orbiculata)*
Groups: Animals, Clams
Current Status: Endangered
Lead Region: 4
Date First Listed: June 14, 1976
Critical Habitat: None
Special Rules: None
Recovery Priority: 5
Approved Recovery Plan? Yes
Historic Range: U.S.A. (AL, AR, IL, IN, KY, LA, MO, OH, PA, TN, VA, WV)
This Status Likely To Occur In: AL, AR, IL, IN, KY, LA,MO, OH, PA, TN, VA, WV

Source: USDI Fish and Wildlife Service

weathered shells reported above, the USFWS lists its distribution as occurring in Gallia, Meigs, Morgan, Washington, and Lawrence counties (USFWS, 2004) (Figure 11).

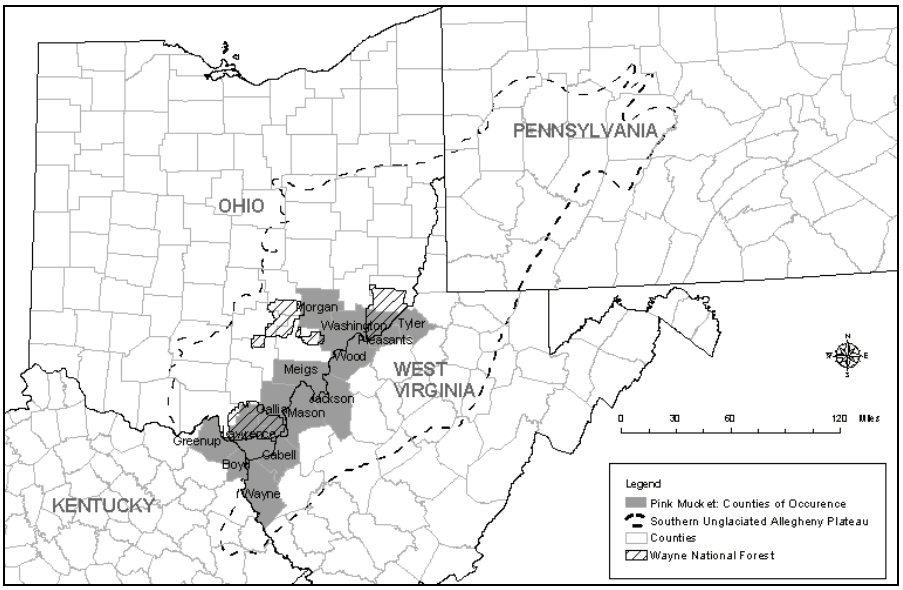


Figure 11. County occurrences of the pink mucket pearly mussel in the Southern Unglaciated Allegheny Plateau.

Life History

The pink mucket pearly mussel is a large river species (60 feet wide or greater) (USFWS, 1985). While it has been reported from riffles with rocky substrates, strong currents, and depths to about three feet, it has also been collected from deep water habitats with slower flows (Gordon and Layzer, 1989).

The shell of the pink mucket pearly mussel is somewhat oval or elliptical in shape. This mussel is four inches long and 2.5 inches in height. The surface of the shell is smooth, except for the concentric growth rings. The outer shell color is greenish brown or yellow, with wide green rays in younger mussels. The inside of the shell is pink to solid white. This species is dimorphic (USFWS, 1985). The anterior margin of the shell is rounded with the posterior-ventral area expanded, broad, and somewhat truncated to accommodate the marsupium in females. The posterior ridge of the shell is well defined in males and younger specimens.

Reproduction of the pink mucket pearly mussel is similar to the fanshell and most freshwater mussels, where the male sperm is discharged to the water column and received by the female through feeding and respiration. Fertilization occurs within the gills of the female. Fertilized eggs are

retained in the posterior section of the outer gills, which are modified brood pouches. Small bivalved larvae, or glochidia, develop from the eggs, and are eventually released and attach to the gill filaments of their host fish (USFWS, 1985). The pink mucket pearly mussel is a bradytictic, or long-term breeder. It becomes gravid in August; glochidia develop and are released the following year, in June (USFWS, 1985). The glochidia are of the hookless type with a delicate shell, and are shaped like the bowl of a very blunt spoon (TABS, 2002).

Barnhart et al. (1997) tested 19 fish species as potential hosts of pink mucket and found that four supported transformation of the glochidia to juvenile mussels: largemouth bass (Micropterus salmoides), smallmouth bass (Micropterus dolomieui), spotted bass (Micropterus punctulatus), and walleye (Stizostedion vitreum). The sauger (Stizostedion canadense) and the freshwater drum (Aplodinotus grunniens) have also been identified as host fish (NatureServe, 2004). A mantle flap and eyespot found on the female mussel might aid in the attraction of host fish by resembling bait fish (Lauritsen, 1986).

Freshwater mussels are generally sedentary, typically spending their lives very near to the site where they first successfully settled. Movement will occur in response to some stimulus, such as nearby water disturbance, exposure to conditions during low water or seasonal temperature change, and during spawning. Movement includes burrowing deeper into the substrate or horizontal movement of a few feet across the substrate (NatureServe, 2004). Through movements of the host fish, glochidia can be transported upstream and downstream from where the female is located.

The pink mucket pearly mussel is a detritivore (NatureServe, 2004).

The Tennessee Animal Biogeographic System (TABS, 2002) reported that the pink mucket has a lifespan of 50 or more years.

Population Dynamics

There was no information in the literature to assess fecundity or population size. NatureServe (2005) has given a global rank of G2 and a national rank of N2 to the pink mucket pearly mussel: (G2) Imperiled – At high risk of extinction due to a very restricted range, very few populations (often 20 or fewer), steep declines, or other factors; (N2) Imperiled – Imperiled in the nation due to a very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation.

Status and Distribution

The pink mucket's distribution has declined from 25 to 16 known rivers and tributaries.

Rangewide Threats to the Species

Please refer to the discussion of threats to the fanshell (previous species addressed). Those threats would be the same for the pink mucket pearly mussel.

Environmental Baseline

Status of the Species in the Action Area

Species Range in the Action Area

Freshwater mussel surveys have been conducted in the major Ohio River tributaries within the proclamation boundary of the WNF (Watters, 1988; Hoggarth, 2001). There are no known populations of the pink mucket pearly mussel within the WNF.

It has been reported from the Bellville, Racine, Gallipolis and Greenup pools of the Ohio River, but no exact locations were available. It is not known for sure it occurs inside or outside the action area.

Suitable Habitat within the Wayne National Forest and Action Area

The pink mucket pearly mussel is a large river species. Streams within the WNF are primarily small, headwater streams; however larger Ohio River tributaries do pass through the WNF proclamation boundaries. These larger tributaries (i.e., Pine Creek, Storms Creek, Raccoon Creek, Hocking River, and Little Muskingum River) do not possess the habitat qualities desired by the pink mucket.

Suitable habitat occurs within the Ohio River, partially which is included in the action area.

While there is no suitable habitat for the fanshell within the WNF, five known host fish species occur within watershed containing NFS lands (WNF Fish Database). The black basses, sauger, and freshwater drum are found within most watersheds that are not impacted by acid mine drainage from past coal mining.

Direct and Indirect Effects of the Selected Alternative

Please refer to the discussion of direct and indirect effects of the Selected Alternative on the fanshell (previous species addressed). Those direct and indirect effects would be the same for the pink mucket pearly mussel and its habitat, and its host fish.

Cumulative Effects of the Selected Alternative

Please refer to the cumulative effects analysis for the fanshell. The cumulative effects of the Selected Alternative on the pink mucket pearly mussel would be the same as those displayed for the fanshell.

Determination of Effect and Rationale

A **No Effect** determination is made for the pink mucket pearly mussel. This determination is based on the fact that the pink mucket pearly mussel does not occur within the WNF, and there is not suitable habitat for it within the WNF. The pink mucket pearly mussel occurs in the Ohio River, downstream of the Marietta Unit and Ironton Ranger District.

A **Not Likely to Adversely Affect** determination is made for the pink mucket pearly mussel habitat. This determination is based on the following rationale:

- The Selected Alternative incorporates beneficial elements that would protect, restore or improve water quality within and downstream of the WNF. It also incorporates the River Corridor Management Area along the Ohio River, a management area which emphasizes retaining, restoring, and enhancing the inherent ecological processes and functions associated with riverine systems.
- Ground disturbance could occur during implementation of some management. Forest-wide standards and guidelines integrated into Alternative E_{mod} are expected to minimize adverse effects to water quality where take would not be expected to occur.

Federally Listed Terrestrial Plant Species

Four plant species currently listed by the Fish and Wildlife Service as endangered or threatened occur in the vicinity of WNF: northern monkshood, running buffalo clover, small whorled pogonia, and Virginia spiraea. Only one of the four species has been found within the action area (running buffalo clover).

Northern Monkshood

Status of the Species

Species Description

Rangewide

The northern monkshood was listed as a federally threatened species in 1978 (43 Fed. Reg. 17,910 (April 26, 1978)). The plant occurs in and around the unglaciated areas of northeastern Iowa and southwestern Wisconsin, in the Catskills of New York, and in eastern Ohio (USFWS, 1983c).

Common Name: Northern monkshood
Scientific Name: *Aconitum noveboracense*
Family: Ranunculaceae
Group: Flowering Plants
Historic Range: U.S.A. (IA, NY, OH, WI)
Population to Which Status Applies: Entire Range
Current Status: Threatened
Date First Listed: April 26, 1978
Critical Habitat: NA
Special Rules: NA
Recovery Plan? Yes
Lead Region: Great Lakes-Big Rivers Region (3)
Current Range: IA, NY, OH, WI
Source: USDI Fish and Wildlife Service

Species Range in Ohio

All Ohio populations of northern monkshood are located in the area where shale and conglomerate sandstone of Mississippian and Pennsylvanian age contact (USFWS, 1983c). There are currently three populations in Ohio, located in Portage, Summit, and Hocking Counties (Cochrane et al., 1995; USFWS, 2004). Of these counties of occurrence, only Hocking County contains NFS lands (Figure 12).

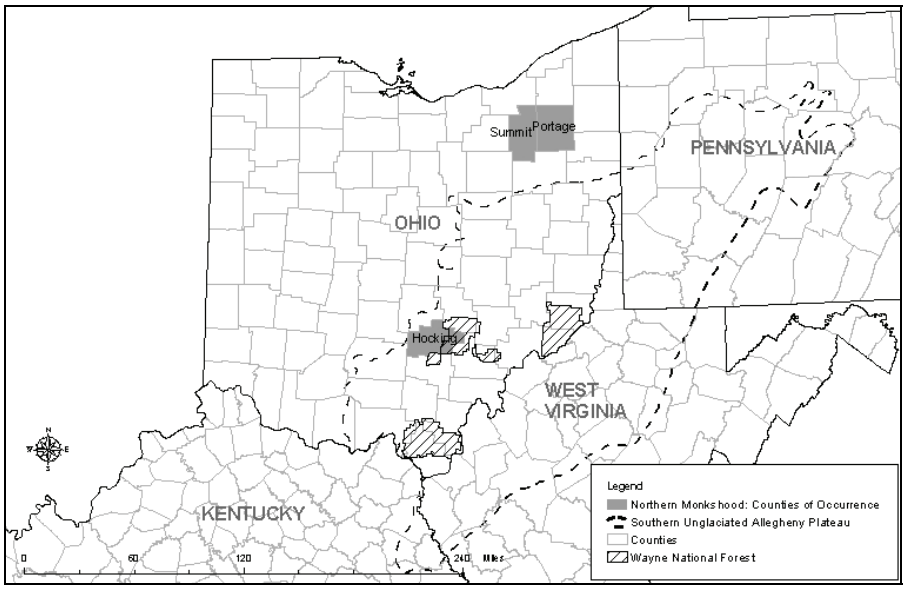


Figure 12. County occurrences of the northern monkshood within the Southern Unglaciated Allegheny Plateau.

The Ohio Division of Natural Areas and Preserves conducted a two-year monitoring and survey project to obtain additional information on the status and possible introduction of the northern monkshood to new sites in Ohio. In this survey, only the Hocking County and Summit County populations were monitored. The Hocking County population, located in privately owned and managed Crane Hollow State Nature Preserve, was found to be reasonably stable in the 1990's (Cochrane et al., 1995), but the population is declining in numbers and has low reproduction. The Summit County population has sharply declined in size since the early 1980's, but numbers have begun to increase since 2000 (S. Selbo, pers. comm.).

Possible sites for introduction of the northern monkshood are being surveyed in Ohio. Of the sites surveyed, two were found to be potentially suitable for introduction of the plant: the Nelson-Kennedy Ledges State Park in Portage County and Thompson Village Park in Geauga County. Neither of these counties contains NFS lands. Cochrane et al. (1995) recommended that areas in northeast and southeast Ohio continue to be surveyed for possible introduction sites.

Life History

The northern monkshood is a perennial herb of Ranunculaceae, the buttercup family. It has short tuberous roots, with basal and cauline leaves that are palmately cleft or dissected, with blue to whitish flowers borne in a terminal raceme or panicle. The flowers are about 1 inch in length, and a

single stem may have many flowers. Stems range from about 1 to 4 feet in length (USFWS, 1994a).

Northern monkshood is 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 (USFWS, 1994a).

Survival from season to season occurs through the annual production of daughter tubers; however vegetative reproduction occurs by means of aerial and subterranean bulbils, as well as adventitious root buds (Kuchenreuther, 1996). Sexual reproduction also occurs through pollination by the bumblebee (USFWS, 1983c).

One plant can yield flowers from late June through September, and the large individual flowers last several days. It can produce large numbers of seeds, which possess a high degree of viability and germinate readily when exposed to an appropriate stratification regime (Kuchenreuther, 1996).

Northern monkshood, like other monkshoods, does not transplant well. Although there have been some successes, greenhouse survival rates of these high-maintenance, slow-growing plants are not encouraging (USFWS, 1983c). Germination trials have produced a success rate of less than one percent. In successive trials, when a better rate has occurred, the germinated seedlings all died off at the same rate, leaving only one remaining.

Population Dynamics

NatureServe (2005) has given a global rank of G3 and a national rank of N3 to northern monkshood: (G3) Vulnerable - at moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors (N3) Vulnerable—Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

NatureServe (2005) reports the largest concentrations are in Iowa and Wisconsin, where the species is known from about 60 localities. Some of the populations in this region are quite large (one population in Iowa has about 10,000 individuals). There are seven-nine extant occurrences in New York and only three in Ohio.

Status and Distribution

A major threat to a major population of northern monkshood in Wisconsin was the catalyst for data collection and subsequent listing of the species

(USFWS 1983c). Many northern monkshood populations are being monitored to determine long-term population trends. Genetic studies are being conducted so population differences can be better understood. A variety of government and private conservation agencies are all working to preserve the northern monkshood and its habitat. Voluntary protection agreements have also been made with some private landowners (USFWS 1994a).

The 775 acre Driftless Area National Wildlife Refuge was established in 1989 to permanently protect populations of the northern monkshood (USFWS, no date). Its habitat cannot be restored once lost and the primary objective of the recovery plan is providing protection for remaining colonies. Concern over threats to the habitat stemmed from logging, grazing, filling of sinkholes, agricultural runoff, roads and quarries.

Rangewide Threats to the Species

The recovery plan lists a variety of threats to northern monkshood populations, each of which may affect only certain populations or parts of populations (USFWS, 1983c). The species presence along streams has made it vulnerable to reservoir projects. Reservoirs located downstream of monkshood populations tend to substantially limit their dispersal of seeds by flowing water. Historically, road construction and maintenance activities, such as summer herbicide use and winter deicing operations, have threatened monkshood plants and their habitat. Logging operations have caused declines in certain northern monkshood populations, not only due to the use of heavy machinery, but also from the removal of shade. Grazing, recreational foot trail development, scientific over collection, and natural catastrophes, such as droughts and flooding, have also been identified as threats to northern monkshood populations.

In Ohio, although the Hocking County population has been relatively stable, the Summit County population has seen a sharp decline due to such factors as high soil salt concentration from road maintenance activities, animal and insect damage, competing vegetation, and human trampling (Cochrane et al., 1995).

The invasion of garlic mustard (*Alliaria petiolata*) onto algific talus slopes has emerged as a threat in recent years. No one knows the potential effects of modern global warming (USFWS, no date-b).

Environmental Baseline

Status of Species in Action Area

Species Range in the Action Area

The northern monkshood has not been found in the action area. The closest occurrence of the species is in Hocking County at the Crane Creek Hollow Nature Preserve, but this is outside the action area.

Suitable Habitat within the Action Area

Habitat providing favorable growth conditions for the northern monkshood may occur in various locations on the WNF. Typically, the northern monkshood grows on cliff faces that possess a cold soil environment due to the flow of subterranean air or water escaping to the surface (USFWS, 1983c). The year-round temperature of the soils in which this species exists can be as cold as 43^{o} F, but typically ranges from 52^{o} to 64^{o} F. Another characteristic of soils at northern monkshood sites is that available phosphorous levels are typically much lower than those of adjacent sites (Evans, 1984).

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 mine openings on the WNF with a constant flow of cold air or water escaping to the surface. However, the forest floor surrounding some of these underground mine portals are barren of vegetation due to leaching from overburden or gob, or acid mine drainage.

Although all known Ohio populations of the northern monkshood are located in the contact zone between the Mississippian and Pennsylvanian age bedrock, there does not seem to be any rock substrate that is preferred by the species across its entire range. The contact zone between the Mississippian and Pennsylvanian age bedrock occurs in the western half of Hocking County, the extreme northern portion of Perry County, the extreme western portion of Vinton County, the extreme western portion of Jackson County, and in eastern Scioto County (Ohio Division of Geological Survey, no date). This contact zone lies very near to, but outside of, the boundary of the WNF, particularly close to the western boundary of the Athens Unit and the northwestern portion of the Ironton Unit. The western boundary of the Marietta Unit of the WNF lies approximately 50 miles to the east of this contact zone.

Adult monkshoods survive, but do not reproduce every year, suggesting that the low temperature of the soil may be a factor in dormancy breaking and seed germination. Since the species has very narrow habitat

requirements, existing only on cliffs and talus slopes and in headwater streams/springs, the amount of area on which the monkshood could be found is limited (USFWS, 1983c). Some headwater streams occur throughout the WNF near rock outcrops. These areas may provide suitable habitat for the northern monkshood.

The northern monkshood has no strong affinity for other plant species. There are over 100 plant species associated with the plant across its range. Most of the vascular plant associates of this species are those common to eastern deciduous forest and to marsh or swamp wetlands. Some of the deciduous forest associates include: sugar maple (*Acer saccharum*), red elder (*Sambucus pubens*), yellow birch (*Betula alleghaniensis*), eastern hemlock (*Tsuga canadensis*), mountain maple (*Acer spicatum*), wood nettle (*Laportea canadensis*), and white snakeroot (*Eupatorium rugosum*). Ferns are usually associated with the moist environment of cliffs and talus slopes. Common fern associates include bulblet fern (*Cystopteris bulbifera*), fragile fern (*Cystopteris fragilis sensu lato*), northern beech fern (*Thelpteris phegopteris*), oak fern (*Gymnocarpium dryopteris*), lady fern (*Athyrium felix-femina*), and florist's fern (*Dryopteris Spinulosa sensu lato*) (USFWS, 1983c).

Field surveys for this species have been completed in parts of the WNF, in association with land management projects. To date, the surveys have not resulted in the discovery of the northern monkshood on NFS lands.

Factors Affecting Species Environment within the Action Area

The northern monkshood has not been found within the action area to date, however potentially suitable habitat exists. For the most part, state and local governments conduct some form of field review prior to implementing projects, but private landowners generally do not. Some activities occurring on private lands could affect potentially suitable habitat or undiscovered populations of northern monkshood, such as woodland grazing, construction of homes, timber harvesting, and energy minerals development. These activities are ongoing within the action area.

Please refer to *Factors Affecting Species Environment* for the Indiana bat for a list of ongoing activities that affect forest habitat.

Beneficial activities are occurring and will likely continue to occur as the proposed action is implemented. These include plant surveys on NFS lands, state properties and lands administered by The Nature Conservancy; reforestation activities on NFS lands, state properties and on private lands; and watershed improvement activities on NFS lands, state properties and on private lands (through programs administered by the Corps of Engineers, Natural Resources Conservation Service).

Direct and Indirect Effects of the Proposed Action on Northern Monkshood

Activities with No Effect

Several management activities projected to occur in the first decade of implementation of Alternatives E_{mod} would have no effect on northern monkshood or its habitat.

- The Forest Service would use prescribed fire and mowing on the WNF to **maintain permanent forest openings**. The northern monkshood prefers partially-shaded habitats on cliffs and near headwaters of streams; permanent forest openings are not maintained in these areas because of protective standards and guidelines, and therefore these activities should have no effect on the species.
- **Restoration of lakes and ponds** primarily involves projects to improve aquatic species habitat (e.g., placing underwater habitat structures) and would not impact terrestrial habitat.
- **Wetland restoration and enhancement** activities occur in bottomland areas that have been tiled or ditched in the past. Wetlands and open agricultural areas do not provide habitat for this species, and therefore these management activities will not impact the monkshood.

