Ohio DNR – Division of Forestry
Representative Sample Area Assessment

A. Purpose

The purpose of this assessment document is to describe the steps taken by the Ohio DNR – Division of Forestry (DOF) to assess the adequacy of representation and protection of ecosystems that would naturally occur on state forests in the landscape. These areas known as Representative Sample Areas (RSA's) serve one or more of three purposes:

1. To establish and/or maintain ecological reference conditions; or
2. To create or maintain an under-represented ecological condition (i.e. includes samples of successional phases, forest types, ecosystems, and/or ecological communities); or
3. To serve as a set of protected areas or refugia for species, communities and community types in order to prevent common ecosystems or components from becoming rare.

The Division of Forestry manages approximately 203,000 acres of forestland in a network of state forests. The assessment of RSA's in Ohio, outlined below, was conducted in order to evaluate adequacy of representation and protection of ecosystems that would naturally occur to determine the need additional RSA's on state forests.

B. Potential Natural Vegetation on Ohio State Forests

Using the LANDFIRE program, DOF obtained spatial datasets of both potential natural vegetation (pnvg) and existing vegetation coverages for Ohio. These data were used to assess the number and acreage of potential natural vegetation types that would have occurred on Ohio's State Forests (Table 1). DOF identified one potential natural vegetation type (highlighted in yellow) not represented on other permanently protected conservation lands. This is discussed below in Section C. Gap Analysis. Further analysis determined the current vegetation on all of Ohio's State Forests (Table 2).

Table 1: Potential Natural Vegetation on Ohio's State Forests. LANDFIRE.

Acres	Code	PNVG_NAME	Potential Natural Vegetation Type	% of Total
2.22	Forested	R8OHPI	Appalachian Oak Hickory Pine	0.00%
249.75	Woodland	R8PIECap	Appalachian Shortleaf Pine	0.12%
6,062.04	Forested	R8PIVlap	Appalachian Virginia Pine	2.98%
433.67	Forested	R7BEMA	Beech-Maple	0.21%
124.76	Grassland	R8BSOB	Bluestem Oak Barrens	0.06%
4,754.13	Forested	R8FPFOpi	Bottomland Hardwood Forest	2.34%
14,493.69	Forested	R8OAKxe	Eastern Dry-Xeric Oak	7.13%
8.23	Wetland	RAWetHb	Generic Herbaceous Wetland; Not assigned during wo	0.00%
75.84	Wetland	RAWetWd	Generic Woody Wetland; Not assigned during worksho	0.04%
16.46	Forested	R6FPFOgl	Great Lakes Floodplain Forest	0.01%
16.23	Forested	R6GLSF	Great Lakes Spruce Fir	0.008%
1,923.94	Forested	R8HEWP	Hemlock - White Pine - Hardwood	0.95%
12,065.37	Forested	R8MMHW	Mixed Mesophytic Hardwood	5.93%
366.95	Grassland	R6BSOH	Mosaic of Bluestem Prairie and Oak-Hickory	0.18%

187.92	Forested	R6NHMB	Northern Hardwood Maple Beech Hemlock	0.09%
536.42	Forested	R6NHHEgl	Northern Hardwood-Hemlock Forest (Great Lakes)	0.26%
0.22	Woodland	R6NOKS	Northern Oak Savanna	0.00%
31,703.27	Woodland	R8OKAW	Oak - Ash - Woodland	15.59%
128,151.47	Forested	R6OAHI	Oak Hickory	63.02%
0.89	Forested	R6PIOK	Pine Oak	0.00%
1,627.93	Forested	R6RPWPif	Red Pine-White Pine with Less Frequent Fire	0.80%
564.22	NonVeg	RAWater	Water	0.28%
203,366				100.00%

Table 2: Current Vegetation on all of Ohio's State Forests. LANDFIRE program.

ACRES	SYSTEMGR_1	SAF_SRM	NVCSORDER	% of Total
416.10	Open Water	LF 11: Water	Non-vegetated	0.20%
6,657.39	Developed-Open Space	LF 20: Developed	No Dominant Lifeform	3.27%
213.72	Developed-Low Intensity	LF 20: Developed	No Dominant Lifeform	0.11%
32.69	Developed-Medium Intensity	LF 20: Developed	No Dominant Lifeform	0.02%
4.00	Developed-High Intensity	LF 20: Developed	No Dominant Lifeform	0.00%
385.41	Barren	LF 31: Barren	Non-vegetated	0.19%
908.26	Agriculture-Pasture and Hay	LF 80: Agriculture	Herbaceous / Nonvascular-dominat	0.45%
737.02	Agriculture-Cultivated Crops and Irrigated Ag	LF 80: Agriculture	Herbaceous / Nonvascular-dominat	0.36%
48.04	Introduced Upland Vegetation-Treed	LF 51: Introduced Upland Vegetation - Tree	Tree-dominated	0.02%
10,455.00	White Oak-Red Oak-Hickory Forest and Woodland	SAF 52: White Oak-Black Oak-Northern Red Oak	Tree-dominated	5.14%
227.07	Chestnut Oak Forest and Woodland	SAF 44: Chestnut Oak	Tree-dominated	0.11%
183.03	White Oak-Red Oak-Hickory Forest and Woodland	SAF 52: White Oak-Black Oak-Northern Red Oak	Tree-dominated	0.09%
3.78	Black Oak Woodland and Savanna	SAF 110: Black Oak	Tree-dominated	0.00%
790.61	Beech-Maple-Basswood Forest	SAF 25: Sugar Maple-Beech-Yellow Birch	Tree-dominated	0.39%
61,253.77	Chestnut Oak Forest and Woodland	SAF 44: Chestnut Oak	Tree-dominated	30.12%
96,255.38	Beech-Maple-Basswood Forest	SAF 60: Sugar Maple-Beech	Tree-dominated	47.33%
1.11	Glades and Barrens	SRM 803: Missouri Glades	Tree-dominated	0.00%
12,527.95	Pine-Hemlock-Hardwood Forest	SAF 60: Sugar Maple-Beech	Tree-dominated	6.16%
219.06	Chestnut Oak-Virginia Pine Forest and Woodlan	SAF 44: Chestnut Oak	Tree-dominated	0.11%
2,612.25	Black Oak Woodland and Savanna	SAF 14: Northern Pin Oak	Tree-dominated	1.28%
75.39	Glades and Barrens	SRM 803: Missouri Glades	Tree-dominated	0.04%
214.39	Inland Marshes and Prairies	LF 44: Laurentian-Acadian Herbaceous Wetland	Herbaceous / Nonvascular-dominat	0.11%
4,127.20	Eastern Floodplain Forests	SAF 61: River Birch-Sycamore	Tree-dominated	2.03%
674.08	Eastern Small Stream Riparian Forests	SAF 61: River Birch-Sycamore	Tree-dominated	0.33%
180.14	Atlantic Swamp Forests	SAF 61: River Birch-Sycamore	Tree-dominated	0.09%
21.35	Inland Marshes and Prairies	LF 45: Central Interior and Appalachian Herbaceous W	Herbaceous / Nonvascular-dominat	0.01%

21.57	Hardwood Flatwoods	SAF 65: Pin Oak-Sweetgum	Tree-dominated	0.01%
132.77	Ruderal Forest	LF 53: Ruderal Forest	Shrub-dominated	0.07%
1,716.89	Ruderal Forest	LF 53: Ruderal Forest	Tree-dominated	0.84%
2,270.21	Managed Tree Plantation	LF 61: Managed Tree Plantation	Tree-dominated	1.12%
203,365.63				**100.00%**

There were 22 identified pnvg types identified on Ohio's state forests. Of those types identified, the data show that approximately 85% of Ohio's State Forest acreage most likely had a historic condition of oak forest types. Current vegetation suggests that only 37% of Ohio's State Forest acreage consists of various oak forest types which have implications for land management. For example, these data suggest that the dominance of oak forests is less than it was historically on our state forest landscape. However, this picture may not be as bleak as the data suggest. In 2009, DOF procured forest inventory services for Ohio's eight largest state forests totaling 155,000 acres. These data suggest that approximately 76% of state forest acreage is classified in some type of oak forest which is more in-line with the LANDFIRE potential natural vegetation data.

C. GAP Analysis

The concept of Gap Analysis was born in 1987 in response to the need to complement species-by-species management in dealing with broad-spectrum habitat loss. The national Gap Analysis Program is a US Geological Survey program whose mission is to "keep common species common" by identifying those species and plant communities that are not adequately represented on existing conservation lands. Gap Analysis gives land managers and policy makers the information they need to make better-informed decisions when identifying priority areas for conservation. Four categories of biodiversity management status have been widely applied in the United States using site based attributes by Michael J. Scott et al, 1993. These categories are also accepted by the Forest Stewardship Council (FSC) and included in the FSC Standard for forest management.

- *GAP Status 1*: An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a natural state within which disturbance events are allowed to proceed without interference.
- *GAP Status 2*: An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a primarily natural state but which receive use or management practices.
- *GAP Status 3*: An area having permanent protection from conversion of natural land cover for the majority of the area, but subject to extractive used of either a broad, low-intensity type or localized intense type. It also confers protection to federally listed endangered and threatened species.
- *GAP Status 4*: Lack of irrevocable easement or mandate to prevent conversion of natural habitat types to anthropogenic habitat types. Allows for intensive use throughout the tract. Includes those tracts for which the existence of such restrictions or sufficient information to establish a higher status is unknown.

DOF conducted a Gap analysis of conservation lands in Ohio that can be classified as Gap Status 1 and Gap Status 2. DOF used a conservation lands dataset complied by ODNR and Ducks Unlimited that identified and classified all conservation lands in Ohio (Appendix B). DOF used the LANDFIRE program to determine the potential natural vegetation on all Gap Status 1 and 2 lands (Table 3). There are approximately 189,670 acres in Ohio classified as Gap Status 1 and 2. Lands that were classified as Gap Status 1 and 2 lands in Ohio included all state-designated nature preserves, state wilderness area, federal lands with permanent protection and no extractive uses, NGO lands that are managed as parks or preserves, and park lands managed by local, state, and federal governments that are managed in their natural condition.

Table 3: Potential Natural Vegetation on Gap Status 1 and 2 lands in Ohio. LANDFIRE.