Activities Not Likely to Adversely Affect - Beneficial Effects

Activities conducted on NFS lands that have the potential to protect and promote suitable habitat for the northern monkshood include those which would protect cliffs and talus slopes from shade modification and construction and those which would protect stream channels from alterations in water flow and erosion. There are no known populations of the northern monkshood on the WNF; however, there may be yet undiscovered populations that exist on NFS lands. Management activities occurring on NFS lands that would benefit potential habitat for the northern wild monkshood would also benefit populations of the species, should they occur.

- **Control of non-native invasive species** (NNIS) by mechanical and biological means would protect ecosystem integrity and prevent habitat degradation, thus protecting potential habitat for monkshood.
- **Surface mine reclamation** and **stabilization of disturbed areas** would involve erosion control and planting to return areas to forested conditions. These activities, over time could create potential habitat in areas that currently do not support monkshood.

- **Restoration and improvement stream habitat** include projects such as, bank stabilization and culvert repairs to decrease sedimentation and improve habitat quality for monkshood. Tree planting activities to provide shade along streams would create partially-shaded habitats favored by the monkshood.
- C**rop tree release** and **grape vine control** involve the manual treatment of individual vines and trees in young (15-25 years old), even-aged stands by ground crews. Over time these activities may create a diverse, semi-shaded forest that could provide potential habitat for monkshood.
- **Reforestation** tends to occur on open lands, such as agricultural fields or reclaimed strip mine areas. Reforestation of partially-forested areas does not typically occur on the WNF. Since the northern monkshood prefers partially shaded habitats, conversion of open habitats to forested conditions may provide new potential habitat for this species.
- **Land acquisition** can be beneficial when private lands containing known population of federally-listed, or potential habitat for a federally listed species, are transferred into public ownership. Protection and management of these areas would become a federal responsibility assuring long-term protection of the habitat or species.

Activities Not Likely to Adversely Affect - Discountable Effects

Activities with the potential to affect potentially suitable habitat for the northern monkshood include any construction activities that result in erosion or compaction; vegetation management activities which result in the removal of shade (canopy); and activities which would alter the course of stream channels or create impoundments. These activities have discountable effects on potentially suitable habitat, which are effects that are extremely unlikely to occur.

- Alternative E_{mod} incorporates Forest-wide standards and guidelines that protect potentially suitable habitat from impact include those that prohibit vegetation management activities within 50 feet of rock shelters and rock faces (TES-32 and TES-33) and the requirement of filterstrips, 50 to 100 feet wide, between riparian areas and construction activities (ARR-5).
- **Herbicides** would be used by the Forest Service to eliminate shade tolerant tree species to promote oak-hickory forests, to control NNIS, and to control nuisance plants (e.g. poison ivy around recreation sites). Use of herbicides for these activities will primarily involve selective, spot spraying to avoid affecting non-target vegetation. Alternative E_{mod} incorporates Forest-wide

standards and guidelines that emphasize proper use of herbicides to protect non-target vegetation and riparian areas (FH-17, FH-18, FH-19, FH-20, and FH-21). Although selective vegetation management is preferred for utility or other rights-of-way or easements, broadcast use of herbicides may be permitted with written Forest Supervisor approval. Aerial spraying of herbicides is conducted on some utility corridors that have outstanding rights on the WNF. Following the standards and guidelines for herbicide usage would reduce the risk of herbicide drift onto suitable northern monkshood habitat, or harming an individual.

- **Site prep for native pine** should not occur in potentially suitable habitat because vegetation management is not allowed within 50 feet of rock outcrops (SFW-TES-32). Forest-wide direction protects ravine habitats from soil disturbance (GFW-ARR-2, GFW-ARR-3, GFW-ARR-5, and GFW-ARR-6).
- **Agricultural activities** occurring on special use agricultural permits may involve the use of pesticides and fertilizers. Use of pesticides and fertilizers in these areas could result in harmful stream runoff, depending on how close application is to water bodies. Since the northern wild monkshood prefers headwater streams - upslope locations, the risk of adverse effects on the species or suitable habitat occurring from agricultural nonpoint source pollution would be unlikely. As added protection, filterstrips would be used along all streams to minimize effects from nonpoint source pollution (ARR-5).
- **Livestock grazing** would be permitted on NFS lands except in the RC, TRL, SA, RNA, and CA MAs. Livestock grazing currently occurs on only six special use permit areas, approximately 300 acres, on the Marietta Unit and Ironton Ranger District. Grazing is restricted to suitable open land; no woodland or brushland would be converted to rangeland. Although grazing has been identified as a threat to the northern monkshood, very little grazing occurs on the Forest and the potential for this activity to occur on suitable northern monkshood habitat is unlikely.
- **Creation of permanent wildlife openings** historically involved the removal of trees from forested areas; however, Forest Service managers would rely primarily on the designation of existing open land on acquired properties to serve as permanent forest openings (e.g. old home sites, agricultural fields) (WLF-5). Similarly, development of agreements with utility companies would be pursued to manage utility corridors as quality permanent forest openings (WLF-4). While it could occur, it is unlikely a forested area would be converted to a permanent opening. Such instances would likely be associated with a vegetation management project

where a log landing may be designated to be maintained as an opening. Sites for log landings would be field reviewed and would not be placed in potentially suitable northern monkshood habitat.

- **Waterhole construction** is projected to only involve approximately 15 acres over the next decade. Waterholes are small in size and would likely be built in forested areas already disturbed by other project activities. Tree removal would not likely occur for waterhole construction. The impact of waterhole construction would be discountable since it would occur in areas already disturbed, and of which the other activities (e.g. timber harvest, oil and gas development) would have a larger impact on habitat.
- **Exchanging** NFS lands with other landowners may affect the northern monkshood if land containing the species or its habitat is transferred out of federal ownership. However, since assessments of all land exchanges occur before action is taken; the chance of exchanging a tract with populations of northern monkshood would be unlikely. The amount of land exchanged over a decade is only projected to be 400 acres of the WNF. Conversely, land exchanges could benefit the species by exchanging unsuitable lands for those with suitable habitat.

Activities Not Likely to Adversely Affect - Insignificant Effects

The following activities are expected to have insignificant effects on potentially suitable habitat. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs.

- Construction of both temporary and permanent **roads** has the potential to affect suitable habitat for the northern monkshood. Construction activities involving the use of heavy machinery may result in the direct removal of vegetation, soil compaction and erosion, and may increase the likelihood of colonization by non-native invasive species. Road construction and maintenance activities have been identified as a primary threat to the northern monkshood, as these activities tend to impact viable populations and suitable habitat for the species (USFWS, 1983a). During operation, temporary unsurfaced roads have the potential to cause soil erosion; however, after use, erosion control measures would be implemented, including construction of water diversions and seeding, and they would be allowed to revert back to vegetative cover. Similarly, standards and guidelines incorporated into Alternative E_{mod} call for measures to reduce erosion in riparian areas when building roads or trails that cross streams and requires filterstrips for roads built along streams. Direct effects from road construction on potential northern monkshood habitat would not be expected, as road construction does not tend to occur on steep

slopes near headwaters. If all standards and guidelines are followed during road construction activities, erosion and sedimentation impacts on potential habitat for the northern monkshood would be minimized. Forest-wide standards and guidelines would provide for prevention and control of NNIS during construction activities, and would allow for treatment of NNIS in areas where there is a high potential for spread.

- **Road decommissioning** activities may have initial effects on suitable habitat similar to road construction, but over the long-term road closures may increase the acres of suitable monkshood habitat on NFS lands. Approximately 29 acres of temporary and permanent roads on the WNF are projected to be closed and vegetated over the next decade.
- **Construction of recreation facilities** (e.g. parking lots) may involve clearing and grading sites and the use of heavy machinery. A maximum of 50 acres is projected over the first decade for recreation facility construction. Recreation facility construction is also unlikely to occur near headwater streams or seeps, and would not occur within 50 feet of rock outcrops. The small amount of forest cleared for recreation facilities and the unlikelihood of them occurring in monkshood habitat make the potential for permanent loss of monkshood habitat low.
- **Construction of hiking, horse, biking and OHV trails** are projected to increase over the next decade. Construction of designated OHV trails would likely involve the use of heavy equipment, which may have similar impacts on potential northern monkshood habitat as described for road construction. Non-motorized recreational trail construction may involve either hand tools or heavy machinery.
- **Use of designated trails** could result in soil compaction and erosion, which may contribute to increased sedimentation and runoff to streams. As northern wild monkshood habitat tends to be located near headwater streams, trail use may affect potential stream bank habitat for this species. However, Alternative E_{mod} incorporates measure to minimize potential impacts. Normal drainage control on designated trails would be provided by water bar installation and lead-off ditching, with the use of side ditching where necessary. In addition, OHV designated trails would be inspected at least twice a year, and necessary erosion control measures implemented. Construction and use of trails would also increase the probability for NNIS introduction and spread along the corridors. Forest-wide standards and guidelines provide for prevention and control of NNIS during construction of trails, and

allow for treatment of NNIS in areas where there is a high potential for spread (Forest-wide objective 7.2b).

- **Even-aged vegetation management** (clearcut, shelterwood, thinning and two-aged harvest methods) results in the removal of all or most trees in areas ranging from 2-30 acres in size, exposing the area to full sun conditions. Even-aged management may temporarily reduce suitable habitat for the northern monkshood if such habitat exists prior to clearing. These effects are short-term in nature because the treated stands would regenerate to closed canopy conditions over time. Removal of shade has been identified as a factor eliminating populations of the monkshoods (USFWS, 1983a). Alternative E_{mod} incorporates Forest-wide standards and guidelines that require low growing flowering and fruiting trees under six inches in diameter to not be cut during even-aged harvest unless the amount left would inhibit natural regeneration of tree species (VEG-12). These remaining trees may provide some shade in these areas, and minimize impacts on potential northern monkshood habitat. Other Forest-wide standards and guidelines require the assessment of NNIS threats during project planning and the use of prevention and control measures during and after project implementation (FH-1).
- **Uneven-aged harvest** has the potential to temporarily impact northern monkshood habitat by increasing light penetration to the forest floor. However, these impacts are short-term in nature as remaining tree canopies and understory trees grow to fill in light gaps over time. An established Forest-wide standard (TES-8) directs the Forest Service to maintain at least 60% canopy cover in all hardwood stands treated with uneven-aged management methods.
- Both **uneven- and even-aged vegetation management** activities may temporarily impact monkshood habitat due to vegetation removal, soil disturbance and compaction, erosion and increased susceptibility of areas to NNIS invasion and establishment. All skid trails and log landings are temporary in nature; these areas are rehabilitated after use to control any erosion or NNIS concerns. Alternative E_{mod} incorporates measures to address NNIS establishment and spread during construction activities.
- **Mineral exploration and development** is on-going throughout the WNF, and will continue as long as the demand for oil and gas remains high. Removal of vegetation and topsoil required for the construction of access roads, well pads, and pipeline corridors during oil and gas activities may temporarily affect suitable habitat for the northern monkshood, in the same way roads do. These activities could result in the exposure of soil to erosion by rain and

wind, which may contribute to increased sedimentation and runoff to streams. Since many known populations of the northern monkshood are located in headwater stream/spring locations, these activities may affect potential streambank habitat for this species. No Surface Occupancy (NSO) restrictions for federally leased minerals are in place on FOF, CA, SA, RNA, DR and TRL MAs. Surface occupancy for private mineral rights require mitigation measures including seasonal restrictions, road construction and maintenance requirements, controlled use in riparian areas, and wildlife coordination. Established Forest-wide standards and guidelines in Alternative E_{mod} mitigates the effects of oil and gas exploration and development (i.e., filterstrips, stream crossings, stabilizing disturbed areas, NNIS prevention and analysis, NSO on steep slopes, controlled surface use on riparian areas). Effects from road and well pad construction are long-term since they remain in use until mineral resources are depleted. Once depleted, the operators are required to restore the disturbed areas (Forest-wide objective 10.2a and b, MIN-2, MIN-8).

- **Surface coal mines** would alter and remove surface soils and vegetation, and subsequently degrade existing habitat. Approximately 1,250 acres of NFS land could be affected by surface mining in the future. The Forest Service has no control over this projected activity since private mineral rights are involved, however the Forest Service would work closely with the operator to incorporate as many Forest-wide standards and guidelines into the operation plan. Furthermore, the operator would need to meet all state regulations.
- **Mineral exploration and development** activities may also result in accidental spills of crude oil or brine, which could affect surrounding vegetation, contaminate soils, and cause harmful runoff to streams. However, State of Ohio regulations require a Spill Prevention and Control Countermeasures Plan (SPCC) for mineral development activities. Dikes are required around all wells on the Forest to contain brine in the event of an accidental spill. In addition, the Ohio Environmental Protection Agency (EPA) is required to be contacted immediately upon discovery of an accidental spill. Remedial action for cleanup of water and soil resources will be conducted by the lessee as directed by the Ohio EPA.
- **Reclamation of depleted or orphan wells** requires clearing the immediate area of the well, and would have similar impacts as those described for construction of well pads; however, these areas are rehabilitated immediately after well reclamation, and over the long-term, closure would benefit the environment by preventing the potential for future leaks or spills from these wells.

- **Prescribed fire** is used on the WNF to reduce hazardous fuels, to promote oak-hickory regeneration, to improve herbaceous and grassy habitats, and to control NNIS. Creation of firelines using bulldozers could result in soil disturbance, soil compaction, removal of vegetation and increased susceptibility for invasion by NNIS, whereas firelines constructed by hand only affect the litter layer. Forest-wide standards and guidelines incorporated into Alternative E_{mod} emphasize the use of existing roads and fire breaks to avoid constructing fireline (FIRE-7). Firelines would be rehabilitated after burns (e.g. water diversions, seed and mulch), to prevent long-term erosion impacts. Fire will reduce overstory cover resulting in a more open habitat that could increase light penetration and dry out the understory, potentially impacting monkshood habitat. However, moist habitats (e.g., cliffs, streambanks) preferred by monkshood are less likely to experience high burn intensities due to their high humidity environments, instead these areas are likely to experience low intensity, mosaic burns and therefore significant alterations to micro-environment in these areas are unlikely to occur.
- The increased density of forests, combined with fire suppression and natural disturbances, has led to an increase of woody material on the forest floor. **Treatment of hazardous fuels** would occur primarily in stands where fuels are greatest, often in pine stands. The work would involve the lopping and scattering of woody material on the ground. However, it is possible that a leaning or standing tree would be felled and bucked up or removed, either as part of the fuels reduction work or to protect workers from a potential hazard tree. Increased light penetration due to tree removal could impact monkshood habitat. Construction of roads, trails and landings during hazard fuel treatment projects could have similar impacts as those discussed for roads and trails.
- **Utility corridor construction and maintenance** is similar in impacts to habitat as road and trail construction, since vegetation would be removed and soil compaction from heavy machinery use would occur. Filterstrip requirements would protect riparian habitat.
- **Small lake and pond construction** would occur for wildlife habitat and to enhance recreation on the WNF. Constructing an impoundment on a stream and flooding the upgradient streambanks could affect potential habitat. However, most ponds constructed in the past were a result of reclamation efforts. Projections are to create 15 acres of small lakes or ponds over the next decade.
- **Installation of bat-friendly gates** at mine openings could impact monkshood habitat. Mine openings often provide suitable habitat

for monkshood due to cold air flows escaping from underground mines. Installation of gates involves removal of some soil around mine openings in order to sink gates below ground surface. Removal of soil in these areas could directly impact plants or disturb any habitat present. However, soil removed during installation would be returned afterwards to pre-installation levels to avoid changing airflows and micro-environments, thus retaining any seedbanks that may exist for the species.

- Areas targeted for **acid mine drainage treatment** often have a history of underground and surface mining that has restricted or altered natural water flows. Often these mine drainages result in barren soils unable to support vegetation due to highly acidic soils. Acid mine drainage treatments often involve closing mine portals which could result in the loss of potential habitat for monkshood if the portals have cold air or water flows. Pre-project surveys of mine portals slotted for closure would occur to determine if monkshood individuals exist within the project areas. Treatment of acid mine drainage may involve soil movement and disturbance to restore surface drainage. The construction and heavy equipment involved could impact suitable habitat. However, these areas have undergone severe disturbance in the past, often limiting their ability to provide quality habitat for this species. Over the long-term, restoring drainage within these areas would restore riparian characteristics to these areas improving habitat and water quality and thus improving suitable habitat for monkshood. Approximately 270 acres are expected to undergo acid mine treatment in the first decade.

Cumulative Effects of the Selected Alternative

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 the action area are forested (Ohio Land Use Cover, based on Landsat TM 1994). Riparian corridors are primarily forested (i.e., 72.5 percent) (National Landcover Database, 1992).

These reforestation trends have benefited northern monkshood by increasing potential shaded habitat and improving water quality conditions within the WNF. Many mine portals that contain potentially suitable habitat for the species are surrounded by shade trees and habitable soils, in comparison to full sunlight, barren soils of the past.

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 for or existing populations of, the northern monkshood, should it occur. 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.

Land exchanges and acquisition to consolidate federally managed land in these areas may result in the revegetation of acquired lands with mining and agricultural histories. Water quality of nearby streams would improve as runoff into these streams would be reduced. Since preferred habitats of the northern monkshood include shaded streambanks and rock outcrops, land consolidation may increase the amount of potentially suitable habitat for the northern monkshood and improve habitat quality.

Any potential cumulative adverse effects that may occur to northern monkshood habitat or unknown populations as a result of implementing the Selected Alternative would be mitigated through the implementation of the protective Forest-wide standards and guidelines.

Determination of Effect and Rationale

A **No Effect** determination is made for the northern monkshood. This determination is based on the fact that there are currently no known populations of the northern monkshood within the action area. The closest known population is located in Hocking County, which contains NFS lands within the Athens Unit of the Forest.

A **Not Likely to Adversely Affect** determination is made for northern monkshood habitat (Table 25). This determination is based on:

- Alternative E_{mod} incorporates beneficial management activities that would protect, restore and create suitable habitat for the northern monkshood;
- Forest-wide goals and objectives promote healthy watershed conditions;
- Forest-wide standards and guidelines to protect streams and rock shelters/faces, a preferred habitat for monkshood;
- Forest-wide standards and guidelines ensure proper pesticide use on the Forest;
- While ground disturbance would occur during management implementation, Forest-wide standards and guidelines would minimize soil erosion, stabilize disturbed areas, and minimize adverse effects from NNIS;
- Plant surveys would be conducted on lands affected by land exchange, surface-disturbing activities and vegetation removal.

Table 25. Summary of effects determinations for the northern monkshood.

Projected Management Activity	Alternative E_{mod}
Vegetation Management	
Even-aged Hardwood Timber Harvest	I
Even-aged Pine Timber Harvest	I
Uneven-aged Timber Harvest	I
Thinning	I
Crop Tree Release	B
Grape Vine Control	B
Site Prep for Native Pine	D
Reforestation	B
Prescribed Fire	I
Herbicide Application	D
Development of Permanent Forest Openings	D
Maintenance of Permanent Forest Openings	N
Control of Non-Native Invasive Species-Mechanical	B
Control of Non-Native Invasive Species-Biological	B
Wetland Restoration & Enhancement	N
Waterhole Construction	D
Fishing Pond/Lake Construction	I
Restoration & Improvement of Aquatic/Riparian Habitat (Lentic)	N
Restoration & Improvement of Aquatic/Riparian Habitat (Lotic)	B
Installation of Bat-Friendly Gates on Mines	I
Recreation Management	
OHV Trail Construction	I
Hiking Trail Construction	I
Horse Trail Construction	I
Mountain Bike Trail Construction	I
Recreation Facility & Parking Lot Construction	I
Transportation Management	
Temporary Road Construction	I
Permanent Road Construction	I
Permanent Road Reconstruction	I
Road Decommissioning	I
Disturbance related to Timber (Skid Trails, Landings)	I
Energy Minerals Management	
Surface Coal Mining Activities	I
Reclamation of Depleted or Orphan Wells	I
Oil & Gas Well Development	I
Special Uses Management	
Utility Corridor Development & Maintenance	I
Agricultural Crop Production & Grazing	D
Watershed Management	
Treatment of AMD	I
Surface Mine Reclamation	B
Closure of Open Mine Portal/Subsidence	I
Stabilization of Disturbed Areas	B
Fire Management	
Reduction of Hazardous Fuels - Mechanical	I
Lands Acquisition Management	
Land Acquisition	B
Land Exchange	D
N = No Effect; **B** = Not Likely to Adversely Affect, Beneficial Effects; **I** = Not Likely to Adversely Affect, Insignificant Effects; **D** = Not Likely to Adversely Affect, Discountable Effects; **A** = Likely to Adversely Affect	

Small Whorled Pogonia

Status of the Species

Species Description

Rangewide

The small whorled pogonia was listed as an endangered plant in 1982. A recovery plan for this species was initiated three years later to protect existing colonies and to create and discover new populations. In 1994, the small whorled pogonia was reclassified as threatened based on fulfillment of the downlisting criteria set forth in the recovery plan (USFWS, 1994b).

The range of the small whorled pogonia spans the Atlantic seaboard from Maine to Georgia, with occurrences in the Midwestern United States and Canada. Although the historic range of the plant included many more states, the small whorled pogonia now likely occurs in seventeen states and Canada (Ontario). These states include: Maine, New Hampshire, Massachusetts, Connecticut, Pennsylvania, Delaware, Virginia, West Virginia, Illinois, Georgia, Michigan, North Carolina, New Jersey, Ohio, Rhode Island, South Carolina, and Tennessee (USFWS, 1992a). Despite its wide range, the plant remains rare; in some states, only a single plant has been documented.

There are three main population centers of the small whorled pogonia. One is in Virginia, in the region between the mountains and the coastal plains, with outlying populations in New Jersey and Delaware. A second center occurs at the southernmost portion of the Appalachian

Common Name: Small whorled pogonia
Scientific Name: *Isotria medeoloides*
Family: Orchidaceae -- Orchid family
Groups: Plants, Flowering Plants
Current Status: Threatened
Lead Region: 5
Date First Listed: September 10, 1982
Critical Habitat: None
Special Rules: None
Recovery Priority: 14
Approved Recovery Plan? Yes
Historic Range: U.S.A. (CT, DC, DE, GA, IL, MA, MD, ME, MI, MO, NC, NH, NJ, NY, PA, RI, SC, TN, VA, VT, WV), Canada (Ont.)
This Status Likely To Occur In: CT, DE, GA, IL, MA, ME, MI, NC, NH, NJ, OH, PA, RI, SC, TN, VA, WV, Canada (Ont.)
Source: USDI Fish and Wildlife Service

Mountains, the Blue Ridge Mountains, where Tennessee, Georgia, and North and South Carolina connect. The northernmost population center is located in the foothills of the Appalachian Mountains in New England and Massachusetts (USFWS, 1992a; USFWS, 1994b).

Species Range in Ohio

Occurrences of the species in Ohio are displayed in Figure 13. In 1985, the small whorled pogonia was documented at one site in Shawnee State Forest in Scioto County, Ohio (Ohio Division of Natural Areas and Preserves, 1992). Scioto County contains the western portion of the Ironton Unit of the WNF. Follow-up visits to the Scioto County population failed to reveal any plants since it was first discovered in 1985, however this species does exhibit periods of long dormancy (from 10-20 years). The site must be visited annually for many years before it can be assumed that the population is no longer present (S. Selbo, personal communication). The small whorled pogonia was discovered in Hocking County near Camp Oty'Okwa in 1998 (S. Selbo, personal communication). Hocking County contains the western portion of the Athens Unit.

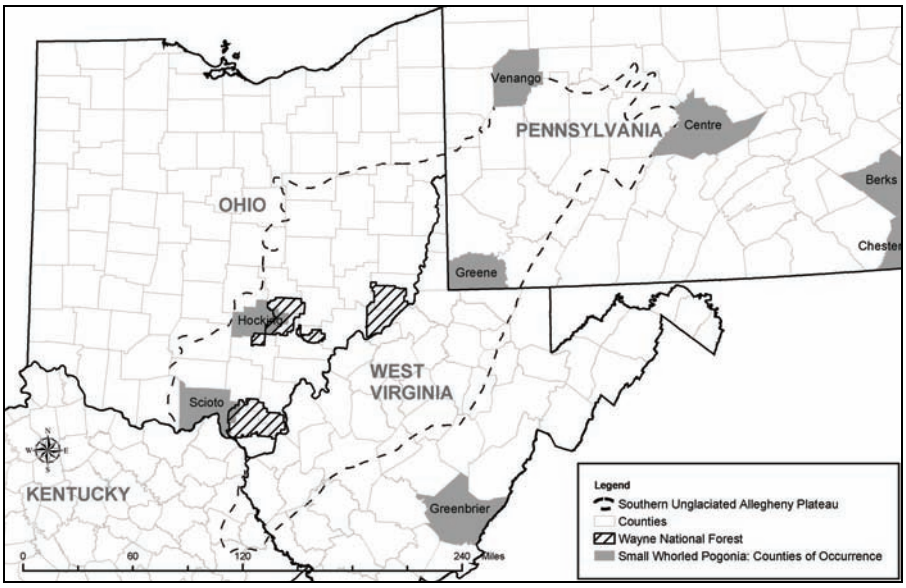


Figure 13. County occurrences of the small whorled pogonia in the Southern Unglaciated Allegheny Plateau.

Life History

The genus *Isotria* consists of only two species, the small whorled pogonia and the large whorled pogonia (*I. verticillata*). Both species are herbaceous perennials with hairy fibrous roots surrounding a rootstock. These plants develop by forming over-wintering buds for the next year's

shoot on the rootstock. Isotria plants have five or six elliptic leaves, grayish-green or milky green in color, surrounding the apex of a smooth, hollow stem. One flower, or a pair of flowers, yellowish-green in color, rises at the center of the false whorl of leaves, creating the appearance of a typical orchid. The sepals and petals of Isotria are narrower than those of typical orchids, and the two lateral petals protrude over the greenish-white lip. The flower's three sepals of nearly equal length led to the name of the genus (Isos = equal; treis = three) (USFWS, 1992a).

While both species are similar in appearance, there are key characteristics used to differentiate them, as summarized in the recovery plan (USFWS, 1992a). The small whorled pogonia is usually single stemmed, although a plant may produce two or more stems in a cluster. The stem ranges from 2-13 inches tall in a flowing plant and is similar in color and degree of glaucousness as a white seedless grape. The elliptic to elliptic-obovate leaves are also a pale milky-green or grayish-green. The flower is yellowish-green with a greenish-white lip. The sepals vary from linear-oblanceolate to narrowly spatula-like in shape, and spread outward when in full flower. The lateral petals are oblanceolate to oblong-elliptic and point forward above the lip. The sepals are approximately ½ to 1 inch long and either equal in length to the lateral petals or up to 1.5 times as long.

A population of the small whorled pogonia may contain plants in one of four different life cycle states: vegetative; flowering, but with an abortive flower bud; flowering; or dormant. It is believed to be self-pollinating, occasionally reproducing vegetatively; the flower contains neither nectar guides nor fragrance (USFWS, 1992a). Flowering occurs from mid-May through mid-June, although not always annually, with flowers lasting no longer than a week (USFWS, 1996a). The plant's past cycles are fairly indicative of its future cycles. For example, large plants are more likely to become flowering plants and bloom the following year, while a small plant is more likely to return as a vegetative plant the next year, or to go dormant or die (USFWS, 1992a).

Like other orchid seeds, those of the small whorled pogonia contain very little food reserves. It is impossible for these plants to germinate or establish seedlings unless they fall into a suitable substrate containing mycorrhizal fungus. The strands of the fungus penetrate the cells of the orchid, and the two form a symbiotic relationship. The orchid provides cellulose and carbohydrates to the fungus, as the seedling obtains water and nutrients through the strands. No specific fungus has ever been linked to the small whorled pogonia (USFWS, 1992a).

Population Dynamics

NatureServe (2005) has given a global rank of G2 and a national rank of N2 to small-whorled pogonia: (G2) Imperiled – At high risk of extinction

due to a very restricted range, very few populations (often 20 or fewer), steep declines, or other factors; (N2) Imperiled – Imperiled in the nation due to a very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation.

According to NatureServe (2005), there are 104 extant sites known, with 66 in New England, 18 in the southern Appalachians, 13 in coastal plain of Virginia, Delaware and New Jersey, and the rest widely scattered. Populations are typically small, and the total number of individuals is probably less than 3000.

Monitoring of various colonies has shown the small whorled pogonia is susceptible to wide population fluctuations from year to year. Individual plants may not emerge in a given year and are considered either dead or dormant. Dormant plants usually return as vegetative plants, but may return in the flowering state (USFWS, 1992a).

Status and Distribution

The small whorled pogonia was reclassified from endangered to threatened in 1994 based on the fulfillment of reclassification criteria as stated in the Recovery Plan and substantial improvement in the status of this orchid species. As outlined in the revised Recovery Plan, reclassification of *Isotria medeoloides* from endangered to threatened should proceed when a minimum of 25 percent of the known viable sites (as of 1992) are protected. As of 1994, 61 percent of the viable populations were permanently protected.

Threats to the Species

Two main threats to the existence of the small whorled pogonia have been identified: habitat destruction and overcollection for scientific, commercial, or recreational purposes. Destruction of the plant's habitat has occurred primarily from residential and commercial development. In addition, construction of roads, power lines, and sewer mains to connect settled areas has occurred in areas surrounding small whorled pogonia habitat, leading to its destruction (USFWS, 1994b). Such construction can serve as a barrier to seed dispersal, which may inhibit recolonization of suitable habitat. Other threats to the small whorled pogonia include collection of the plant for recreational use, such as for home gardening and herbivory by white-tailed deer and invertebrates (USFWS, 1992a).

In some parts of its range, other threats may include vandalism or the formation of barriers (e.g., clearings, development) to seed dispersal.

Environmental Baseline

Status of the Species in the Action Area

Species Range in the Action Area

The small whorled pogonia has not been found within the action area. The closest counties having occurrences are Scioto and Hocking, but the populations are outside the action area.

A survey for the small whorled pogonia was conducted in June 1996 on the Ironton Ranger District, specifically in Scioto County, Ohio. A total of 260 acres were surveyed. The survey resulted in the discovery of several populations of the large whorled pogonia; however, no populations of small whorled pogonia were found (Boyle, 1996).

Approximately 1,500 acres of NFS lands were surveyed in 2003 for this species, in Lawrence, Scioto, and Gallia counties in preparation for two ice storm hazardous fuels treatment projects. The species was not located on these tracts; however one large whorled pogonia was found.

In 2004, approximately 3,500 acres were surveyed in Lawrence County in preparation for additional ice storm hazardous fuel treatments. While no small whorled pogonias were found, approximately 10 populations of the large whorled pogonia were.

No small-whorled pogonias were found during the 2005 field season. About 1,511 acres of NFS lands were surveyed on the Ironton Ranger and 473 acres of NFS lands were surveyed on the Athens Ranger District.

Suitable Habitat within the Action Area

The plant is found under a wide variety of forest conditions, therefore habitat providing favorable growth conditions for the small whorled pogonia may occur throughout the Action Area. The small whorled pogonia occurs in mixed deciduous or mixed deciduous/coniferous forests, which tend to be in second- to third-growth successional stages. The plant grows in both somewhat young forests as well as in maturing stands, which vary in composition (USFWS, 1992a). Several characteristics are common among most small whorled pogonia sites. 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 *I. medeoloides* sites (USFWS, 1994b). There is often sparse to moderate groundcover, except when in association with ferns, and 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 (USFWS, 1992a). In addition, historical agricultural use of the small whorled pogonia habitat is not uncommon. Although these characteristics are common for most small

whorled pogonia sites, there are many exceptions and variations that can occur locally and regionally.

The array of suitable habitats of the small whorled pogonia includes dry, rocky, wooded slopes to moist slopes or slope bases braided by vernal streams (USFWS, 1994b). Slope exposure and degree, however, vary throughout the range of the species. Slopes on which the small whorled pogonia occurs typically vary from 0 to 30 percent. Most populations of the species are found at the base of a slope or at mid-slope positions (USFWS, 1992a).

Many species are associated with the small whorled pogonia, including a few taxa that are associated with the plant in both the northeastern part of its range and the southern portion of its range. However, associates of the small whorled pogonia vary widely between regions, none of which occurs commonly enough to be considered a true indicator species. In the Ohio region, the plants associated with small whorled pogonia include: witch hazel (*Hamamelis virginiana*), striped maple (*Acer pensylvanica*), serviceberry (*Amelanchier arborea*), partridgeberry (*Mitchella repens*), Indian cucumber root (*Medeola virginiana*), and New York fern (*Thelypteris noveboracensis*) (USFWS, 1992a). In addition, the small whorled pogonia often occurs near or intermixed in populations of the large whorled pogonia (USFWS, 1992a). The large whorled pogonia has been known to occur at the bases of sandstone cliffs, or on the upper slopes above sandstone cliffs. Such cliffs are found throughout the WNF, on all three Units.

Although soil moisture fluctuates seasonally, small whorled pogonia populations typically occur on soils ranging from dry-mesic to wet-mesic (Rawinski, 1986). The substrate in which the plant is rooted may be of a variety of different textures, ranging from extremely stony glacial till, to stone-free sandy loams, to sterile duff (USFWS, 1992a). The small whorled pogonia thrives in acidic soils, particularly those with an impermeable soil layer (fragipan), which restricts downward water movement, beneath the acidic soil layer. On these slopes, which are typically 8 to 15 percent slopes, water is forced to move laterally above the fragipan. It is hypothesized that this surface and near-surface water movement removes soluble nutrients, leaving a strongly acidic duff (Rawinski, 1986). Soil analyses have found a range in soil pH values from 4.0 to 5.0 where small whorled pogonia grows (USFWS, 1992a).

Acidic soil types are found throughout the WNF. The majority of the soils that occur on the WNF have a surface soil pH ranging from 3.6 to 5.5. In localized areas, the soil is acidic due to leaching of metals into the soil from past mine operations. Acid mine drainage affects riparian areas near such old mines, lowering the pH values of the waters to less than 5.5, and also affects the soils on lands adjacent to these riparian areas, up to about 15 feet up the streambanks. Past mine operations, and subsequent acid

mine drainage, are prevalent throughout the Athens Unit, particularly in the central and western portions of the Unit. The Ironton Unit also contains old mines, particularly in Pine Creek watershed. Past mine operations are not found in the Marietta Unit and subsequent acid mine drainage does not occur there.

Factors Affecting Species Environment within the Action Area

The small whorled pogonia has not been found within the action area to date, however potentially suitable habitat exists. For the most part, state and local governments conduct some form of field review prior to implementing projects, but private landowners generally do not. Some activities occurring on private lands could affect potentially suitable habitat or undiscovered populations of small whorled pogonia, such as woodland grazing, construction of homes, timber harvesting, and energy minerals development. These activities are ongoing within the action area.

Please refer to *Factors Affecting Species Environment* for the Indiana bat for a description of ongoing activities in the action area that affect forest conditions.

Beneficial activities are occurring and will likely continue to occur as the proposed action is implemented. These include plant surveys on NFS lands, state properties and lands administered by The Nature Conservancy; reforestation activities on NFS lands, state properties and on private lands; and watershed improvement activities on NFS lands, state properties and on private lands (through programs administered by the Corps of Engineers, Natural Resources Conservation Service).

Direct and Indirect Effects of the Selected Alternative on Small Whorled Pogonia

Activities with No Effect

Several management activities projected to occur in the first decade of implementation of Alternative E_{mod} would have no effect on small whorled pogonia or its habitat.

- The Forest Service uses prescribed fire and mowing to **maintain permanent openings**. Since the small whorled pogonia prefers partially-shaded habitats, the species would not likely be found in permanent openings.
- **Livestock grazing** is permitted to allow continued current use by livestock, contribute to wildlife habitat objectives and to help control NNIS. Livestock grazing occurs on only six special use permit areas, approximately 300 acres, on the Marietta Unit and Ironton Ranger District. Grazing is restricted to suitable open land;

no woodland or brushland would be converted to rangeland. Agricultural activities occurring on special use agricultural permits may involve the use of pesticides and fertilizers. Since the small whorled pogonia prefers forested habitat, grazing activities would not affect this species.

- **Restoration of lakes and ponds** primarily involves projects to improve aquatic species habitat (e.g., placing underwater habitat structures) and would not impact terrestrial habitat.
- **Wetland restoration and enhancement** activities often occur in bottomland areas that have been tiled or ditched to promote agricultural use. Wetlands and open agricultural areas do not provide habitat for these species, and therefore management activities will not impact the pogonia.

Activities Not Likely to Adversely Affect - Beneficial Effects

There are no known populations of the small whorled pogonia within the WNF; however, there may be yet undiscovered populations that exist on NFS lands. Management activities occurring on NFS lands that would benefit potential suitable habitat for the small whorled pogonia would also benefit populations of the species, should they occur.

This species is known to favor mesic hillsides. There are many Forest-wide standards and guidelines that are designed to protect the water quality of water resources on the Forest, to minimize erosion, and to stabilize disturbed areas. Water and soil resource management standards and guidelines for the Forest are focused on reducing soil erosion and discharge into watercourses and establishing filterstrips for riparian areas to prohibit sediments from entering stream habitats. Protecting riparian habitat could protect any pogonia populations or potential habitat occurring at the base of slopes or near streambanks.

- **Control of non-native invasive species** (NNIS) by mechanical and biological means would protect ecosystem integrity and prevent habitat degradation, thus protecting potential habitat for small whorled pogonia
- **Surface Mine Reclamation** and **stabilization of disturbed areas** would involve erosion control and planting to return areas to forested condition. These activities, over time could create potential habitat in areas that currently do not support the pogonia.
- Timber stand improvement activities such as, **crop tree release** and **grape vine contro**l involve the manual treatment of individual vines and trees in even-aged, young stands by ground crews. Overtime these activities may create a diverse, semi-shaded forest that could provide potential habitat for small whorled pogonia.

Currently, the dense growth and shading within these stands do not provide suitable habitat for the species.

- **Reforestation** tends to occur on open lands, such as agricultural fields or reclaimed strip mine areas. Reforestation of partially-forested areas does not typically occur on the WNF. Since small whorled pogonia prefers partially shaded habitats, conversion of open habitats to forested conditions may provide new potential habitat for this species.
- **Restoration and improvement of stream habitat** include projects such as, bank stabilization and culvert repairs to decrease sedimentation and improve habitat quality for small whorled pogonia. Tree planting activities to provide shade along streams would create partially-shaded habitats favored by the pogonia.
- **Land acquisition** can be beneficial when private lands containing known populations of federally listed species, or potential habitat for a federally listed species, are transferred into public ownership. Protection and management of these areas would become a federal responsibility, assuring long-term protection of the habitat or species.

Activities Not Likely to Adversely Affect - Discountable Effects

There are no known populations of the small whorled pogonia on the WNF. However, there may be undiscovered populations, or potential habitat, that could be impacted by activities that occur on the WNF. These activities have discountable effects on potentially suitable habitat, which are effects that are extremely unlikely to occur.

- **Herbicides** would be used by WNF to eliminate shade tolerant tree species to promote oak/hickory forests, to control non-native invasive species, and to control nuisance plants (e.g. poison ivy) around recreation sites. Use of herbicides for these activities will primarily involve selective, spot spraying to avoid affecting non-target vegetation. Each alternative incorporates Forest-wide standards and guidelines that emphasize proper use of herbicides to protect non-target vegetation (FH-17, FH-18, FH-19, FH-20, and FH-21). Although selective vegetation management is preferred for utility or other rights-of-way or easements, broadcast use of herbicides may be permitted with written Forest Supervisor approval. Aerial spraying of herbicides is conducted on utility corridors that have outstanding rights on the Forest. Following standards and guidelines for herbicide usage would reduce the potential for herbicides to drift onto suitable pogonia habitat, or an individual.

- **Creation of permanent wildlife openings** historically involved the removal of trees from forested areas, however, Forest Service managers rely primarily on the designation of existing open land on acquired properties to serve as permanent forest openings (e.g. old home sites, agricultural fields) (WLF-5). Similarly, development of agreements with utility companies would be pursued to manage utility corridors as quality permanent forest openings (WLF-4). While it could occur, it is unlikely a forested area would be converted to a permanent forested opening.
- **Waterhole construction** is projected to only involve approximately 15 acres over the next decade. Waterholes are small in size and would likely be built in forested areas already disturbed by other project activities. Tree removal would not likely occur for waterhole construction. The impact of waterhole construction will be discountable since it will occur in areas already disturbed, and of which the other activities (e.g. timber harvest, oil and gas development) will have a larger impact on habitat.
- **Exchanging** NFS lands with other owners may affect the small whorled pogonia if land containing the species, or its habitat, is transferred out of federal ownership. However, since assessments of all land exchanges by biologists occur before action is taken; the chance of exchanging a tract with populations of small whorled pogonia would be unlikely. The amount of land exchanged over a decade is only projected to be 400 acres. Conversely, land exchanges could benefit the species by exchanging unsuitable lands for those with suitable habitat.
- **Installation of bat-friendly gates** involves the removal of soils around mine openings in order to sink gates below ground surface. Removal of soil in these areas could directly impact any plants or habitat present. Soils removed during installation are returned afterwards to pre-installation conditions to avoid changing airflows and micro-environments, thus retaining any seedbanks that may be exist for the species. Many of the areas impacted by installation are devoid of vegetation due to any combination of dense shade, acid mine drainage, or soil compaction by human use. The small amount of soil disturbance coupled with the small probability of potential habitat occurring in these areas makes this impact unlikely.