ACRES	CODE	PNVG_NAME	DISPLAY	% of Total
1,515.62	Forested	R8OHPI	Appalachian Oak Hickory Pine	0.80%
368.73	Woodland	R8PIECap	Appalachian Shortleaf Pine	0.19%
4,056.93	Forested	R8PIVlap	Appalachian Virginia Pine	2.14%
1.78	NonVeg	RABarren	Barren	0.00%
14,712.09	Forested	R7BEMA	Beech-Maple	7.76%
123.43	Grassland	R8BSOB	Bluestem Oak Barrens	0.07%
5,575.66	Forested	R8FPFOpi	Bottomland Hardwood Forest	2.94%
9,493.81	Forested	R8OAKxe	Eastern Dry-Xeric Oak	5.01%
3,611.03	Wetland	RAWetHb	Generic Herbaceous Wetland; Not assigned during worksh	1.90%
2,618.92	Wetland	RAWetWd	Generic Woody Wetland; Not assigned during workshops;	1.38%
6,057.37	Forested	R6FPFOgl	Great Lakes Floodplain Forest	3.19%
549.76	Forested	R6MBMHW	Great Lakes Maple-Basswood Mesic Hardwood Forest	0.29%
2.22	Forested	R6WPHEff	Great Lakes Pine Forests: White Pine Hemlock Frequent	0.00%
1,153.78	Forested	R8HEWP	Hemlock - White Pine - Hardwood	0.61%
6,016.00	Forested	R8MMHW	Mixed Mesophytic Hardwood	3.17%
9,188.69	Grassland	R6BSOH	Mosaic of Bluestem Prairie and Oak-Hickory	4.84%
2,590.90	Forested	R6NHMB	Northern Hardwood Maple Beech Hemlock	1.37%
685.64	Forested	R6NHHEgl	Northern Hardwood-Hemlock Forest (Great Lakes)	0.36%
25.35	Woodland	R6NOKS	Northern Oak Savanna	0.01%
13,334.35	Woodland	R8OKAW	Oak - Ash - Woodland	7.03%
100,772.00	Forested	R6OAHI	Oak Hickory	53.13%
161.24	Forested	R6PIOK	Pine Oak	0.09%
612.48	Forested	R6RPWPff	Red Pine-White Pine with Frequent Fire	0.32%
1,370.40	Forested	R6RPWPif	Red Pine-White Pine with Less Frequent Fire	0.72%
4,832.42	NonVeg	RAWater	Water	2.55%
239.74	Forested	R6WPHEif	White Pine Hemlock	0.13%
189,670.33				100.00%

The LANDFIRE data identified 26 potential natural vegetation types (pnvg) that exist on Gap 1 and 2 lands in Ohio. Of all 22 identified pnvg types on Ohio's state forest; only 1 pnvg type was not represented on other Ohio Gap 1 and 2 lands. This forest type, "Great Lakes Spruce Fir", represented 16.23 acres of state forest land or 0.008% of the state forest acreage. This is a very small percentage of the acreage and most likely within the error limits of the data used for this analysis. For context, DOF manages only small acreage within proximity to Lake Erie, with the remaining acreage in the southern portion of the state. DOF lands within proximity to Lake Erie are managed as a "forest reservation" by Lake County Metroparks. This property, known as Chapin Forest Reservation, is managed for recreation use only and has no extractive timber uses. A positive result of this analysis showed that oak forests represented 66% of Gap Status 1 and 2 lands. These communities are vitally

important to a host of species. The conservation and promotion of oak forests is a key issue in Ohio and is identified as a priority of many conservation organizations.

DOF consulted other analyses as part of this assessment. In Ohio, the USGS, Ohio State University, and the ODNR-Division of Wildlife (DOW) cooperated in the early part of this decade to produce a Gap Analysis for Ohio's conservation lands. The Ohio Gap Program had terrestrial and aquatic components that included a host of vertebrate and macro-invertebrate species. Additionally, the Ohio Gap initiated an analysis on wetlands within the Lake Erie Basin. The Ohio Gap's purpose was to produce tools and maps that identify valuable ecological areas and produce products available to state and local agencies charged with land-use, transportation, and development planning. The Ohio Gap project experiences challenges and final products continue to be analyzed by researchers. A summary of results of the analysis were published in a March 2009 update paper in conjunction with the national Gap Analysis Program (Appendix C). The results show that 3.7 percent of Ohio is under management for protection from land conversion and lands with the highest level of protection (Gap Status 1 and 2) comprise 0.7 percent of Ohio's land. Regarding plant communities, the Ohio Gap program results show that 6 of 59 natural cover types in the state have less than 1 percent of their distribution on Gap Status 1 and 2 lands. However, the Ohio Gap program found that primarily the Ohio Department of Natural Resources (ODNR) (43.4 percent) along with The Nature Conservancy (30.3 percent) accounted for the majority of Gap status 1 and 2 lands in Ohio and that 54.5 percent of the status 3 lands were managed by ODNR.

Another relevant analysis is available from the USFS Forest Inventory and Analysis Program (FIA). Based on FIA data, the total area of forest land in Ohio is 7.92 million acres, representing 30.2% of the State's land cover (2006 FIA data; Widmann et al. 2009). By ecological sections (Fig. 1), the unglaciated Allegheny Plateau in southeast Ohio is the most heavily forested, followed by the glaciated Allegheny plateau in northeast Ohio. According to the most recent FIA report the amount of "reserved" land in Ohio in 2006 was 203,900 acres. FIA defines "reserved" forest land as land that meets the FIA criteria for timber land, and have statutes or administrative constraints that preclude timber utilization. The FIA definition translates roughly into GAP Status 1 and GAP Status 2 lands together, but FIA does not consider other non-timber uses. FIA "reserved" lands represent 2.6% of the total forest land in Ohio.

Based on FIA data, the general trend is an increasing number of acres in the reserved productive forest land category.

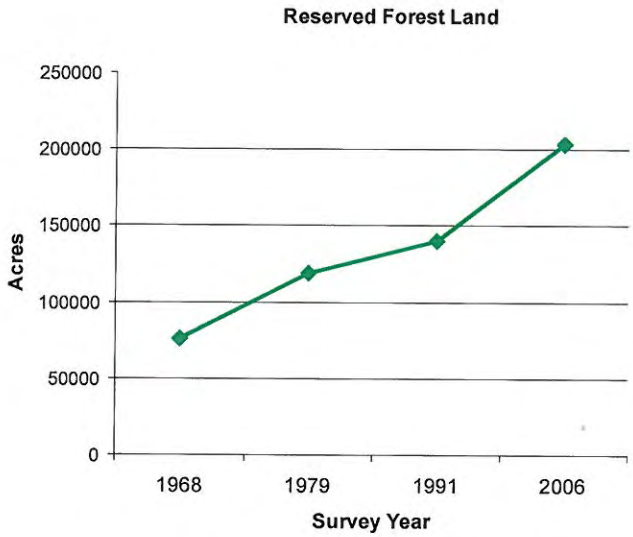
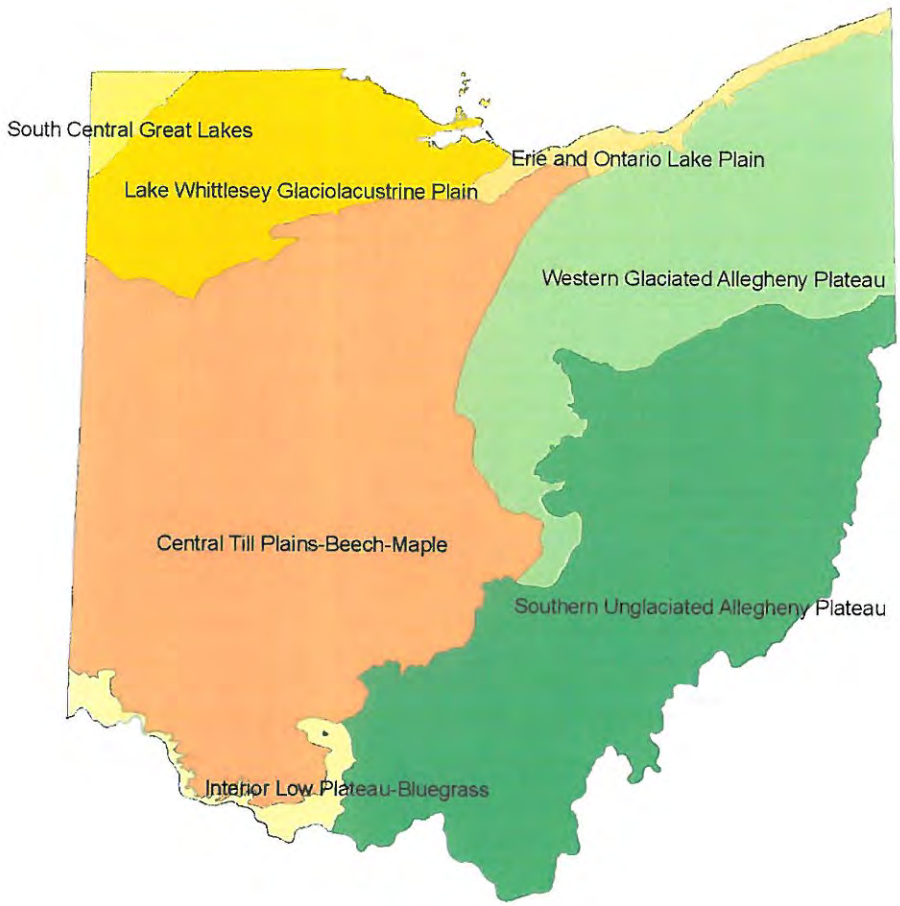
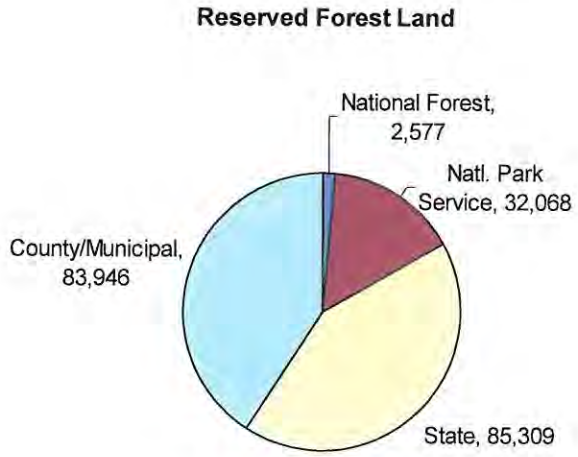


Figure 1 – Ecological Sections of Ohio from the USDA Forest Service's ECOMAP 2007 (USFS 2007