Activities Not Likely to Adversely Affect - Insignificant Effects

The following activities are expected to have insignificant effects on potentially suitable habitat. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs.

- While **roads** could provide semi-permanent breaks in the forest canopy, which tend to encourage the growth of small whorled pogonia, the heavy construction associated with these developments may impact pogonia habitat. (USFWS, 1992a). Construction activities involving the use of heavy machinery may result in the direct removal of vegetation, soil compaction and erosion, and may increase the likelihood of colonization by non-native invasive species. Road construction and maintenance activities have been identified as a primary threat to the small whorled pogonia, as these activities tend to impact viable populations (seed dispersal barriers) and suitable habitat for the species (USFWS, 1994b). During operation, temporary unsurfaced roads have the potential to cause soil erosion; however, after use, they are water barred, seeded, and allowed to revert back to vegetative cover to prevent erosion after closing. Similarly, standards and guidelines call for measures to reduce erosion on riparian systems when building roads or trails that cross streams and requires filterstrips for roads built parallel to riparian systems. Forest-wide standards and guidelines would provide for prevention and control of non-native invasives during construction activities, and would allow for treatment of non-natives in areas where there is a high potential for spread.
- When regenerating native pine, the forest floor must be opened to full sunlight and soil must be exposed so that native pine seeds can germinate and survive. In most cases, soil disturbances from logging or removal of leaf litter during prescribed fire will be enough to allow seeds to contact soil. However, in certain sites it may be necessary to scarify the soil (**site prep**) to facilitate the appropriate environment for seed germination. The objective is to create small, scattered patches of exposed soil, but ground cover would remain on 75 percent or more or the treatment area. Since potentially suitable habitat may be available in pine stands, such actions could directly disturb undiscovered populations. This activity could also encourage the establishment of NNIS, which could indirectly affect undiscovered populations or could degrade habitat quality.
- **Road decommissioning** activities may have initial effects on suitable habitat similar to road construction, but over the long-term road closures may increase the acres of suitable for small whorled pogonia on the WNF.

- **Construction of recreation facilities** (e.g. parking lots) may involve clearing and grading sites and the use of heavy machinery. Such developments could result in the permanent loss of suitable habitat for the small whorled pogonia. A maximum of 50 acres is projected over the first decade for recreation facility construction. The small amount of forest cleared for recreation facilities combined with the likelihood of suitable pogonia habitat occurring would make the potential for permanent loss of habitat low.
- **Construction of hiking, horse, biking and OHV trails** is projected to occur over the next decade. Construction of designated OHV trails would likely involve the use of heavy equipment, which may have similar impacts on potential small whorled pogonia habitat as described for road construction. Non-motorized recreational trail construction may involve either hand tools or heavy machinery.
- **Use of designated trails** could result in soil compaction and erosion, which may contribute to increased sedimentation in streams. As small whorled pogonia habitat can be located near streams, trail use may affect potential stream bank habitat for this species. However, each alternative incorporates measures to minimize potential impacts. Normal drainage control on designated trails would be provided by water bar installation and lead-off ditching, with the use of side ditching where necessary. In addition, OHV designated trails will be inspected twice a year, and necessary erosion control measures implemented. Construction and use of trails will also increase the probability for non-native invasive species introduction and spread along the corridors. Forest-wide standards and guidelines provide for prevention and control of non-native invasives during construction of trails, and allow for treatment of non-natives in areas where there is a high potential for spread (Forest-wide objective 7.2b).
- **Even-aged vegetation management** (clearcut, shelterwood, thinning and two-aged harvest methods) results in the removal of all or most trees in areas ranging from 2-30 acres in size, exposing the area to full sun conditions. Changes in light intensities reaching the forest floor could cause the herbaceous layer to flourish and result in more competition and shading, and temporarily reducing the quality of suitable habitat for the small whorled pogonia (USFWS, 1992a). These effects are short-term in nature because the treated stands would regenerate to closed canopy conditions over time. Alternative E_{mod} incorporates Forest-wide standards and guidelines that require low growing flowering and fruiting trees under six inches in diameter not be cut during even-aged harvest unless the amount left would inhibit natural regeneration of tree species (VEG-12). These remaining trees may provide some shade

in these areas, and minimize impacts on pogonia habitat. Other Forest-wide standards and guidelines also require the assessment of non-native species threats during project planning and the use of prevention and control measures during and after project implementation (FH-1).

- **Uneven-aged harvest** has the potential to temporarily benefit small whorled pogonia habitat by increasing light penetration to the forest floor. Since the species often likes to grow near breaks in the canopy (USFWS, 1992a), canopy removal could be beneficial until trees grow fill in light gaps.
- Both **uneven- and even-aged vegetation management** activities may temporarily impact small whorled pogonia habitat due to vegetation removal, soil disturbance and compaction, erosion and increased susceptibility of areas to NNIS invasion and establishment. All skid trails and log landings are temporary in stature; these areas are rehabilitated after use to control any erosion or NNIS concerns. Alternative E_{mod} incorporates measures to address non-native invasive species establishment and spread during construction activities. Roads, skid trails and log landings associated with timber removal could provide breaks in the overstory canopy and benefit the pogonia initially until canopies recover.
- **Mineral exploration and development** is on-going throughout the WNF, and will continue as long as the demand for oil and gas remains high. Removal of vegetation and topsoil required for the construction of access roads, well pads, and pipeline corridors during oil and gas activities may temporarily affect suitable habitat the same as road and trail construction. No Surface Occupancy restrictions for USA-owned minerals are in place on the FOF, CA, SA, RNA, DR and TRL management areas. Surface occupancy for private mineral rights require mitigation measures including seasonal restrictions, road construction and maintenance requirements, setbacks from streams, marshes and ponds, noise abatement, wildlife coordination, and visual resource coordination. Established Forest-wide standards and guidelines in each of the alternative mitigate the effects of oil and gas exploration and development (i.e., filterstrips, stream crossings, stabilizing disturbed areas, NNIS prevention and analysis, NSO on steep slopes, controlled surface use on riparian areas). Effects from road and well pad construction are long-term since they remain in use until mineral resources are depleted. Once depleted, the operators are required to restore the disturbed areas (Forest-wide objective 10.2a and b, MIN-2, MIN-8).

- **Surface coal mines** would alter and remove surface soils and vegetation, and subsequently degrade existing habitat. Approximately 1,250 acres of NFS land could be affected by surface mining in the future. The Forest Service has no control over this projected activity since private mineral rights are involved, however the Forest Service would work closely with the operator to incorporate as many Forest-wide standards and guidelines into the operation plan. Furthermore, the operator would need to meet all state regulations.
- **Mineral exploration and development** activities may also result in accidental spills of crude oil or brine, which could affect surrounding vegetation, contaminate soils, and cause harmful runoff to streams. However, State of Ohio regulations require a Spill Prevention and Control Countermeasures Plan (SPCC) for mineral development activities. Dikes are required around all wells on the Forest to contain brine in the event of an accidental spill. In addition, the Ohio Environmental Protection Agency (EPA) is required to be contacted immediately upon discovery of an accidental spill. Remedial action for cleanup of water and soil resources will be conducted by the lessee as directed by the Ohio EPA.
- **Reclamation of depleted or orphan wells** requires clearing the immediate area of the well, and would have similar impacts as those for construction for well pads; however, these areas are rehabilitated immediately after well reclamation, and over the long-term closures would benefit the environment by preventing the potential for future leaks or spills from these wells.
- **Prescribed fire** is used on the WNF to control hazardous fuel build-up, to promote oak-hickory regeneration and to control non-native invasive species. Creation of firelines using bulldozers for prescribed fire activities could result in soil disturbance, soil compaction, removal of vegetation and increased susceptibility for invasion by NNIS, whereas firelines constructed by hand only affect the litter layer. Forest-wide standards and guidelines incorporated into Alternative E_{mod} emphasize the use of existing roads and fire breaks to avoid constructing fireline (FIRE-7). Firelines would be rehabilitated after burns (e.g. water diversions, seed and mulch), to prevent long-term erosion impacts. Fire will reduce understory cover resulting in a more open habitat that could benefit habitat for the small whorled pogonia in the short-term, and if areas are burned repeatedly, the benefit could be long-term. Mosaic pattern burning is encouraged (GFW-WLF-2).
- The increased density of forests, combined with fire suppression and natural disturbances, has led to an increase of woody material

on the forest floor. **Treatment of hazardous fuels** would occur primarily in stands where fuels are greatest, often in pine stands. The work would involve the lopping and scattering of woody material on the ground. However, it is possible that a leaning or standing tree would be felled and bucked up or removed, either as part of the fuels reduction work or to protect workers from a potential hazard tree. Increased light penetration due to tree removal could benefit pogonia, as could the increase in wood litter that would decay overtime. Construction of roads, trails and landings during hazard fuel treatment projects would have similar impacts as those discussed in roads and trails.

- **Utility corridor construction and maintenance** is similar in impacts to habitat as road and trail construction, since vegetation will be removed and soil compaction from heavy machinery use may occur. Filterstrip requirements would protect riparian habitat. Over the long-term, these semi-permanent breaks in the canopy could create small whorled pogonia habitat along corridor edges.
- **Small lake and pond construction** would occur for wildlife habitat and to enhance recreation on the WNF. Constructing an impoundment on a stream and flooding the upgradient streambanks could affect potential habitat. However, most ponds constructed in the past were a result of reclamation efforts on the Forest. Projections are to create 15 acres of small lakes or ponds over the next decade.
- Areas targeted for **acid mine drainage treatment** often have a history of underground and surface mining that has restricted or altered natural water flows. Often these mine drainages result in barren soils unable to support vegetation due to highly acidic soils. Treatment of acid mine drainage may involve large amounts of soil movement and disturbance to restore surface drainage. The construction and heavy equipment involved could impact suitable pogonia habitat. However, these areas have undergone severe disturbance in the past often limiting their ability to provide quality habitat for this species. Over the long-term, restoring drainage within these areas will restore riparian characteristics to these areas, improve water quality, create canopy breaks over drainages, and improve habitat quality for small whorled pogonia. Approximately 270 acres are expected to undergo acid mine treatment in the first decade.

Cumulative Effects of the Selected Alternative

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 the action area are forested

(Ohio Land Use Cover, based on Landsat TM 1994). Riparian corridors are primarily forested (i.e., 72.5 percent) (National Landcover Database, 1992).

These reforestation trends have benefited small whorled pogonia by increasing potential shaded habitat and improving water quality conditions within the WNF. Accumulation of forested lands, with litter and decaying matter, has replaced full sunlight, barren soils of the past.

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 for, or existing populations of, the small whorled pogonia, should it occur. 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.

Land exchanges and acquisitions to consolidate federally managed land in these areas may result in the revegetation of acquired lands with mining and agricultural histories. Water quality of nearby streams would improve as runoff into these streams would be reduced. Since shaded forests are the preferred habitat of small whorled pogonia, land consolidation may increase the amount of potential habitat for the pogonia and improve the quality of that habitat.

Any potential adverse cumulative effects that may occur as a result of implementing Alternative E_{mod} would be mitigated through the implementation of the protective Forest-wide standards and guidelines.

Determination of Effect and Rationale

A **No Effect** determination is proposed for the small whorled pogonia. This determination is based on the fact that there are currently no known populations of the pogonia within the WNF. The closest known populations are located in Hocking County, which contains lands within the Athens Unit of the Forest, and Scioto County, which contains lands within the Ironton Unit.

A **Not Likely to Adversely Affect** determination is made for pogonia habitat (Table 26). This determination is based on:

- While small whorled pogonia is not known to occur within the action area, suitable habitat does exist;
- Alternative E_{mod} incorporates beneficial management activities that would protect, restore and create suitable habitat for the small whorled pogonia;

- Forest-wide goals, and objectives promote healthy watershed conditions;
- Forest-wide standards and guidelines ensure proper pesticide use on the Forest;
- While ground disturbance will occur during management implementation, Forest-wide standards and guidelines minimize erosion, stabilize disturbed areas, and minimize adverse effects from non-native invasive species;
- Plant surveys will be conducted on lands affected by land exchange, surface-disturbing activities and vegetation removal.

Table 26. Summary of effects determinations for small whorled pogonia.

Projected Management Activity	Alternative E_{mod}
Vegetation Management	
Even-aged Hardwood Timber Harvest	I
Even-aged Pine Timber Harvest	I
Uneven-aged Timber Harvest	I
Thinning	I
Crop Tree Release	B
Grape Vine Control	B
Site Prep for Native Pine	I
Reforestation	B
Prescribed Fire	I
Herbicide Application	D
Development of Permanent Forest Openings	D
Maintenance of Permanent Forest Openings	N
Control of Non-Native Invasive Species-Mechanical	B
Control of Non-Native Invasive Species-Biological	B
Wetland Restoration & Enhancement	N
Waterhole Construction	D
Fishing Pond/Lake Construction	I
Restoration & Improvement of Aquatic/Riparian Habitat (Lentic)	N
Restoration & Improvement of Aquatic/Riparian Habitat (Lotic)	B
Installation of Bat-Friendly Gates on Mines	D
Recreation Management	
OHV Trail Construction	I
Hiking Trail Construction	I
Horse Trail Construction	I
Mountain Bike Trail Construction	I
Recreation Facility & Parking Lot Construction	I
Transportation Management	
Temporary Road Construction	I
Permanent Road Construction	I
Permanent Road Reconstruction	I
Road Decommissioning	I
Disturbance related to Timber (Skid Trails, Landings)	I
Energy Minerals Management	
Surface Coal Mining Activities	I
Reclamation of Depleted or Orphan Wells	I
Oil & Gas Well Development	I
Special Uses Management	
Utility Corridor Development & Maintenance	I
Agricultural Crop Production & Grazing	N
Watershed Management	
Treatment of AMD	I
Surface Mine Reclamation	B
Closure of Open Mine Portal/Subsidence	I
Stabilization of Disturbed Areas	B
Fire Management	
Reduction of Hazardous Fuels - Mechanical	I
Lands Acquisition Management	
Land Acquisition	B
Land Exchange	D
N = No Effect; **B** = Not Likely to Adversely Affect, Beneficial Effects; **I** = Not Likely to Adversely Effects, Insignificant Effects; **D** = Not Likely to Adversely Affect, Discountable Effects; **A** = Likely to Adversely Affect	

Virginia Spiraea

Status of the Species

Species Description

Rangewide

Courtesy: West Virginia Nongame Wildlife and Natural Heritage Program

Virginia spiraea was listed as a federally threatened species by the U. S. Fish and Wildlife Service on June 15, 1990. The range of the Virginia spiraea spans from Pennsylvania and Ohio south to Georgia and Tennessee (Walton, 1995). Historically, Virginia spiraea has been found in Georgia, Kentucky, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia within the Blue Ridge or Appalachian Plateau provinces in the Ohio River Basin (USFWS, 1992b; 1990b). In 1992, the species had 31 populations along streams in seven states, including West Virginia, Virginia, Tennessee, North Carolina, Ohio, Kentucky, and Georgia (USFWS, 1992b).

Species Range in Ohio

Common Name: Virginia spiraea
Scientific Name: *Spiraea virginiana*
Family: Rosaceae -- Rose family
Groups: Plants, Flowering Plants
Current Status: Threatened
Lead Region: 5
Date First Listed: June 15, 1990
Critical Habitat: None
Special Rules: None
Recovery Priority: 8
Approved Recovery Plan? Yes
Federal Register Citation Numbers: First Listing--389, Current Status--389
Historic Range: GA, KY, NC, OH, PA, TN, VA, WV
This Status Likely To Occur In: GA, KY, NC, OH, PA, TN, VA, WV

Source: USDI Fish and Wildlife Service

Occurrences of the Virginia spiraea in Ohio are displayed in Figure 14. In 1991, the southeastern portion of Ohio, including portions of all three units of the WNF, was surveyed for the Virginia spiraea (Stine, 1993). Four populations of Virginia spiraea were found along Scioto Brush Creek in Scioto County, Ohio. Three of these populations were found between the communities of Otway and Arion. The fourth population was discovered in close proximity to an island between the community of McDermott and the mouth of the Scioto Brush Creek

(Stine, 1993). Although Scioto County, Ohio, contains NFS land, no new populations were found within the action area.

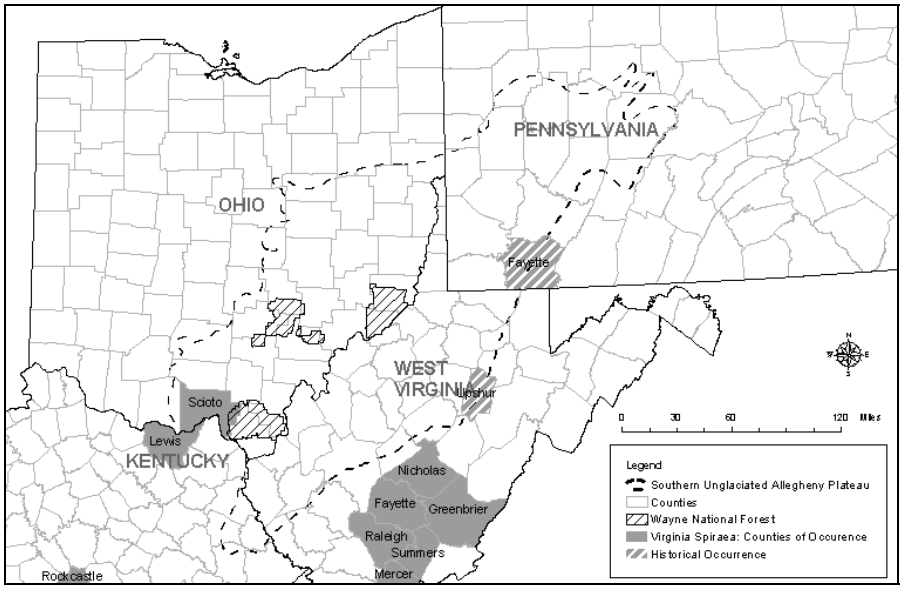


Figure 14. County occurrences of Virginia spiraea in the Southern Unglaciated Allegheny Plateau.

Life History

The Virginia spiraea, a member of the rose family (Rosaceae), is a perennial flowering shrub with a modular growth pattern. This growth pattern may exhibit many genetically identical, but phenotypically different, "forms," which are determined by age and environmental conditions. These various phenotypic forms have contributed to identification problems with this species (Ogle, 1991).

Virginia spiraea produces showy, tightly packed, white to cream-colored flowers, and ranges in size from two to ten feet tall (USFWS, 1990b). Flowering typically occurs in June and July. Virginia spiraea stems are sparsely branched and either upright (up to 4 feet) or arching (Walton, 1995). Larger stems appear grayish in color, while younger stems are greenish-yellow to reddish-brown. Leaves of Virginia spiraea are simple and alternate, varying widely in shape, size, and degree of serration.

According to the recovery plan (USFWS, 1992b), Virginia spiraea reproduces primarily asexually, through fragmentation of rhizomes or clones, which are generally separated during high water events and washed downstream. Young vigorous plants often send out long lateral rhizomes, but slightly older plants sprout prolifically to form a dense clump. The species flowers are visited by a host of insects, most

commonly beetles. Flowers may abort without producing follicles, particularly if the water supply is inadequate.

Additionally, Virginia spiraea may have impaired and limited reproductive capacity. Few seeds collected from research sites have germinated. Research indicates that spiraea seeds germinate best in water or mineral soils (USFWS, 1990b). Existing plant populations may be represented by only one genotype within a single drainage, thereby making it difficult for the plant to sexually reproduce and widely establish (55 Fed. Reg. 24,242 (June 15, 1990)). Genetic studies are currently underway to understand the genome of the species. Cross pollination between cultivated clones from different localities have resulted in viable seeds, whereas seeds obtained from plants pollinated by plants at the same locality tend to be abortive, and have low germination rates (Walton, 1995).

The seeds of this species are small and are produced at only a few known localities in the wild. Seed dispersal can occur by wind and water (USFWS, 1992b). Experts believe that the paucity of seed production may be due to having only one genome present at any given locality; when clones from different localities are grown together, they fruit prolifically and produce seed.

Population Dynamics

NatureServe (2005) has given a global rank of G2 and a national rank of N2 to Virginia spiraea: (G2) Imperiled – At high risk of extinction due to a very restricted range, very few populations (often 20 or fewer), steep declines, or other factors; (N2) Imperiled – Imperiled in the nation due to a very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation.