All of the reserved forest land reported by the FIA is on public land, with the State holding the largest acreage. However, some private, non-governmental organizations, such as land trusts, may own private forest lands or hold conservation easements on private lands that meet the definition of reserved forests (i.e., prohibit timber utilization)



D. Conservation Priorities of other Ohio partners.

The Nature Conservancy, as part of their ecoregional planning efforts in the early part of this decade, completed a "Matrix Forest Assessment" with the purpose of identifying the major natural communities that constitute the background "matrix" within which most biodiversity is found. TNC recognized that natural communities vary greatly in terms of size of occurrence and ecological specificity and attempted to classify natural communities into one of three types, referred to as matrix, large patch and small patch. Matrix communities form extensive cover, often blanketing 80% of the undeveloped land and covering vast acreages. TNC considered how large occurrence of matrix communities should be based on the size and frequency of natural disturbances and the habitat size needs of area-sensitive species. In the East, TNC set a minimum size for a viable occurrence of a matrix site to be 15-25,000 acres. The analysis resulted in 18 matrix forests that represented 7 ecological land unit groups. Many of the identified matrix forests are inclusive of Ohio state forests (Appendix D).

The Ohio DNR-Division of Wildlife, as part of their Comprehensive Wildlife Conservation Strategy, identified "focus areas" for conservation of wildlife habitats and developed tactical plans for each focus area. These focus areas centered on habitat and landscape conservation and provide the basis for DOW efforts in the future. DOW identified two forest focus areas: The Appalachian Foothills and The Tecumseh. These forest focus areas include DOF's two largest state forests – Shawnee and Zaleski State Forests as well as the Vinton Furnace Experimental Forest, State Parks, Nature Preserves, Wildlife Areas and other private land. These 2 forest focus areas are important to DOW because they contain viable populations of most, if not all important wildlife species in the state. The DOW focus area concept is designed to enhance or maintain the highest possible level of diversity in the state. DOW

recognizes that forest management is critical to sustain the diversity that exists in these focus areas and has provided recommendations concerning age class and structural metrics in order to maintain and enhance wildlife diversity on these areas (Appendix E).

The Ohio DNR-Division of Wildlife also assumed responsibilities for the former Division of Natural Areas and Preserves (DNAP) who is charged with the management of Ohio's Nature Preserves and the maintenance of the Ohio Biodiversity Database (formally the Natural Heritage Database). Data from the Ohio Biodiversity Database serve as a backbone for DOF's assessment of biodiversity and conservation of sensitive species. DOF uses heritage data in our pre-activity assessments, our High Conservation Value Forest assessment, and for determining protection provided by conservation lands. In the 1980's, DNAP completed an assessment of priority areas located on state forests. DOF used this assessment to re-zone many areas into our zone 1A – High Conservation Value Forest.

E. Conclusions

Based on results of analysis of LANDFIRE data and consultation with other analyses and conservation priorities, DOF believes that current Gap Status 1 and 2 lands are adequate is size and scope to cover the important *forest* communities that exist in the relevant forested ecoregions of Ohio. There appears to be some small gaps associated with great lakes vegetation communities (Great Lakes Spruce Fir) and their adequacy of representation on conservation lands, however, DOF manages state forests mostly in the unglaciated southeastern forested portion of Ohio and anticipates limited opportunity to add additional representative sample areas to the Division's land base. However, where possible DOF will support the efforts of other partners to conserve the under-represented communities. The single forest property near Lake Erie owned by DOF is Chapin Forest Reservation, managed as part of a long-term lease with Lake County Metroparks, is managed as a recreation area with no extractive timber uses.

Further, it should be noted that both TNC and DOW have identified state forests as important sources of biodiversity primarily due to the size, scope, and variety of age classes and successional stages that exist on state forests due to forest management practices. DOF forest management practices have contributed to the presence of habitat elements that have been identified as important as a result of decades of forest management.

Finally, DOF owns four important Gap Status 1 lands that serve an important biodiversity role in Ohio. These lands are listed below. Two of these areas are state-designated nature preserves, one area is protected as a Wilderness Area by Ohio law, and one property is managed as a recreation area in its natural condition. The Shawnee Wilderness area, codified in Ohio law in 1988, is one of the largest Gap Status 1 lands in Ohio at over 8300 acres. The range of potential natural vegetation types that exist on the Shawnee Wilderness area as determined from LANDFIRE data is diverse with Oak-Ash-Woodland being the dominant potential forest type. Currently, the Shawnee Wilderness Area includes a range of successional stages and cover types due to forest management prior to wilderness designation. No extractive uses are allowed in the wilderness area, however, passive recreation such as hunting and trail use is allowed.

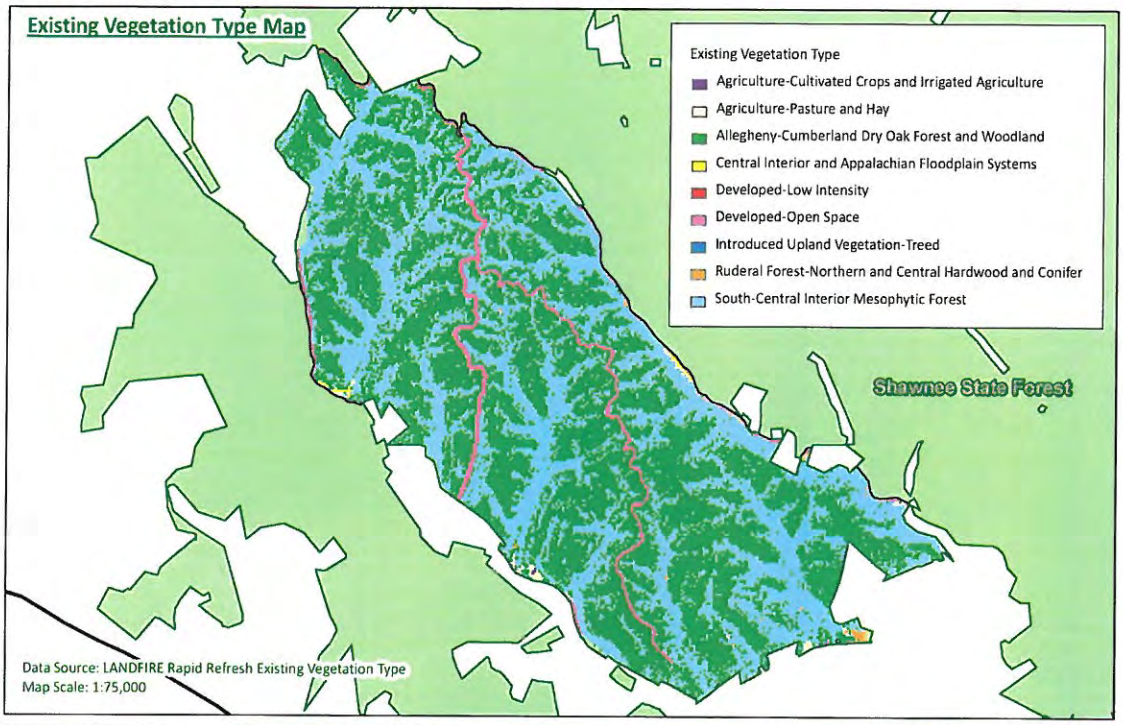
Ohio DNR – Division of Forestry "on-FMU" Representative Sample Area's

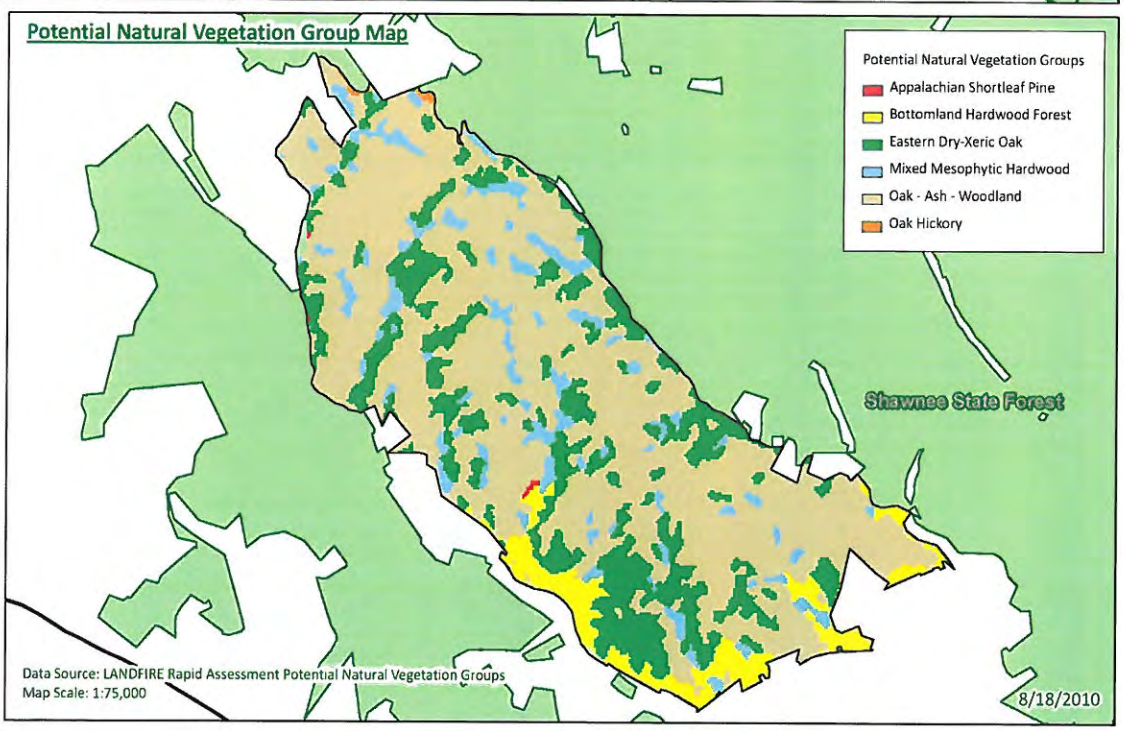
Name	Gap Status	RSA purpose	Acreage
The Shawnee Wilderness Area	1	1, 2, 3	8,354
Sheik Hollow Nature Preserve	1	1, 2, 3	169
Little Rocky Hollow Nature Preserve	1	1, 2, 3	282
Chapin Forest Reservation	1	1, 2, 3	369

Appendix A: Shawnee Wilderness Area – Current Vegetation and Potential Natural Vegetation based on LANDFIRE data.