Status and Distribution

Virginia spiraea was listed as threatened because of its small population size, the paucity of sexual reproduction and dispersal, and manipulation of riverine habitat (USFWS, 1992b). Little population expansion has been reported, and most of the extant populations consist of just a few clumps; fewer than 30 different genotypes are thought to exist (NatureServe, 2005).

Threats to the Species

Virginia spiraea is threatened by alteration of riverine habitats, small population size, and a low level of sexual reproduction and dispersal (USFWS, 1992b). However, human activities, especially reservoir construction, are the principal cause of the destruction of Virginia spiraea habitat. Both flood control and inundation caused by dams,

impoundments, and other water stabilization and improvement projects eliminate plant populations (USFWS, 1990b). Rising water destroys clones and washes propagules downstream. Watershed clearing and water diversions have destroyed Virginia spiraea habitat, as have road construction and maintenance activities. Natural factors, such as insect damage caused primarily by aphids and caterpillars, have also impacted the species. However, damage caused by insects is only evident at a few locations (USFWS, 1992b). Several species of non-native plants such as the Japanese knotweed (*Polygonum cuspidatum*), Chinese privet (*Ligustrum sinense*), and multiflora rose (*Rosa multiflora*) also aggressively compete with the native Virginia spiraea.

One of the threats to West Virginia populations of Virginia Spiraea that we see at almost all sites is damage to individual plants and to their habitat by recreational users of the rivers upon which they occur. Populations along the Gauley, Meadow, Bluestone, Greenbrier, and Buckhannon Rivers are being impacted by the clearing of riverside sites for fishing, camping, and rafting. Overuse by hikers, fishermen, and boaters have resulted in breakage of the fragile stems of these plants (WVDNR, 1998).

Environmental Baseline

Status of the Species in the Action Area

Species Range in the Action Area

Field surveys for this species have been completed in parts of the action Area, in association with NFS land management projects. In addition, stream survey crews were taught how to recognize this species so they could look for it during fish and mussel surveys along the Little Muskingum River, Symmes Creek, and Pine Creek. To date, surveys have not resulted in the discovery of Virginia spiraea on NFS lands. The closest county having occurrences is Scioto, but populations are outside the action area.

Suitable Habitat within the Action Area

Habitat providing favorable growth conditions for the Virginia spiraea may occur in some locations within the WNF. The plants are 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 (USFWS, 1992b). Virginia spiraea prefers disturbed or geologically active areas where erosion, deposition, and scouring inhibit competition of other woody plant species (USFWS, 1992b). Disturbance, usually by flooding and scouring, are essential to the survival of the plant. The species root system allows it to inhabit areas of appropriate disturbance (USFWS, 1992b). The riverine areas in which the Virginia spiraea tends to occur are not, however, sites of maximum

erosion. Such areas are typically sites where deposition occurs after high water flows, such as overwash islands and floodplains (Ogle, 1991).

The habitat of the species is often disturbed early successional areas. Its many associates are usually determined by their availability to recolonize after a disturbance (USFWS, 1992b). Competition with aggressive colonizing species appears to be one of the most important variables related to the persistence of the species in these disturbed habitats. This is a species that was once more widespread and probably occurred more frequently during and near glaciation when tree competition was much reduced, and erosion was more severe and widespread (Ogle, 1991). Regular flooding and scour are important in reducing competition for the species. The scour must be severe enough to collapse the larger trees and wash out the smaller vegetation, without being so severe as to wash out the shrub's fibrous roots or its lateral rhizome (USFWS, 1992b).

In Ohio, Virginia spiraea generally occurs along the banks of streams associated with sandstone bedrock that is subjected to scouring during flooding, and on gravel bars that have riparian debris. In Ohio, it is associated with a variety of species, a sample of which includes: sugar maple, southern blue monkshood (*Aconitum uncinatum*), royal fern (*Osmunda regalis*), trumpet creeper (*Campsis radicans*), fowl mannagrass (*Glyceria striata*), Canadian clearweed (*Pilea pumila*), lizard's tail (*Saururus cernuus*), and American basswood (*Tilia Americana*) (Walton, 1995).

In places, the mainstem of Symmes Creek exhibits several characteristics common to the preferred habitat of the Virginia spiraea. Regular flooding and scouring occurs along the creek, particularly on the outside of bends. Areas of forested land and open agricultural land surround the banks of Symmes Creek, providing an alternate pattern of shaded and full sun conditions.

Factors Affecting Species Environment within the Action Area

The Virginia spiraea has not been found within the action area to date, however potentially suitable habitat exists. For the most part, state and local governments conduct some form of field review prior to implementing projects, but private landowners generally do not. Some activities occurring on private lands could affect potentially suitable habitat or undiscovered populations of Virginia spiraea, such as woodland grazing, construction of homes, timber harvesting, stream channel modifications, and energy minerals development. These activities are ongoing within the action area.

Ongoing State, local, or private actions occurring in close proximity to streams that could affect this species may include earth disturbing activities that result in sedimentation of aquatic habitat (e.g., road

construction, streambank modifications, dredging). Activities that occur within the Ohio River or streams are generally regulated by the Corps of Engineers and State environmental agencies, therefore effects from these activities are often reduced or eliminated.

Please refer to *Factors Affecting Species Environment* for the Indiana bat for a description of ongoing activities in the action area that affect forest conditions.

Beneficial activities are occurring and will likely continue to occur as the proposed action is implemented. These include plant surveys on NFS lands, state properties and lands administered by The Nature Conservancy; reforestation activities on NFS lands, state properties and on private lands; and watershed improvement activities on NFS lands, state properties and on private lands (through programs administered by the Corps of Engineers, Natural Resources Conservation Service).

Direct and Indirect Effects of the Selected Alternative on Virginia Spiraea

Activities with No Effects

Several management activities projected to occur in the first decade of implementation of Alternative E_{mod} would have no effect Virginia spiraea or its habitat.

- The Forest Service uses prescribed fire and mowing on the WNF to **maintain wildlife openings**. While a wildlife opening could occur near a riparian habitat that supports spiraea or its habitat, the opening would have a buffer strip between it and any streams. Therefore, maintenance of these areas would not impact this species or its habitat.
- **Creation of permanent wildlife openings** historically involved the removal of trees from forested areas, however, today Forest Service managers would rely primarily on the designation of existing open land on acquired properties to serve as permanent forest openings (e.g. old home sites, agricultural fields) (WLF-5). Similarly, development of agreements with utility companies is pursued to manage utility corridors as quality permanent forest openings (WLF-4). Creation or designation of permanent wildlife openings would not occur in high gradient stream habitat.
- **Small lake and pond construction** would occur for wildlife habitat and to enhance recreation on the WNF. Constructing an impoundment would only occur on intermittent or headwater streams, not on large streams where this species would occur.

- **Restoration of lakes and ponds** primarily involves projects to improve aquatic species habitat (e.g., placing underwater habitat structures) and would not impact streamside habitat.
- **Waterhole construction** will occur in forested areas already disturbed by other project activities. Since these activities are small in scope, and do not occur within riparian habitat, they will have no impact on Virginia spiraea habitat.

Activities Not Likely to Adversely Affect: Beneficial Effects

Activities conducted on the WNF that have the potential to protect and promote suitable habitat for the Virginia spiraea include those which would protect or improve riparian habitats to maintain natural waterflows and reduce sedimentation. There are no known populations of the Virginia spiraea on the WNF; however, there may be yet undiscovered populations that exist on NFS lands. Management activities occurring on NFS lands that would benefit potential habitat for the Virginia spiraea would also benefit populations of the species, should they occur.

- **Control of non-native invasive species** (NNIS) by mechanical and biological means would protect ecosystem integrity and prevent habitat degradation, thus protecting potential habitat for Virginia spiraea from aggressive competitors.
- **Surface mine reclamation** and **stabilization of disturbed areas** would involve erosion control and planting to return areas to forested conditions. These activities, over time could improve water quality and natural stream flow and improve habitat for the spiraea.
- C**rop tree release** and **grape vine control** involve the manual treatment of individual vines and trees in young (15-25 years old), even-aged stands by ground crews. The low soil impact from these operations would not affect water quality. Removal of competitive trees and shading within riparian areas could improve habitat for the species.
- Areas targeted for **acid mine drainage treatment** often have a history of strip mining that has restricted or altered natural water flows. Virginia spiraea requires high gradient streams for habitat and would not likely occur in areas targeted for AMD treatment. Over the long-term, restoring drainage within these areas will restore riparian characteristics to these areas, and improve water quality, which could have secondary beneficial impacts on downstream potential spiraea habitat. Approximately 270 acres are expected to undergo acid mine treatment in the first decade.
- **Restoration and improvement of stream habitat** includes projects such as bank stabilization and culvert repairs to decrease

sedimentation and improve habitat quality for Virginia spiraea along streambanks. Tree planting activities to provide bank stabilization along streams could decrease sedimentation, improving stream quality and spiraea habitat.

- **Reforestation** tends to occur on open lands, such as agricultural fields or reclaimed strip mine areas. Reforestation of partially-forested areas does not typically occur on the Forest. Reforestation could improve water quality by decreasing erosion and sedimentation in streams. Reforestation would not occur within suitable habitat for the species, and therefore would not present a competition concern. Increasing watershed health would benefit this species.
- **Wetland restoration and enhancement activities** often occur in bottomland areas that have been tiled or ditched to promote agricultural use. Wetlands restoration and enhancement activities occur outside of stream channels and are constructed to restore wetlands where they originally occurred. The restoration of wetlands in areas where they were historically drained, would increase watershed health and benefit stream habitat and the Virginia spiraea.
- **Land acquisition** can be beneficial when private lands containing known population of federally-listed or potential habitat for a federally listed species are transferred into public ownership. Protection and management of these areas would become a federal responsibility assuring long-term protection of the habitat or species.

Activities Not Likely to Adversely Affect: Discountable Effects

There are no known populations of Virginia spiraea on the WNF. However, there may be undiscovered populations, or potential habitat, that could be impacted by activities that occur on the Forest. These activities have discountable effects on potentially suitable habitat, which are effects that are extremely unlikely to occur.

- **Herbicides** would be used to eliminate shade tolerant tree species to promote oak/hickory forests, to control non-native invasive species, and to control nuisance plants (e.g. poison ivy) around recreation sites. Use of herbicides for these activities will primarily involve selective, spot spraying to avoid affecting non-target vegetation. Alternative E_{mod} incorporates Forest-wide standards and guidelines emphasize proper use of herbicides to protect non-target vegetation (FH-17, FH-18, FH-19, FH-20, and FH-21). Although selective vegetation management is preferred for utility or other rights-of-way or easements, broadcast use of herbicides

may be permitted with written Forest Supervisor approval. Aerial spraying of herbicides is conducted on utility corridors that have outstanding rights on the Forest. Following standards and guidelines for herbicide usage would reduce the potential for herbicides to drift onto suitable spiraea habitat.

- Forest-wide direction protects streamside and instream habitat from upland activities (GFW-ARR-2, GFW-ARR-3, GFW-ARR-5, and GFW-ARR-6), therefore the potential for **site prep for native pine** activities to directly or indirectly affect this species or its habitat is unlikely.
- **Exchanging NFS lands** with other owners may affect the Virginia spiraea if land is transferred out of federal ownership that contains potential habitat for the species. However, since assessments of all land exchanges by biologists occur before action is taken, the chance of exchanging a tract with spiraea is unlikely. The amount of land exchanged over a decade is only projected to be 400 acres. Conversely, land exchange could benefit the species by exchanging unsuitable lands for those with suitable habitat.

Activities Not Likely to Adversely Affect: Insignificant Effects

The following activities are expected to have insignificant effects on potentially suitable habitat. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs.

- **Road and trail construction, and use**, may result in soil disturbance, erosion and sedimentation. Construction and use also increases the susceptibility for NNIS invasion which could degrade habitat for or directly compete with Virginia spiraea. Alternative E_{mod} incorporates standards and guidelines to reduce erosion on riparian systems when building roads or trails that cross streams, and include filterstrips for roads built parallel to riparian systems. These Forest-wide standards and guidelines also provide for prevention and control of non-native invasives during construction activities, and allow for treatment of non-natives in areas where there is a high potential for spread (Forest-wide Objective 7.2b).
- **Timber harvesting** (even and uneven aged methods) involves the felling of trees, removal of trees to a landing and transport off-site. These activities will result in soil disturbance and may have erosion and sedimentation into streams and an increased susceptibility of NNIS invasion. However, filterstrips minimize the potential for sediment introduction into streams. While timbering activities could take place in riparian areas, it would not occur within the stream channel or on stream islands that contain suitable spiraea habitat. Standards and guidelines also require the assessment of non-native species threats during project planning

and the use of prevention and control measures during and after project implementation (FH-1).

- **Mineral exploration and development** is on-going throughout the Forest, and will likely continue as long as the demand for oil and gas remains high. Removal of vegetation and topsoil required for the construction of access roads, well pads, and pipeline corridors during oil and gas activities would have similar impacts as road and trail construction. These activities could contribute to increased sedimentation and runoff to streams. No Surface Occupancy restrictions for USA-owned minerals are in place in the FOF, CA, SA, RNA, DR and TRL management areas. Surface occupancy for private mineral rights may require site-specific seasonal construction restrictions, road construction and maintenance requirements, setbacks from streams, marshes and ponds, noise abatement, wildlife coordination, and visual resource coordination. Established Forest-wide standards and guidelines mitigate the effects of oil and gas exploration and development (i.e. filterstrips, stream crossings, stabilizing disturbed areas, NNIS prevention and analysis, NSO on steep slopes, controlled surface use on riparian areas). Effects from road and well pad construction are long-term since they remain in use until mineral resources are depleted. Once depleted, the operators are required to restore the disturbed areas (Forest-wide objective 10.2a and b, MIN-2, MIN-8).
- **Surface coal mines** would alter and remove surface soils and vegetation, and subsequently degrade existing habitat. Approximately 1,250 acres of NFS land could be affected by surface mining in the future. The Forest Service has no control over this projected activity since private mineral rights are involved, however the Forest Service would work closely with the operator to incorporate as many Forest-wide standards and guidelines into the operation plan. Furthermore, the operator would need to meet all state regulations.
- **Mineral exploration and development** activities may also result in accidental spills of crude oil or brine, which could affect surrounding vegetation, contaminate soils, and cause harmful runoff to streams. However, State of Ohio regulations require a Spill Prevention and Control Countermeasures Plan (SPCC) for mineral development activities. Dikes are required around all wells on the Forest to contain brine in the event of an accidental spill. In addition, the Ohio Environmental Protection Agency (EPA) is required to be contacted immediately upon discovery of an accidental spill. Remedial action for cleanup of water and soil resources will be conducted by the lessee as directed by the Ohio EPA.

- **Reclamation of depleted or orphan wells** requires clearing the immediate area of the well, and would have similar impacts as those for construction for well pads, however, these areas are rehabilitated immediately after well reclamation and over the long-term, and closure would benefit the environment by preventing the potential for future leaks or spills from these wells.
- **Prescribed fire** is used on the WNF to control hazardous fuel build-up, to promote oak-hickory regeneration and to control non-native invasive species. Creation of firelines using bulldozers for prescribed fire activities could result in soil disturbance, soil compaction, removal of vegetation and increased susceptibility for invasion by NNIS; however old existing roads are typically used. Firelines constructed by hand only affect the litter layer. Forest-wide standards and guidelines incorporated into Alternative E_{mod} emphasize the use of existing roads and firebreaks to avoid constructing fireline (FIRE-7).
- The increased density of forests, combined with fire suppression and natural disturbances, have led to an increase of woody material on the forest floor. **Treatment of hazardous fuels** would occur primarily in stands where fuels are greatest, often in pine stands. The work involves the lopping and scattering of woody material on the ground. Soil disturbance during cutting and dragging of fuels could cause erosion and increased sedimentation into streams. Construction of roads, trails and landings during hazard fuel treatment projects would have similar impacts as those discussed in roads and trails. Forest-wide standards and goals incorporated into Alternative Emod would protect riparian and soil resources during soil disturbing activities.
- **Utility corridor construction and maintenance** is similar in impacts to habitat as road and trail construction, since vegetation will be removed and soil compaction from heavy machinery use may occur. Filterstrip requirements in Alternative E_{mod} would protect riparian habitat
- **Agricultural activities** occurring on special use agricultural permits may involve the use of pesticides and fertilizers. Use of pesticides and fertilizers on these special use areas could result in harmful stream runoff, depending on how close application is to water bodies. Alternative E_{mod} requires filterstrips be used along all streams to minimize effects from nonpoint source pollution (ARR-5).
- **Livestock grazing** would be permitted on NFS lands except RC, TRL, SA, RNA and CA. Livestock grazing currently occurs on only 6 special use permit areas, approximately 300 acres, on the Marietta and Ironton Units of the Forest. Grazing is restricted to

suitable open land on the Forest; no woodland or brushland will be converted to rangeland. Impacts from grazing could include soil compaction and sedimentation of streams. Alternative E_{mod} incorporates Forest-wide standards and guidelines that require filterstrips be used along all streams to minimize effects from sedimentation (ARR-5). Another guideline requires the use of fencing and placement of salt to protect aquatic resources from livestock impacts (RANGE-4). Very little grazing occurs on the WNF and the potential for this activity to occur on suitable Virginia spiraea habitat is unlikely.

Cumulative Effects of the Selected Alternative

Virginia spiraea populations are threatened by alteration and degradation of stream habitat. In Ohio, it only occurs in Brush Creek in Scioto County, Ohio. Efforts by the Forest Service, other state and federal agencies, conservation organizations, and private landowners continue to result in improved water quality conditions within the planning area. Effects from past mining and other land use activities are being addressed through active restoration projects on public and private lands.

Reforestation trends on WNF have benefited Virginia spiraea by improving water quality conditions along NFS streams and rivers. Reductions in sedimentation have allowed more natural water flows and flooding events that benefit the species.

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 for or existing populations of the Virginia spiraea, should it occur. 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.

Any potential adverse cumulative effects that may occur as a result of implementing the Selected Alternative would be mitigated through the implementation of the protective Forest-wide standards and guidelines.

Determination of Effect and Rationale

A **No Effect** determination is made for Virginia spiraea. This determination is based on the fact that there are currently no known populations of the spiraea in the action area. The closest known population to the Forest is located in Scioto County.

A **Not Likely to Adversely Affect** determination is made for Virginia spiraea (Table 27). This determination is based on:

- While Virginia spiraea is not known to occur within the action area, suitable habitat may exist;
- The Selected Alternative incorporates beneficial management activities that would protect, restore and create suitable habitat for the spiraea;
- Forest-wide goals, and objectives promote healthy watershed conditions;
- Forest-wide standards and guidelines ensure proper pesticide use on the Forest;
- While ground disturbance will occur during management implementation, Forest-wide standards and guidelines are incorporated into all alternative to minimize erosion, stabilize disturbed areas, and minimize adverse effects from non-native invasive species;
- Plant surveys will be conducted on lands affected by land exchange, surface-disturbing activities and vegetation removal.

Table 27. Summary of effects determinations for potential habitat for Virginia Spiraea.

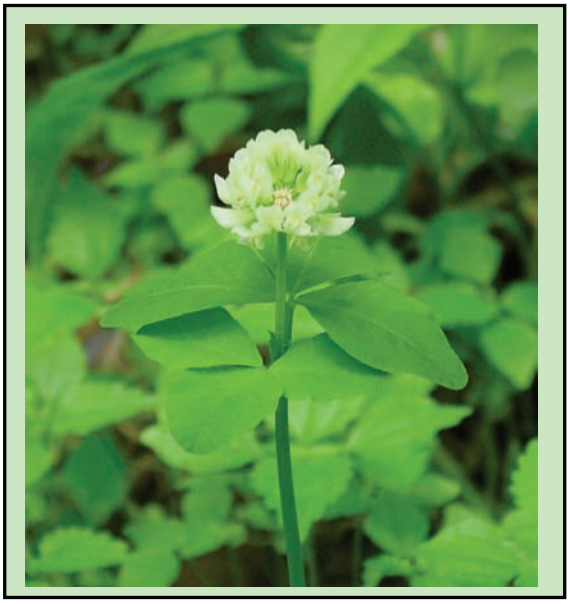
Projected Management Activity	Alternative E_{mod}
Vegetation Management	
Even-aged Hardwood Timber Harvest	I
Even-aged Pine Timber Harvest	I
Uneven-aged Timber Harvest	I
Thinning	I
Crop Tree Release	B
Grape Vine Control	B
Site Prep for Native Pine	D
Reforestation	B
Prescribed Fire	I
Herbicide Application	D
Development of Permanent Forest Openings	N
Maintenance of Permanent Forest Openings	N
Control of Non-Native Invasive Species-Mechanical	B
Control of Non-Native Invasive Species-Biological	B
Wetland Restoration & Enhancement	B
Waterhole Construction	N
Fishing Pond/Lake Construction	N
Restoration & Improvement of Aquatic/Riparian Habitat (Lentic)	N
Restoration & Improvement of Aquatic/Riparian Habitat (Lotic)	B
Installation of Bat-Friendly Gates on Mines	N
Recreation Management	
OHV Trail Construction	I
Hiking Trail Construction	I
Horse Trail Construction	I
Mountain Bike Trail Construction	I
Recreation Facility & Parking Lot Construction	I
Transportation Management	
Temporary Road Construction	I
Permanent Road Construction	I
Permanent Road Reconstruction	I
Road Decommissioning	I
Disturbance related to Timber (Skid Trails, Landings)	I
Energy Minerals Management	
Surface Coal Mining Activities	I
Reclamation of Depleted or Orphan Wells	I
Oil & Gas Well Development	I
Special Uses Management	
Utility Corridor Development & Maintenance	I
Agricultural Crop Production & Grazing	I
Watershed Management	
Treatment of AMD	B
Surface Mine Reclamation	B
Closure of Open Mine Portal/Subsidence	B
Stabilization of Disturbed Areas	I
Fire Management	
Reduction of Hazardous Fuels - Mechanical	I
Lands Acquisition Management	
Land Acquisition	B
Land Exchange	D
N = No Effect; **B** = Not Likely to Adversely Affect, Beneficial Effects; **I** = Not Likely to Adversely Effects, Insignificant Effects; **D** = Not Likely to Adversely Affect, Discountable Effects; **A** = Likely to Adversely Affect	

Running Buffalo Clover

Status of the Species

Species Description

Rangewide



When running buffalo clover was first proposed for listing as a federally endangered species, it was known to be extant at only two sites in West Virginia (51 fed. Reg. 8,217 (March 10, 1986)). Consequently, this species was listed as federally endangered on June 5, 1987 (52 Fed. Reg. 21,478 (June 5, 1987)).

The historic range of the running buffalo clover included Arkansas, Illinois, Indiana, Kentucky, Missouri, Nebraska, Ohio, and West Virginia (USFWS, 1989). Until the mid-1800's this clover ranged from eastern Kansas to West Virginia and was apparently abundant in certain locations, such as the Bluegrass Region of Kentucky (West Virginia Natural Heritage Program, 1990).

Common Name: Running buffalo clover
Scientific Name: Trifolium stoloniferum
Family: Fabaceae -- Pea family
Groups: Plants, Flowering Plants
Current Status: Endangered
Lead Region: 3
Date First Listed: June 5, 1987
Critical Habitat: None
Special Rules: None
Recovery Priority: 2
Approved Recovery Plan? Yes
Historic Range: AR, IL, IN, KS, KY, MO, OH, WV
This Status Likely To Occur In: AR, IN, KY, MO, OH, WV

Source: USDI Fish and Wildlife Service

Until the rediscovery of two small populations of the running buffalo clover in 1985 in West Virginia, the plant was believed to be extinct (USFWS, 1992c). It is currently known from 120 sites in the Appalachian region (West Virginia, southeastern Ohio, and western Kentucky), Bluegrass region (southwestern Ohio, central Kentucky, and Indiana) and in the Ozarks (Missouri) (USFWS, 2005b). A population was discovered in Hamilton County, Ohio in 2004, and populations in Brown and Lawrence counties in 2005 (S. Selbo, personal communication).

In the five states with populations, the populations vary in size from a few individuals covering a few square feet to hundreds of individuals occupying more than a quarter of an acre (USFWS, 1992c).

Species Range in Ohio

At the time the recovery plan for the running buffalo clover was drafted, only eight populations had been discovered in Ohio (Cusick, 1989). As of 2004, there were 17 occurrences in Hamilton, Clermont, and Lawrence counties (S. Selbo, personal communication) (Figure 15). In addition to these 17 sites, there are seven which are considered extirpated (S. Selbo, pers. comm.). A new population was discovered on the Wayne National Forest (Lawrence County) in 2005.

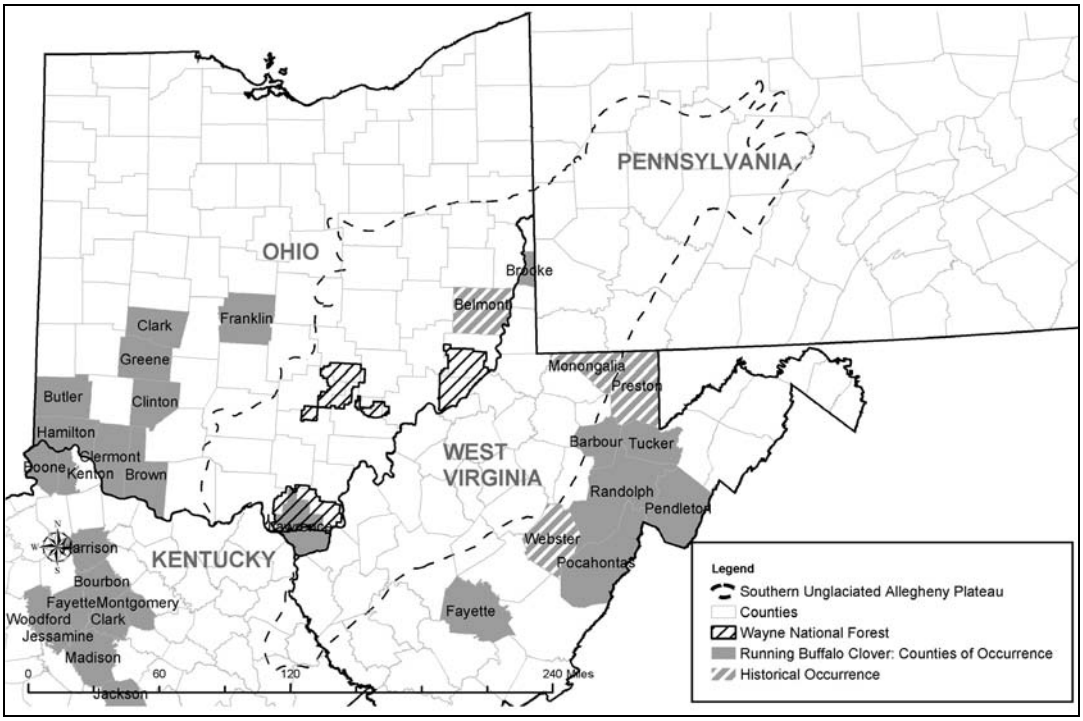


Figure 15. County occurrences of running buffalo clover in the Southern Unglaciated Allegheny Plateau.

Life History

Running buffalo clover is a member of the pea family (Fabaceae), and is one of the four species of clover native to the eastern United States. The erect, flowering stems of the plant, typically three to six inches in height with two leaves near the apex, are topped by a round flower head (USFWS, 1989). Flowering occurs from April to June and the seed heads are visible until August. It has a pair of leaves on the flower stalk, which distinguishes it from most other species of clover.

It is a perennial that forms long runners or stolons that root at the nodes, allowing it to spread and form new plants (USFWS, 1992c). It also spreads by seeds. Scarification of seeds by large herbivores is thought to be important for germination and seed dispersal (USFWS, 1989). The running buffalo clover can be grown from cuttings (USFWS, 1992c).

Growth and development of a the plant varies across its range, but in Ohio it has displayed the following pattern: (May-June) the plant flowers and produces stolons with associated unrooted daughter crowns; (by July) daughter crowns begin to root but remain connected by stolons to the parent plant; (by July) 1st or 2nd year plants are also present; (September) stolons senesce and parent and daughter crowns are no longer connected (S. Selbo, pers. comm.).

Population Dynamics

Running buffalo clover populations can display cyclic patterns of population size and structure, possibly due to weather patterns, management, or other unknown factors (S. Selbo, pers. comm.).

It is pollinated by bees (*Apis* spp. and *Bombis* spp.), and there is evidence that cross-pollination occurs (S. Selbo, pers. comm.). The number of seeds produced by an individual flower head can vary across its range, and by individual plants. Studies on seed production showed ranges from 4-68 seeds per head (S. Selbo, pers. comm.).

NatureServe (2005) has given a global rank of G3 and a national rank of N3 to running buffalo clover: (G3) Vulnerable - at moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors; (N3) Vulnerable—Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

Status and Distribution

Running buffalo clover was listed as endangered because the few known populations were threatened by habitat alteration (USFWS, 2005b). There are 120 known populations.

Threats to the Species

Habitat loss, alteration and degradation are primary threats to this species. This species appears to have been dependent upon the 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.). Direct loss of habitat through urban sprawl and land development is a threat in some parts of its range. Non-native invasive species, including such as white clover (*Trifolium repens*), Japanese stilt grass (*Microstegium vimineum*), garlic mustard (*Alliaria petiolata*), Japanese honeysuckle (*Lonicera japonica*), amur honeysuckle (*Lonicera maackii*), wintercreeper (*Euonymus fortunei*), and periwinkle (*Vinca minor*) pose risks to this species and its habitat (S. Selbo, pers. comm.).

Collection of running buffalo clover, disease, and parasitism pose a minimal threat to this species (S. Selbo, pers. comm.). Herbivory or predation by rabbits, ground hogs, slugs, and white-tailed deer have been reported across its range, however herbivores may also serve as seed dispersers (S. Selbo, pers. comm.).

NatureServe (2005) reported that a 1995 meeting of botanical experts resulted in the following list of the major threats to the species: (1) any irreversible, catastrophic disturbance, such as road construction that completely destroys the habitat and/or kills all plants and seeds within the path of the disturbance; (2) the closing of forest canopies through succession to the point of severe shading, leading to reduced flower and fruit production; (3) loss of habitat through natural or human causes; (4) a reduction of hooved mammals for dispersal of the species' seeds and vegetative fragments, 5) low genetic diversity among populations (6) low population size (less than 30 rooted crowns, or "D-ranked quality" of 41% of the extant occurrences and associated fragility and susceptibility to destruction by vehicle and foot traffic, use of heavy equipment, etc.; (7) a range of viruses that have been observed attacking the species at Missouri Botanical Garden and in introduced populations in Missouri; (8) herbivory by mammals, especially rabbits, groundhogs, etc.; (9) fungal diseases, including "tar spot"; (10) canopy closure causes too much shade, or canopy removal causing too much sunlight; (11) reduction in a plant pollinator (12) competition from non-native invasive plant species, especially from *Microstegium vimineum*, *Trifolium repens*, and *Alliaria petiolata*; (13) over grazing; and (14) disruption of moderate prolonged disturbance.

Environmental Baseline

Status of the Species in the Action Area

Species Range in the Action Area

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 the 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 (*Ulmus americana*) and bitternut hickory (*Carya cordiformis*), provide dappled shading. Canopy cover above this old road section averaged 47±% (measured with a spherical densiometer at four points and in the cardinal directions at each point).

The dominant herbaceous species association with this site include running buffalo clover, Asiatic stilt grass, cat greenbrier (*Smilax glauca*), vetch (*Vicia sp.*), panic grass (*Dichanthelium sp.*), common yellow oxalis (*Oxalis stricta*), poison ivy (*Toxicodendron radicans*), Japanese honeysuckle (*Lonicera japonica*), hairy leafcup (*Smallanthus uvedalius*), common hop (*Humulus lupulus*), sassafras (*Sassafras albidum*), eastern bottlebrush grass (*Hystrix patula*), aster (*Aster sp.*), ragweed (*Ambrosia sp.*), Virginia creeper (*Parthenocissus quinquefolius*), smallspike false nettle (*Boehmeria cylindrica*), common St. Johnswort (*Hypericum perforatum*), white ash (*Fraxinus americana*), black locust (*Robinia pseudoacacia*), tulip poplar (*Liriodendron tulipifera*), common boneset (*Eupatorium perfoliatum*), common moonseed (*Menispermum canadense*), spicebush (*Lindera benzoin*), American lopseed (*Phryma leptostachya*), deertongue (*Dichanthelium clandestinum*), ryegrass (*Elymus sp.*), Carolina elephantsfoot (*Elephantopus carolinianus*), roundleaf greenbrier (*Smilax rotundifolia*), redbud (*Cercis canadensis*), common plantain (*Plantago major*), American elm, bitternut hickory. Asiatic Stilt grass is by far the most dominant species at this site, cover over 75% of the RBC patch.

The old road was recently disturbed during a spring 2005 fire suppression operation, but has since received little traffic. It appears that this trail has not received much illegal OHV traffic in recent years. The fire burned on either side of the old road and may have lightly burned over the road, but there was no direct fire evidence, four months after the fire occurred.

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

Suitable Habitat within the Action Area

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). Ohio populations are found in mesic wooded sites and lawn sites (S. Selbo, pers. comm.).

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).

There is no known correlation between the range of the running buffalo clover and any specific soil type. Soil associations are only weakly correlated with the distribution of the species. However, all of the existing Ohio populations grow in fine-textured, loamy soil of lacustrine or alluvial origin (Cusick, 1989). Most soils on the WNF have a surface texture that is silt loam, loam, or sandy loam. Subsoil textures, however, range from sandy loam to clay.

A survey for the running buffalo clover was conducted in May 1996 on the Ironton Ranger District of the Forest, specifically in Lawrence County, Ohio. A total of 320 acres were surveyed. Approximately 1,500 acres were surveyed in 2003, in Lawrence, Scioto and Gallia counties. The surveys did not result in the discovery of the running buffalo clover on the WNF (R. Boyle, pers. comm.; M. Freidhof, pers. comm.). In 2004, approximately 3,500 acres were surveyed in Lawrence County in preparation for ice storm hazardous fuel treatments. About 1,980 acres were surveyed for this species in 2005.

Factors Affecting the Species Environment within the Action Area

For the most part, state and local governments conduct some form of field review prior to implementing projects, but private landowners generally do not. Some activities occurring on private lands could affect potentially suitable habitat or undiscovered populations of running buffalo clover, such as woodland grazing, construction of homes, timber harvesting, road construction, illegal OHV riding, and energy minerals development. These activities are ongoing within the action area.

Please refer to *Factors Affecting Species Environment* for the Indiana bat for a description of ongoing activities in the action area that affect forest conditions.

Beneficial activities are occurring and will likely continue to occur as the proposed action is implemented. These include plant surveys on NFS

lands, state properties and lands administered by The Nature Conservancy; reforestation activities on NFS lands, state properties and on private lands; and watershed improvement activities on NFS lands, state properties and on private lands (through programs administered by the Corps of Engineers, Natural Resources Conservation Service).

Direct and Indirect Effects of the Selected Alternative on Running Buffalo Clover

Activities with No Effect

Several management activities projected to occur in the first decade of implementation of alternative E_{mod} would have no effect on running buffalo clover or its habitat.

- The Forest Service would use prescribed fire and mowing on the WNF to **maintain permanent forest openings**. Since running buffalo clover prefers partially-shaded habitats, the species would not be expected in these openings. Therefore, no effect from this activity is expected on this species or its habitat.
- **Site prep for native pine** would occur in areas where suitable habitat is not present.
- **Restoration of lakes and ponds** primarily involves projects to improve aquatic species habitat (e.g., placing underwater habitat structures) and would not impact terrestrial habitat.
- **Wetland restoration and enhancement** activities often occur in bottomland areas that have been tiled or ditched to promote agricultural use. Wetlands and open agricultural areas do not provide habitat for this species, and therefore this management activity would not impact the clover.
- **Livestock grazing** would be permitted on NFS lands except in the RC, TRL, SA, RNA, and CA management areas. Livestock grazing currently occurs on only six special use permit areas, approximately 300 acres, on the Marietta Unit and Ironton Ranger District. Grazing is restricted to suitable open land; no woodland or brushland would be converted to rangeland. Since the running buffalo clover prefers forested habitat, grazing activities would not affect this species.

Activities Not Likely to Adversely Affect: Beneficial 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. Management

activities occurring on NFS that would benefit potential habitat for the running buffalo clover in most cases (with the exception of prescribed fire) would also benefit populations of the species.

While suitable habitat for running buffalo clover will be available in every management area, and well-distributed across the WNF, four management areas created to maintain more open stands will improve long-term habitat for this species (however, see discussion of fire in following section). The DCF and DCFO management areas primarily use uneven-aged vegetation management to create structurally diverse and more open forest stands. The HF and HFO management areas primarily use uneven-aged vegetation management combined with prescribed fire to create forest communities with more open understory conditions. The combined disturbances from timber harvesting (e.g. skid trails) with more open light habitats could create the ideal habitat for this species.

Alternative E_{mod} incorporates Forest-wide standards and guidelines that minimize erosion, and stabilize disturbed areas. These standards and guidelines focus on reducing soil erosion and discharge into watercourses and establishing filterstrips for riparian areas to reduce sediments and nutrients entrance into stream habitats. Since running buffalo clover is known to occur along streambanks, these standards and guidelines would help protect potentially suitable habitat.

- **Control of non-native invasive species** (NNIS) by mechanical and biological means would protect ecosystem integrity and prevent habitat degradation, thus protecting potential habitat for running buffalo clover.
- **Restoration and improvement of stream habitat** include projects such as bank stabilization and culvert repairs to decrease sedimentation and improve habitat quality for running buffalo clover. Tree planting activities to provide shade along streams would create partially-shaded habitats favored by the clover.
- **Surface Mine Reclamation** and **stabilization of disturbed areas** would involve erosion control and planting to return areas to forested condition. These activities, over time could create potentially suitable habitat for the running buffalo clover in areas that currently would not support the species.
- **Crop tree release** and **grape vine contro**l involve the manual treatment of individual vines and trees in young, even-aged stands by ground crews. Overtime these activities will create a diverse, semi-shaded forest that could provide potential habitat for running buffalo clover. Currently the dense growth and shading within these stands do not provide suitable habitat for the species.

- **Reforestation** on the WNF tends to occur on open lands, such as agricultural fields or reclaimed strip mine areas. Reforestation of partially-forested areas does not typically occur on the WNF. Since the running buffalo clover prefers partially shaded habitats, conversion of open habitats to forested conditions would provide new potential habitat for this species where it does not currently exist.
- **Uneven-aged vegetation management** removes individual or groups of trees and opens a portion of the canopy. Small openings in the canopy from single tree selection harvests may directly benefit running buffalo clover habitat because the species cannot withstand full-shade environments (Cusick, 1989). Likewise, the moderate disturbance created by skid trails could benefit this species (Madarish and Schuler, 2002). While the removal of timber would improve habitat, the effects of road construction and log landings (discussed in following section) could impact individuals or habitat.
- **Land acquisition** can be beneficial when private lands containing known populations of federally listed species or potential habitat for a federally listed species are transferred into public ownership. Protection and management of these areas would become a federal responsibility, assuring long-term protection of the habitat or species.

Activities Not Likely to Adversely Affect: Discountable Effects

Some activities could have discountable effects on potentially suitable habitat, which are effects that are extremely unlikely to occur.

- **Agricultural activities** occurring on special use agricultural permits may involve the use of pesticides and fertilizers. Use of pesticides and fertilizers in these areas could result in harmful stream runoff, depending on how close application is to water bodies. Since the running buffalo clover does not occur in open lands, run-off would likely become diluted before reaching potential habitat and thus the chance of an adverse effect occurring from agricultural run-off on the species would be unlikely. As added protection, filterstrips would be used along all streams to minimize effects from nonpoint source pollution (ARR-5).
- **Creation of permanent wildlife** openings historically involved the removal of trees from forested areas, however, Forest Service managers would rely primarily on the designation of existing open land on acquired properties to serve as permanent forest openings (e.g. old home sites, agricultural fields) (WLF-5). Similarly, development of agreements with utility companies would be

pursued to manage utility corridors as quality permanent forest openings (WLF-4). While it could occur, it is unlikely a forested area would be converted to a permanent forested opening. If it did, it would most likely occur when a log landing is designated for permanent opening status. Plant surveys are conducted prior to construction of log landings, and therefore it is unlikely that creation of openings in this manner would affect the species.

- **Small lake and pond construction** would occur for wildlife habitat and to enhance recreation on the WNF. Constructing an impoundment on a stream and flooding the upgradient streambanks could affect potential habitat. However, most ponds constructed in the past were a result of reclamation efforts.
- **Waterhole construction** is projected to only involve approximately 15 acres over the next decade. Waterholes are small in size and would likely be built in forested areas already disturbed by other project activities. Tree removal would not likely occur primarily for waterhole construction. The impact of waterhole construction will be discountable since it will occur in areas already disturbed, and of which the other activities (e.g. timber harvest, oil and gas development) will have a larger impact on habitat.
- **Installation of bat-friendly gates** involves the removal of soils around mine openings in order to sink gates below ground surface. Removal of soil in these areas could directly impact any plants or habitat present. However, soils removed during installation are returned afterwards to pre-installation conditions to avoid changing airflows and micro-environments, thus retaining any seedbanks that may exist for the species. Many of the areas impacted by installation are devoid of vegetation due to any combination of dense shade, acid mine drainage, or soil compaction by human use. The small amount of soil disturbance coupled with the small probability of potential running buffalo clover habitat occurring in these areas makes this impact unlikely.
- **Exchanging NFS lands** with other owners may affect the running buffalo clover if land containing the species or its habitat is transferred out of federal ownership. However, since assessments of all land exchanges by biologists occur before action is taken, the chance of exchanging a tract with populations of running buffalo clover is unlikely. The amount of land exchanged over a decade is only projected to be 400 acres. Conversely, land exchanges could benefit the species by exchanging unsuitable lands for those with suitable habitat.