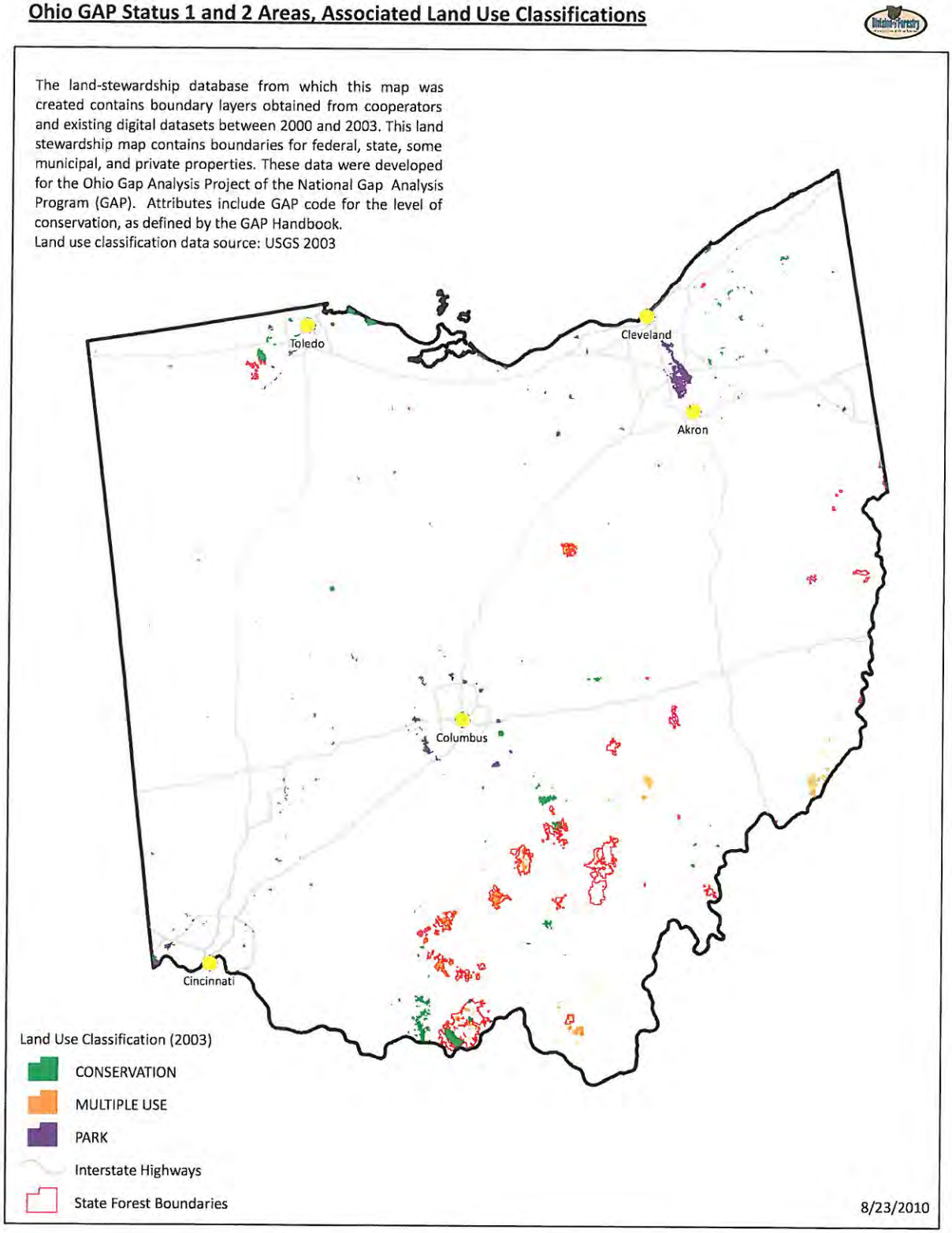
Vegetation Comparision of Shawnee SF Wilderness Area

The 8,466 acre Shawnee State Forest Wilderness Area is the largest GAP Level 1 property in Ohio.





Appendix B: Map of Gap Status 1 and 2 areas in Ohio.



Appendix C: Ohio Gap Analysis Project Gap Analysis Bulletin No. 16, March 2009

Ohio Gap Analysis Project

Compiled from Final Project Report

Introduction

The Ohio Gap Analysis Project (OH-GAP) is a regional assessment of the predicted distribution and current conservation status of native wildlife species and natural land cover types in the state. These coarse filter assessments facilitate conservation efforts by proactively identifying areas of potentially high biodiversity that occur outside protected area boundaries as "gaps" in the existing network of conservation lands. This is accomplished through the following five primary objectives, as suggested by the National Gap Analysis Program (GAP): (1) map and describe actual land cover; (2) map predicted terrestrial vertebrate species distributions based on species habitat affinities; (3) document species and land cover types represented in areas managed for the long-term maintenance of biodiversity; (4) provide the compiled information and analysis to the public and those entities charged with land use, research, policy, planning, and management; and (5) build institutional cooperation in the application of this information to state and regional management activities. GAP projects use a data driven approach applying GIS, remote sensing, and other advanced technologies to identify gaps in the representation of biological diversity in areas managed exclusively or primarily for the long-term maintenance of native species and natural ecosystems. OH-GAP was conducted for the entire state of Ohio, encompassing approximately 110,000 km^2 and portions of the Huron-Erie Lake Plain, Eastern Corn Belt Plain, Eastern Ontario Lake Plain, Interior Plateau, and Western Allegheny Plateau ecoregions.