Activities Not Likely to Adversely Affect: Insignificant Effects

The following activities are expected to have insignificant effects on potentially suitable running buffalo clover habitat. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Potential impacts to known running buffalo clover populations, or to potentially suitable habitat, are minimized with implementation of Forest-wide standards and guidelines TES-27 through TES-31.

- **Herbicides** would be used by WNF to eliminate shade tolerant tree species to promote oak/hickory forests, to control non-native invasive species, and to control nuisance plants (e.g. poison ivy) around recreation sites. Use of herbicides for these activities will primarily involve selective, spot spraying to avoid affecting non-target vegetation. Alternative E_{mod} incorporates Forest-wide standards and guidelines that emphasize proper use of herbicides to protect non-target vegetation (FH-17, FH-18, FH-19, FH-20, and FH-21). In addition, a Forest-wide guideline restricts the use of herbicides within 25 feet of known populations. (GFW-TES-29). Although selective vegetation management is preferred for utility or other rights-of-way or easements, broadcast use of herbicides may only be permitted with written Forest Supervisor approval. Aerial spraying of herbicides is conducted on utility corridors that have outstanding rights on the Forest. Following standards and guidelines for herbicide usage would reduce the potential for herbicides to drift onto suitable clover habitat, or an individual.
- **Use of designated trails** could result in soil compaction and erosion, which may contribute to increased sedimentation in streams. As running buffalo clover habitat can be located near streams, trail use may affect potential stream bank habitat for this species. However, Alternative E_{mod} incorporates measure to minimize potential impacts. Normal drainage control on designated trails will be provided by water bar installation and lead-off ditching, with the use of side ditching where necessary. In addition, OHV designated trails will be inspected twice a year, and necessary erosion control measures implemented. Construction and use of trails will also increase the probability for non-native invasive species introduction and spread along the corridors. Forest-wide standards and guidelines provide for prevention and control of non-native invasives during construction of trails, and allow for treatment of non-natives in areas where there is a high potential for spread (Forest-wide Objective 7.2b). Conversely, if trails are free of NNIS, provide for semi-permanent breaks in the forest canopy that the species likes, and therefore could benefit clover habitat.

- The increased density of forests, combined with fire suppression and natural disturbances, has led to an increase of woody material on the forest floor. **Treatment of hazardous fuels** will occur primarily in stands where fuels are greatest, often in pine stands. The work would involve the lopping and scattering of woody material on the ground. However, it is possible that a leaning or standing tree would be felled and bucked up or removed, either as part of the fuels reduction work or to protect workers from a potential hazard tree. Increased light penetration due to tree removal could benefit running buffalo clover habitat. Construction of roads, trails and landings during hazard fuel treatment projects would have similar impacts as those discussed in roads and trails.
- **Utility corridor maintenance** of existing corridors, over the long-term, could provide semi-permanent breaks in the canopy, but maintained corridors themselves are not likely to be considered as suitable habitat for this species.
- Areas targeted for **acid mine drainage treatment** often have a history of underground and surface mining that has restricted or altered natural water flows. Often these mine drainages result in barren soils unable to support vegetation due to highly acidic soils. Acid mine drainage treatments often involve closing mine portals and may involve large amounts of soil movement and disturbance to restore surface drainage. The construction and heavy equipment involved could impact suitable clover habitat. However, these areas have undergone severe disturbance in the past that have removed good topsoil often limiting their ability to provide quality habitat for this species. Over the long-term, restoring drainage within these areas will restore riparian characteristics to these areas, improve soil and water quality, create semi-permanent canopy breaks, and improve habitat quality for running buffalo clover.

Activities Likely to Adversely Affect

There are some activities, or components of activities, projected to occur within the first decade that could negatively impact running buffalo clover. Potential impacts to known running buffalo clover populations, or to potentially suitable habitat, are minimized with implementation of Forest-wide standards and guidelines TES-27 through TES-31.

- Construction of both temporary and permanent **roads** has the potential to affect individuals or potentially suitable habitat. Construction activities involving the use of heavy machinery may result in the direct removal of individuals, or may affect soil compaction and erosion, and may increase the likelihood of colonization by non-native invasive species which could degrade

running buffalo habitat (competition from non-native species has been identified as a primary threat to running buffalo clover). During operation, temporary unsurfaced roads have the potential to cause soil erosion; however, after use, they are water barred, seeded, and allowed to revert back to vegetative cover to prevent erosion after closing. Similarly, standards and guidelines incorporated into Alternative E_{mod} require measures to reduce erosion on riparian systems when building roads or trails that cross streams and providing filterstrips for roads built parallel to riparian systems. Forest-wide standards and guidelines would provide for prevention and control of non-native invasives during construction activities, and allow for treatment of non-natives in areas where there is a high potential for spread. While the heavy construction associated with road development may result in the loss of suitable habitat, over the long-term, road corridors will provide for semi-permanent breaks in the forest canopy that the species requires (USFWS, 1992c), and therefore could benefit clover habitat along edges of roads.

- **Road decommissioning** activities may have short-term effects on suitable habitat similar to road construction, but over the long-term road closures may increase the acres of suitable habitat for running buffalo clover on the Forest by decreasing the amount of Forest acres containing NNIS or that are susceptible to NNIS invasion.
- **Construction of recreation facilities** (e.g. parking lots) may involve clearing and grading sites and the use of heavy machinery. Such developments could result in the disturbance of individuals or the permanent loss of suitable habitat for running buffalo clover.
- **Construction of hiking, horse, biking and OHV trails** is projected to occur over the next decade, as is the construction of developed and dispersed recreation facilities. Construction of OHV trails would likely involve the use of heavy equipment, which may have similar impacts as described for road construction. Non-motorized recreational trails construction may involve either hand tools or heavy machinery.
- **Use of designated trails** could result in soil compaction and erosion, which may contribute to increased sedimentation in streams. As running buffalo clover habitat can be located near streams, trail use may affect potential stream bank habitat for this species. However, Alternative E_{mod} incorporates measures to minimize potential impacts. Normal drainage control on designated trails will be provided by water bar installation and lead-off ditching, with the use of side ditching where necessary. In addition, OHV designated trails will be inspected twice a year, and necessary erosion control measures implemented. Construction and

use of trails will also increase the probability for non-native invasive species introduction and spread along the corridors. Forest-wide standards and guidelines provide for prevention and control of non-native invasives during construction of trails, and allow for treatment of non-natives in areas where there is a high potential for spread (Forest-wide Objective 7.2b). Conversely, if trails are free of NNIS, trails create breaks in the forest canopy that the species likes (USFWS, 1992c).

- **Even-aged vegetation management** (clearcut, shelterwood, thinning and two-aged harvest methods) results in the removal of all, or most, trees in areas ranging from 2-30 acres in size, exposing the area to partial to full sun conditions. Changes in light intensities reaching the forest floor might cause the herbaceous layer to flourish and result in more competition and shading, and may affect undiscovered populations or may temporarily reduce the quality of suitable habitat for running buffalo clover, if such habitat exists prior to cutting. These effects are short-term in nature since the treated stands would regenerate to closed canopy conditions over time. Alternative E_{mod} incorporates Forest-wide standards and guidelines require that low growing flowering and fruiting trees under six inches in diameter not be cut during even-aged harvest unless the amount left would inhibit natural regeneration of tree species (VEG-12). These remaining trees may provide some shade in these areas, and minimize impacts on clover habitat. Other Forest-wide standards and guidelines require the assessment of non-native species threats during project planning and the use of prevention and control measures during and after project implementation (FH-1).
- Both uneven- and even-aged vegetation management activities could affect undiscovered individuals or may temporarily impact running buffalo clover habitat due to **road and log landing construction** which involves soil compaction, erosion and increased susceptibility of areas to NNIS invasion and establishment. All log landings are temporary in stature and are rehabilitated after use to control any erosion or NNIS concerns. Alternative E_{mod} incorporates measures to address non-native invasive species establishment and spread during construction activities. Skid trails can be beneficial to running buffalo clover (Madarish and Schuler, 2002), while roads and log landings could provide short-term breaks in the uneven-age managed canopies and benefit habitat for the clover. A healthy population of running buffalo clover in Hamilton County, Ohio occurs along the perimeters of an old logging road and the canopy break it provides.
- **Mineral exploration and development** is on-going throughout the WNF, and will continue as long as the demand for oil and gas

remains high. Removal of vegetation and topsoil required for the construction of access roads, well pads, and pipeline corridors during oil and gas activities may affect undiscovered individuals or suitable habitat the same as road and trail construction. No Surface Occupancy restrictions for USA-owned minerals are in place in the FOF, CA, SA, RNA, DR and TRL management areas. Surface occupancy for private mineral rights may require seasonal restrictions, road construction and maintenance requirements, setbacks from streams, marshes and ponds, noise abatement, wildlife coordination, and visual resource coordination. Established Forest-wide standards and guidelines in Alternative E_{mod} mitigates the effects of oil and gas exploration and development (i.e. filterstrips, stream crossings, stabilizing disturbed areas, NNIS prevention and analysis, NSO on steep slopes, controlled surface use on riparian areas). Effects from road and well pad construction are long-term since they remain in use until mineral resources are depleted. Once depleted, the operators are required to restore the disturbed areas (Forest-wide objective 10.2a and b, MIN-2, MIN-8).

- **Surface coal mines** would alter and remove surface soils and vegetation, and subsequently degrade existing habitat and possibly affecting undiscovered populations. Approximately 1,250 acres of NFS land could be affected by surface mining in the future. The Forest Service has no control over this projected activity since private mineral rights are involved, however the Forest Service would work closely with the operator to incorporate as many Forest-wide standards and guidelines into the operation plan. Furthermore, the operator would need to meet all state regulations.
- **Mineral exploration and development** activities may also result in accidental spills of crude oil or brine, which could affect surrounding vegetation, contaminate soils, and cause harmful runoff to streams. However, State of Ohio regulations require a Spill Prevention and Control Countermeasures Plan (SPCC) for mineral development activities. Dikes are required around all wells on the Forest to contain brine in the event of an accidental spill. In addition, the Ohio Environmental Protection Agency (EPA) is required to be contacted immediately upon discovery of an accidental spill. Remedial action for cleanup of water and soil resources will be conducted by the lessee as directed by the Ohio EPA.
- **Reclamation of depleted or orphan wells** requires clearing the immediate area of the well, and would have similar adverse affects as those for construction for well pads, however, these areas are rehabilitated immediately after well reclamation and over the long-

term, and closure would benefit the environment by preventing the potential for future leaks or spills from these wells.

- **Prescribed fire** is used on the WNF to control hazardous fuel build-up, to promote oak-hickory regeneration and to control non-native invasive species. Creation of firelines using bulldozers for prescribed fire activities could result in soil disturbance, soil compaction, removal of vegetation and increased susceptibility for invasion by NNIS, whereas firelines constructed by hand only affect the litter layer. Forest-wide standards and guidelines incorporated into Alternative E_{mod} emphasize the use of existing roads and fire breaks to avoid constructing fireline (FIRE-7). In addition, mechanical construction of firelines is to be avoided near known populations of running buffalo clover (SFW-TES-28). Firelines would be rehabilitated after burns (e.g. water diversions, seed and mulch), to prevent long term erosion impacts. Since the clover has stolons that remain on the soil surface, direct burning of any undiscovered plants would likely eliminate them; conversely, the disturbance and opening of understory by fire would likely encourage the species emergence from any existing seedbanks. Fire will reduce understory cover resulting in a more open habitat that could benefit habitat for running buffalo clover in the short-term, and if areas are burned on a rotational basis the benefit may be long-term in providing habitat and perpetuating populations if successful seedset and germination occurred.
- **Utility corridor construction** is similar in impacts to habitat as road and trail construction, since vegetation will be removed and soil compaction from heavy machinery use may occur. Forest-wide Standards and Guidelines provide guidance in protecting riparian areas during construction activities. Filterstrip requirements would protect riparian habitat. Over the long-term, these semi-permanent breaks in the canopy could create running buffalo clover habitat along corridor edges.

Cumulative Effects of the Selected Alternative

Partial or filtered light is important to this species. Researchers believe that the action 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 the action area 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.

A description of forest management on non-Federal lands during the past 20 years through today is presented in the cumulative effects section for the Indiana bat. Similarly, estimates of future forest management activities are presented in the cumulative effects section for the Indiana bat.

Various management projects are projected to occur on the WNF over the next ten years, including projects that could adversely affect the running buffalo clover (RBC). Cumulatively, the Forest Service could implement about 74,000 acres of projects that could adversely affect the species or its habitat (Table 28). These disturbances would be distributed across the WNF and over the decade. The actual disturbance s 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.

Table 28. Activities with potential adverse effects on the RBC.

Management Activity	Alternative E_{mod}
Even-aged Management	1,925
Prescribed Fire	69,169
Permanent Road Construction	74
Permanent Road Reconstruction	318
Temporary Road Construction	146
Skid Trails & Landings	740
Recration Facilities	60
OHV Trail construction	150
Hiking Trail Construction	18
Horse Trail Construction	61
Mountain Bike Trail Construction	36
Utility Corridor Development	50
Surface Coal Mining	1,250
Reclamation of Depleted/Orphan Wells	70
Oil and Gas Exploration and Development	121
Total	**74,188**
Percent of NFS lands affected	**31%**
Percent of action area affected	**7%**

Any potential adverse cumulative effects would be minimized through the implementation of Forest-wide standards and guidelines (refer to the references to these in the analysis of direct and indirect effects). 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 action area.

Determination of Effect and Rationale

Table 29 presents a summary of the effects of the Selected Alternative on running buffalo clover and its habitat.

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 Selected Alternative could potentially cause adverse impacts to the clover or its habitat, implementing the Selected Alternative

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 Selected Alternative to aid in the recovery of this species.

1. The Selected Alternative incorporates 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 and included in the revised Forest Plan (see Appendix 1 of this Biological Assessment). This 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.

   - Alternative E_{mod} incorporates habitat management tools to provide a diversity of forest habitats, including those that provide partial shading or filtered light to the forest floor. The DCF, DCFO, HF, and HFO management areas will use uneven-aged management to open the canopy. The HF and HFO management areas rely on the use of prescribed fire, which could be adverse to the clover, but there is guidance to encourage mosaic burning (GFW-WLF-2).

2. Forest-wide direction has been incorporated into the Selected Alternative 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 the species in suitable habitat would be implemented prior to any ground or canopy disturbing activity (GFW-TES-31).

3. 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.

Table 29. Summary of effects determinations for running buffalo clover.

Projected Management Activity	Alternative E_{mod}
Vegetation Management	
Even-aged Hardwood Timber Harvest	A
Even-aged Pine Timber Harvest	A
Uneven-aged Timber Harvest	A
Thinning	I
Crop Tree Release	B
Grape Vine Control	B
Site Prep for Native Pine	N
Reforestation	B
Prescribed Fire	A
Herbicide Application	I
Development of Permanent Forest Openings	D
Maintenance of Permanent Forest Openings	N
Control of Non-Native Invasive Species-Mechanical	B
Control of Non-Native Invasive Species-Biological	B
Wetland Restoration & Enhancement	N
Waterhole Construction	D
Fishing Pond/Lake Construction	D
Restoration & Improvement of Aquatic/Riparian Habitat (Lentic)	N
Restoration & Improvement of Aquatic/Riparian Habitat (Lotic)	B
Installation of Bat-Friendly Gates on Mines	D
Recreation Management	
OHV Trail Construction	A
Hiking Trail Construction	A
Horse Trail Construction	A
Mountain Bike Trail Construction	A
Recreation Facility & Parking Lot Construction	A
Transportation Management	
Temporary Road Construction	A
Permanent Road Construction	A
Permanent Road Reconstruction	A
Road Decommissioning	A
Disturbance related to Timber (Skid Trails, Landings)	A
Energy Minerals Management	
Surface Coal Mining Activities	A
Reclamation of Depleted or Orphan Wells	A
Oil & Gas Well Development	A
Special Uses Management	
Utility Corridor Development & Maintenance	A
Agricultural Crop Production & Grazing	D/N
Watershed Management	
Treatment of AMD	I
Surface Mine Reclamation	B
Closure of Open Mine Portal/Subsidence	I
Stabilization of Disturbed Areas	B
Fire Management	
Reduction of Hazardous Fuels - Mechanical	I
Lands Acquisition Management	
Land Acquisition	B
Land Exchange	D
N = No Effect; **B** = Not Likely to Adversely Affect, Beneficial Effects; **I** = Not Likely to Adversely Effects, Insignificant Effects; **D** = Not Likely to Adversely Affect, Discountable Effects; **A** = Likely to Adversely Affect	

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Personal Communications

Ann Acheson, Air Quality Specialist. USDA Forest Service Eastern Region, Milwaukee, Wisconsin

Lynda Andrews, District Wildlife Biologist. Wayne National Forest, Athens Ranger District.

Judy Dumke, Taxonomic expert with input into Species Viability Evaluations.

Ryan Evans, Database Administrator. Western Pennsylvania Conservancy, 209 Fourth Avenue, Pittsburgh, PA 15222

Mike Freidhof, Timber Program Manger. Wayne National Forest, Ironton Ranger District.

Rick Gardner, Heritage Botanist. Ohio Department of Natural Resources, Department of Natural Areas and Preserves. 2045 Morse Rd. Building F-1, Columbus, Ohio.

Andy King, Endangered Species Biologist. U. S. Fish and Wildlife Service, Ecological Services Field Office, Bloomington, Indiana.

Kevan Moore, Fire Management Officer. Wayne National Forest.

Phil Perry, Forest Silviculturist (now retired). Wayne National Forest.

Francis Rothwein, District Wildlife Biologist. Ouachita National Forest, Cold Springs Ranger District.

Ted Schenck, Regional Planning Biologist. USDA Forest Service Eastern Region, Milwaukee, Wisconsin – transferred to the Rocky Mountain Regional Office.

Sarena Selbo, Endangered Species Biologist, U. S. Fish and Wildlife Service, Division of Ecological Services. 6950 Americana Parkway, Suite H, Reynoldsburg, OH 43068-4127.

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Appendix 1. Conservation Plan for Federally Listed Species

The Forest Service is committed to conserving, protecting, and maintaining habitat for federally listed species. As a Federal agency, it has defined responsibilities in supporting recovery objectives for federally listed species. Populations of these species will receive individualized attention. Management activities that may affect federally listed species occur in consultation with the U.S. Fish and Wildlife Service. If additional species that occur on the Wayne National Forest become listed, we will consult with the USFWS as appropriate (50 CFR 402.16).

A major purpose of the WNF's Revised Forest Plan is fulfillment of the Forest's obligations under the Endangered Species Act, Section 7(a)(1), to conserve Federally listed species. Section 7(a)(1) of the Act mandates Federal agencies to take a proactive approach in the conserving of endangered species:

> "All other Federal agencies shall, in consultation with and with the Secretary, utilize their authorities in furtherance of the purposes of this Act, by carrying out programs for the conservation of endangered species and threatened species pursuant to Section 4 of this Act."

The foundation of the conservation plan is the allocation of NFS lands into management areas that contain the ecological conditions needed by particular species. These management area allocations are also intended to conserve the biodiversity that will promote the recovery and maintenance of federally listed species.

- The prescriptions for the Diverse Continuous Forest and Diverse Continuous Forest with OHVs management areas call primarily for the use of uneven-aged vegetation management to create structurally diverse forest stands. The prescriptions for the Historic Forest and Historic Forest with OHVs management areas call primarily for the use of uneven-aged vegetation management combined with prescribed fire to create oak and hickory dominated forest communities with more open conditions. These management areas were formulated, in part, to provide habitat conditions beneficial for the Indiana bat, American burying beetle, and running buffalo clover.

- The River Corridor and Timbre Ridge Lake management areas were developed, in part, with the bald eagle in mind and should provide long-term direct benefits to this species as it expands its range in Ohio. The purpose of the River Corridor Management Area is to retain, restore, and enhance the inherent ecological processes and functions associated with riverine systems on the Forest. The desired future condition of the Timbre Ridge Lake Management Area is excellent water quality in the 100-acre lake where a self-sustaining bass-bluegill fishery is encouraged. A landscape of wooded character surrounds the lake and provides feeding opportunities as well as suitable roosting or nesting habitat for the bald eagle.

Together, these and all other management areas provide well-distributed and diverse habitat for native and desired non-native plants and animals, including federally listed species.

Species List

The U.S. Fish and Wildlife Service identified nine federally listed species as occurring on or near the Wayne National Forest:

Species	Status
American burying beetle (*Nicrophorus americanus)*	Endangered
Bald eagle (Haliaeetus leucocephalus)	Threatened
Fanshell (*Cyprogenia stegaria)*	Endangered
Indiana bat (*Myotis sodalis)*	Endangered
Northern monkshood (*Aconitum noveboracense)*	Threatened
Pink mucket pearly mussel (*Lampsilis abrupta*	Endangered
Running buffalo clover (*Trifolium stoloniferum)*	Endangered
Small whorled pogonia (*Isotria medeoloides)*	Threatened
Virginia spiraea (*Spiraea virginiana)*	Threatened

Conservation Plan Relationship to Other Documents

Section 7(a)(2) of the Endangered Species Act states that Federal agencies shall consult with the U.S. Fish and Wildlife Service.

> "Each Federal agency shall, in consultation with and with the assistance of the Secretary, insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary, after consultation as appropriate with affected States, to be critical, unless such an agency is granted an exemption for such action by the committee pursuant to subsection (h) of this section. In fulfilling the requirements of this paragraph each agency shall use the best scientific and commercial data available."

To meet the consultation requirements under Section 7(a)(2) of the Act, the Forest Service completed a Programmatic Biological Assessment for the Wayne National Forest Land and Resource Management in March 2001. It included a list of management activities with amounts expected to occur by September 2006. The U.S. Fish and Wildlife Service responded with a Biological Opinion on the Wayne National Forest Land and Resource Management Plan on September 20, 2001.

The Biological Opinion provided "non-discretionary, reasonable, and prudent measures" as well as terms and conditions that would minimize the potential for incidental take of federally listed species. It also recommended conservation measures that the WNF could implement to meet its responsibilities under Section 7(a)(1) for the Indiana bat, bald eagle and American burying beetle.

The non-discretionary, reasonable and prudent measures along with the recommended terms and conditions were incorporated into the 1988 Forest Plan (Amendment 13) as

Forest-wide goals and standards, respectively. The discretionary conservation recommendations were also incorporated into the 1988 Forest Plan (Amendment 13) as conservation recommendations. During the Forest Plan revision process, these Forest-wide goals and standards, and conservation recommendations were reviewed with the Fish and Wildlife Service, and slight modifications were made to incorporate the best available scientific information into the revised Forest Plan and to ensure clarity of revised Forest Plan direction.

Species-specific recovery plans provide additional guidance to conserve and recover each threatened or endangered species throughout its range. Each recovery plan has been developed by a team of scientists who are considered experts on the affected species. Not all recovery objectives may be applicable to the WNF since it encompasses only a portion of the range of nine endangered and threatened species.

Format of the Conservation Plan

This Conservation Plan is arranged into two sections: (1) Section I displays direction and guidance that is applicable to all nine federally listed species; and (2) Section II outlines the direction and guidance specific for the Indiana bat, bald eagle, American burying beetle, and running buffalo clover. These are species that occur on the WNF, or are likely to be reintroduced to the WNF in the near future.

Each section is arranged into four categories: Administrative & Technical Information; Protection of Individuals; Habitat Protection & Improvement; Education & Awareness; and Inventory, Analysis & Monitoring.

Implementation of the Conservation Plan

Responsibilities for implementation of the Conservation Plan rest primarily with personnel of the Wayne National Forest. Some work, however, will be done cooperatively with the U. S. Fish and Wildlife Service, Ohio Division of Wildlife, or other conservation partners.

Conservation Plan Accomplishments

All management accomplishments related to the conservation, protection, and recovery of federally listed species will be disclosed in the annual WNF Forest Plan monitoring and evaluation report.

I. Conservation Direction and Guidance for all Federally Listed Species

Administrative & Technical Information

Consult with the Fish and Wildlife Service to ensure activities planned and implemented on the WNF are in accordance with the Endangered Species Act.

To ensure that the exemption of incidental take is appropriately documented, the Fish and Wildlife Service will implement a tiered programmatic consultation approach. As individual projects are proposed under the Forest Plan, the Forest Service shall provide project-specific information to the Fish and Wildlife Service that:

a. describes the proposed action and the specific area to be affected;

b. identifies the species that may be affected;

c. describes the manner in which the proposed action may affect Federally listed species, and the anticipated effects;

d. specifies that the anticipated effects from the proposed action are similar to those anticipated in the programmatic Biological Opinion for the revised Forest Plan;

e. a cumulative total of incidental take that has occurred to date under the Tier I Biological Opinion; and

f. describes any additional effects, if any, not considered in the Tier I consultation.

The Fish and Wildlife Service will review the information for each proposed project and this project-specific review is appropriately documented. If it is determined that an individual proposed project is not likely to adversely affect federally listed species, the Fish and Wildlife service will complete its documentation with a standard concurrence letter that refers to the Biological Opinion for the revised Forest Plan, the Tier I programmatic document (i.e., it "tiers" to it), and specifies that the Fish and Wildlife Service concurs that the proposed project is not likely to adversely affect listed species or critical habitat. If it is determined that the proposed project is likely to adversely affect listed species or designated critical habitat, then the Fish and Wildlife Service will complete a Tier II Biological Opinion with a project-specific incidental take statement.

Protection of Individuals

For all federal oil and gas lease projects, the Forest Service is responsible for assuring that the area to be disturbed is examined prior to allowing any surface disturbing activities on lands covered by this lease type. The examination is to determine effects upon any plant or animal species listed, or proposed for listing, as Federally endangered or threatened and their habitats. If the findings of this examination determine that the operation(s) may have a detrimental effect on a species covered by the Endangered Species Act, the operator's plans may be denied or restrictions added.

The Forest Service has the responsibility to conduct the required examination. In cases where the Forest Service time frames cannot meet the needs of the lessee/operator, the lessee/operator may, at his discretion and cost, conduct the examination on the lands to be disturbed. This examination must be done by or under the supervision of a qualified resource specialist approved by the Forest Service. An acceptable report must be provided to the Forest Service identifying the anticipated effects of the proposed action on Federally endangered and threatened species, or their habitats. **[Appendix H - Oil & Gas Leasing Notification 3]**

Inventory, Analysis and Monitoring

Coordinate and cooperate with the U.S. Fish and Wildlife Service and experts from other agencies, universities, and organizations to conserve, protect, recover, and monitor populations and habitats of Federally listed species.

Education and Awareness

Provide training opportunities for employees on the identification, biology, and habitat requirements of Federally listed species along with monitoring techniques.

II. Species-specific Conservation Direction and Guidance

A. Indiana Bat

Additional resource management direction and guidance found in the Forest Plan and should be considered during project planning and implementation, as needed, to promote recovery of this species.

Administrative & Technical Information

Preferred Indiana bat roost trees include the following species: shagbark hickory, shellbark hickory; bitternut hickory; silver maple; green ash; white ash; eastern cottonwood; northern red oak; post oak; white oak; slippery elm; American elm; black locust; pignut hickory; red maple; sugar maple; and black oak. This list of trees is based on review of literature and data on Indiana bat roosting requirements. Other species may be added, as identified.

When identifying existing Indiana bat roosting habitat (SFW-TES-10(a)), the trees that are hollow, have major splits, or have broken tops need to have characteristics that provide maternity habitat for one or more Indiana bats. In other words, these trees must possess crevices into the hollow area or where the split or broken top occurred for it to provide habitat for this species. Furthermore, trees with broken tops should be 6 inches dbh or greater where the broken top occurs.

Discovery of dead bats of undetermined species on the WNF should be reported immediately to the U.S. Fish and Wildlife Service, Reynoldsburg Field Office, and the remains transported on ice to that office. The USFWS will make the final species determination of any dead or moribund bats found on the WNF. If an Indiana bat is identified, the USFWS will contact the appropriate USFWS law enforcement office.

No attempt should be made to handle any live bat, regardless of its condition. This does not apply to individuals who are permitted, as agents of the State, to conduct work on Federally listed bat species.

Report bats that appear to be sick or injured to USFWS Reynoldsburg Field.

Protection of Individuals

Goal 5.1.1 – Retain or develop Indiana bat roosting and foraging habitat; protect all known Indiana bat hibernacula.

Objective 5.1.1a – If additional Indiana bat hibernacula are discovered on NFS land, install bat-friendly gates to prevent unauthorized entry.

SFW-TES-1 – Deter human access to areas surrounding known hibernacula by closing or relocating trails that lead to, or pass within easy viewing distance of hibernacula.

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

a. Prohibit new trail and road construction;

b. Do not conduct prescribed burning during the fall swarming period (generally mid-August to mid-October) or during the hibernation period (September 15th through April 15th);

c. Do not permit surface occupancy for exploration or development of Federally owned minerals;

d. Implement vegetation management only to maintain or improve Indiana bat roosting, swarming, or foraging habitat.

GFW-TES-3 – Establish a one-quarter mile buffer around all mine openings that are known Indiana bat fall swarming sites, but where actual Indiana bat hibernation has not been established. Reduce or eliminate

human disturbances within the buffer. Implement vegetation management only to maintain or improve Indiana bat roosting, swarming, or foraging habitats.

SFW-TES-4 – Develop prescribed burning plans that specify weather conditions that would prevent smoke dispersal into known hibernacula.

SFW-TES-5 – Before backfilling any mine openings, such as portal entrances or subsidence depressions with developed openings, conduct surveys for potential bat presence during the fall swarming period (generally mid-August to mid-October).

GFW-TES-6 – Conduct pre-gating and post-gating mist net surveys at mines where bat-friendly gates are installed.

SFW-TES-13 – Prohibit the cutting of standing dead trees for firewood.

SFW-MIN-10 (Appendix H, Stipulation 10) – Within management areas where surface occupancy is generally permitted, apply the No Surface Occupancy stipulation for Federal leases where the following conditions occur:

- Areas within ¼ mile of Indiana bat hibernacula

Appendix H, Stipulation 12 (Controlled Surface Use on USA oil and gas leases – Known locations of Federally listed species) – No cutting of snags (trees with less than 10% live canopy), shagbark or shellbark hickories, or trees that are hollow and/or have major splits or broken tops, except during the bat hibernation season (September 15th – April 15th). If such trees are a safety hazard, they may be cut anytime they pose an imminent threat to human safety, but if cut in the non-hibernation season, the Forest Service biologist must be notified in advance. This stipulation applies only to trees over six inches in diameter.

Habitat Protection & Improvement

Goal 5.1.1 – Retain or develop Indiana bat roosting and foraging habitat; protect all known Indiana bat hibernacula.

Objective 5.1.1a – If additional Indiana bat hibernacula are discovered on NFS land, install bat-friendly gates to prevent unauthorized entry.

SFW-TES-7 – When even-aged regeneration methods are used, retain forested flight corridors within and between early successional habitat patches. These flight corridors may include forested corridors along ephemeral, intermittent, and perennial streams; and where present, clumps of snags and trees of varying size classes in the early successional habitat. When present, leave larger-sized trees on the edges of early successional patches for future maternity roosts.

SFW-TES-8 – Within hardwood cutting units with uneven-aged vegetation management prescriptions, maintain an average of at least 60 percent canopy cover.

GFW-TES-9 – Retain all shagbark and shellbark hickory trees greater than or equal to 6 inches dbh, unless removal is necessary to protect human safety or to avoid adverse impacts to steep slopes, erodible soils, floodplains or wetlands (e.g., cut a hickory rather than relocating a skid trail onto a steep slope).

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

a. Trees of any species 6 inches dbh or greater that are hollow, have major splits, or have broken tops that provide maternity habitat.

b. Snags 6 inches dbh or greater that have Indiana bat roost tree characteristics. Consider any tree with less than 10 percent live canopy to be a snag.

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

SFW-TES-11 – Schedule any summer prescribed burning after August 15th to reduce potential effects on Indiana bat reproduction.

SFW-TES-12 – With all hardwood timber harvests, retain a minimum of 12 live trees per acre (averaged over the cutting unit) of any species that are 6 inches dbh or greater with large areas of loose bark, unless they pose a safety hazard.

In addition to these, retain live preferred roost trees, when present to provide a supply of future roost trees (i.e., large, overmature trees) as shown in the following table. Refer to the Administrative & Technical Information section above for a list of tree species preferred as roost trees by Indiana bats. Consult with the U. S Fish and Wildlife Service regarding exceptions that may be needed to minimize adverse effects to other resources or human health and safety.

Indiana Bat Preferred Roost Tree Size Class	Number of live trees to retain (average per acre over the cutting unit)
>20 inches (dbh)	3*
>11 in (dbh and < 20 in (dbh)	6

*If there are few or no live Indiana bat roost trees > 20 inches dbh in the stand, retain three live trees > 16 inches dbh and < 20 inches dbh per acre (averaged across the cutting unit). If there are no live trees > 16 inches dbh, retain nine additional live trees > 11 inches dbh and < 16 inches dbh per acre (averaged across the cutting unit).

SFW-TES-13 – Prohibit the cutting of standing dead trees for firewood.

GFW-TES-14 – Provide water sources that promote aquatic insect production and provide drinking sources for Indiana bats along suitable flight paths, especially in upland areas, and off/away from recreation sites, and designated trails and roads.

Appendix H, Stipulation 12 – No cutting of snags (trees with less than 10% live canopy), shagbark or shellbark hickories, or trees that are hollow and/or have major splits or broken tops, except during the bat hibernation season (September 15th – April 15th). If such trees are a safety hazard, they may be cut anytime they pose an imminent threat to human safety, but if cut in the non-hibernation season, the Forest Service biologist must be notified in advance. This stipulation applies only to trees over six inches in diameter.

Education & Awareness

Provide refresher training to employees, as needed, to ensure proper identification of Indiana bat roosting habitat. Such training should include how to recognize potentially suitable maternity roosts from other non-maternity roost trees.

Provide training to employees on the proper methods for conducting emergence surveys.

Inventory, Analysis & Monitoring

Emphasis will be placed on collecting information that supports Indiana bat recovery objectives. This may include, but is not limited to, monitoring population trends of known hibernacula; monitoring of microclimate conditions in known hibernacula, and assessing our understanding of Indiana bat winter and summer distributions on the WNF, including any maternity colonies.

Monitor annually and report every five years the answers to the following monitoring questions, as required in Chapter 4 of the Forest Plan:

a. How many acres of potentially suitable Indiana bat habitat were protected or improved?

b. How many bat-friendly gates were installed on known Indiana bat hibernacula?

B. Bald Eagle

Additional resource management direction and guidance found in the Forest Plan and should be considered during project planning and implementation, as needed, to promote recovery of this species.

Administrative & Technical Information

By June 1 of each year, provide an annual report to the U.S. Fish and Wildlife Service and the Ohio Division of Wildlife, which includes the following:

a. Results of any winter searches for communal bald eagle night roosts and concentrations, including mid-winter bald eagle surveys conducted in cooperation with the USFWS and the Ohio Division of Wildlife;

b. Discovery of any bald eagle nesting territories on the WNF. If no surveys have been conducted and no territories discovered on the WNF during an annual reporting period, an annual report should be submitted with a statement to this effect;

c. Documented cases of a prescribed fire that behaved contrary to predicted movement patterns and which resulted in a confirmed adverse impact to bald eagles.

For any prescribed fire that could potentially impact bald eagles, provide the USFWS with the opportunity to review burn plans with the WNF Fire Management Officer prior to the burn plan's approval.

Protection of Individuals

Goal 5.1.2 – Protect bald eagle communal night roosts, daytime concentration sites, and occupied breeding territories.

SFW-TES-16 – Protect any bald eagle communal night roosts and concentrations (including nests) discovered during winter surveys or during any additional field surveys or proposed project areas, following guidelines outlined in the Northern States Bald Eagle Recovery Plan.

SFW-TES-17 – Report discovery of bald eagle nests immediately to the U. S. Fish and Wildlife Service and the Ohio Department of Natural Resources, Division of Wildlife.

SFW-TES-19 – Allow no prescribed fire within one-half mile of occupied bald eagle sites. Consider all bald eagle communal night roosts, daytime concentration sites, or occupied breeding territories as occupied sites. To prevent smoke inversion from occurring at occupied bald eagle sites, and to minimize smoke drifting toward them from prescribed fires outside the one-half mile radius of occupied sites, require burn plans to take into account of wind direction, speed, and mixing height as well as transport winds.

Appendix H, Stipulation 12 – Protect known nests and roosts as described in the Bald Eagle Recovery Plan, or as directed by the U. S. Fish and Wildlife Service.

Habitat Protection & Improvement

SFW-TES-18 – Protect supercanopy trees, or other identified congregation roost trees, along major river corridors and lakes in addition to following Forest-wide riparian area standards and guidelines.

Appendix H, Stipulation 12 – Protect all supercanopy trees or other identified congregation roost trees for bald eagles along major river corridors and lakes.

Education & Awareness

Provide field training for new employees so they will be able to recognize bald eagle signs at night roosts, even when eagles are absent.

Inventory, Analysis & Monitoring

Objective 5.1.2a – Conduct a minimum of three annual winter searches to locate any previously unknown communal night roosts or bald eagle concentrations.

SFW-TES-15 – Focus winter bald eagle searches in areas that eagles are known to frequent or where concentrated food sources occur near NFS land. Conduct searches during early-, mid-, and late-winter. Follow search criteria outlined in the Northern States Bald Eagle Recovery Plan.

SFW-TES-20 – If the bald eagle is found nesting on the Wayne National Forest, monitor populations according to the recovery plan. At such time as the bald eagle is de-listed, use the de-listing monitoring plan.

In addition to these Forest-wide objectives and standards, monitor annually and report every five years the answers to the following monitoring questions, as required in Chapter 4 of the Forest Plan:

a. How many winter bald eagle searches were conducted?

b. How many bald eagles were observed?

C. American Burying Beetle

Additional resource management direction and guidance found in the Forest Plan and should be considered during project planning and implementation, as needed, to promote recovery of this species.

Protection of Individuals

Goal 5.1.3 – Cooperate in efforts to reintroduce the American burying beetle.

GFW-TES-21 – Discourage the use of bug zappers by campers in dispersed or developed recreation sites within 10 air miles of known occupied American burying beetle habitat.

GFW-TES-23 – During the American burying beetle activity period, use bait-away methods prior to and during the implementation of major earth disturbing activities that occur in known occupied American burying beetle habitat.

GFW-TES-26 – Restrict the use of insecticides within known occupied American burying beetle habitat.

Habitat Protection & Improvement

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

GFW-TES-24– In occupied American burying beetle habitat, design new roads with the minimum safe width necessary for planned use of the road.

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

Inventory, Analysis & Monitoring

Cooperate in efforts to determine the extent of occupied habitat on the WNF as reintroduction efforts continue on NFS lands and non-Federal lands.

Monitor annually and report every five years the answers to the following monitoring question, as required in Chapter 4 of the Forest Plan:

a. What cooperative efforts were accomplished to achieve the reintroduction of the American burying beetle?

D. Running Buffalo Clover

Additional resource management direction and guidance found in the Forest Plan and should be considered during project planning and implementation, as needed, to promote recovery of this species.

Protection of Individuals

Goal 5.1.4 – Actively manage known populations of running buffalo clover to maintain appropriate habitat conditions.

SFW-TES-27 – Implement measures to protect known running buffalo clover populations during prescribed fire activities. These may include, but are not limited to wetting down the occupied area, raking off fuels from the occupied area, or constructing firelines around the occupied area.

SFW-TES-28 – Avoid mechanical construction of firelines in known occupied RBC habitat. Mechanical fireline construction adjacent to known RBC populations must maintain appropriate light conditions in known occupied habitat.

GFW-TES-29 – Restrict the application of herbicides within 25 feet of known running buffalo clover populations.

Habitat Protection & Improvement

Objective 5.1.4a – Maintain partial to filtered sunlight over and adjacent to occupied habitat.

SFW-TES-30 – Protect and maintain known RBC populations during road and trail construction, reconstruction, and maintenance by locating ground disturbance outside the occupied habitat. The appropriate light conditions must be maintained in the occupied habitat during such activities.

GFW-TES-31: Conduct surveys for running buffalo clover in suitable habitat prior to implementing ground or canopy disturbing activities.

Education & Awareness

Ensure employees are familiar with locations of known running buffalo clover populations on the WNF.

Conduct annual refresher training on running buffalo clover identification for all field-going employees.

Inventory, Analysis and Monitoring

Objective 5.1.4b – Conduct annual monitoring of known running buffalo clover populations and adjacent areas to identify potential risks or management needs.

Monitor annually and report every five years the answers to the following monitoring question, as required in Chapter 4 of the Forest Plan:

a. What running buffalo clover population and habitat monitoring efforts were accomplished?