GAP is conducted as state-level projects that are coordinated by the U.S Geological Survey. Cooperative efforts among regional, state, and federal agencies, as well as private groups are encouraged. OH-GAP was conducted in accordance with national GAP standards in cooperation with the U.S. Geological Survey Water and Biological Resources Divisions, The Ohio State University, and the Ohio Division of Wildlife, taking advantage of the expert knowledge and background of many individuals. The Ohio State University Center for Mapping (CFM) was responsible for the production of the land cover map. Animal modeling was conducted through the Department of Evolution, Ecology and Organismal Biology (EEOB) and the Ohio Ecological Services Field Office of the U.S. Fish and Wildlife Service. Mapping of conservation land stewardship for the state was conducted by the U.S. Geological Survey Water Resource Division. Financial support was provided by Ohio Division of Wildlife.

A Biodiversity Overview of Ohio

Landscape patterns of biodiversity are the result of complex interactions, now and in the past, among the geology, climate, and human use of Ohio's natural resources. Ohio's border encompasses a wide variety of landscapes within two major landforms: the Central Lowlands and the Appalachian Plateau. Approximately two-thirds of the state's 44,825 mi^2 of land area makes up the glaciated region, bearing the fingerprint of the last great Ice Age that ended approximately 10,000 years ago. This resulted in a relatively youthful plain with flat to rolling topography covered by glacial till. In contrast, the southeastern hill country remains a rugged, mature landscape dissected by river valleys. These are broken down into five distinct physiographic regions defined by soil type, vegetation, and topography: (1) Huron/Erie Lake Plains, (2) Eastern Corn Belt Plain, (3) Erie/Ontario Lake Plain, (4) Interior Plateau, and
(5) Western Allegheny Plateau.

Lying in the humid continental zone, Ohio experiences a temperate climate with abundant and evenly distributed precipitation. Variations in temperature produce distinct seasonal differences. These variations are the result of topography and the influence of Lake Erie, which exerts a major influence on weather and climate conditions. In the winter, temperatures usually approach or slightly exceed 32°F, but periods of cold weather frequently occur, when temperatures can drop below zero. Summer temperatures normally reach their peak during July, with mean daily maximums ranging from 80–82°F in the northeastern counties to 88°F in southern Ohio.

Ohio receives a moderate amount of total precipitation annually, which varies from 29–33 inches in northwestern counties near Lake Erie to 39–45 inches in northeastern and southern Ohio. Snowfall ranges from more than 50 inches in the northeast to less than 20 inches in south-central Ohio along the Ohio River. The "lake-effect" contributes to large

accumulations of snow in the snowbelt, which is east of Cleveland, averaging in excess of 100 inches annually in Geauga County. The overall pattern of annual precipitation reveals that the southeastern Ohio receives more than the northwestern Ohio.

The earliest human inhabitants of what is now Ohio were Paleo-Indian peoples, who lived in the area as early as 13,000 B.C. Later, the Mound Builders, the Adena, and the Hopewell cultures, occupied Ohio from about 100 B.C. to A.D. 500. Ohio was populated by successive groups of Native Americans until European settlement. Population pressure from expanding European colonies on the Atlantic coast compelled several groups to relocate to the Ohio country by 1730. Ohio's chief tribes prior to European exploration were the Wyandot and Ottawa in the northwest, the Erie in the northeast; the Shawnee, ranging north across Ohio; the Miami in the southwest; and the Delaware in the southeast. When the first Europeans began to arrive to the Ohio Country, Native Americans participated in the fur trade.

In the early 1700s, Ohio's pristine environment was described as a predominantly forested landscape with scattered openings, numerous wetlands, and an abundance of wildlife. Ohio's rich natural history and resources drew settlers to the region and make the state economically productive today. However, human settlement has left its mark throughout the state by the clearing, draining, and reshaping of the land to provide for agricultural, industry, and housing. Historically, 95 percent of Ohio's landscape was covered by hardwood forests. The remainder of the state included 5 million acres of various wetland types (bogs, fens, and marshes). The Great Black Swamp in northwestern Ohio stretched 120 miles long and 30 to 40 miles wide. Until it was drained by the end of the 19th century, it was a barrier to early east-west travel and settlement. In addition, it is estimated that approximately 1,000 mi^2 of prairies occupied large forest openings, predominately in the western half of the state. Today, Ohio's landscape is a mosaic of agricultural, suburban and urban areas, and fragmented woodlands. Less than 10 percent of Ohio's original wetlands remain, and original prairie habitat has been lost as a functional ecosystem.

Ohio once was a land of vast mature hardwood forests and wetlands, and coastal beaches and cliff communities, interspersed with prairie and grasslands. Ohio's natural resources provided habitat for numerous species of fish and wildlife. These resources were the foundation for Ohio's current prosperity. The Ohio Gap Analysis project can assist in proactive efforts to protect biological diversity by identifying critical areas where habitat can be preserved or restored in order to ensure that these components remain a part of Ohio's precious natural heritage.

Land Cover Classification and Mapping

The OH-GAP land cover map contains 37 categories, consisting of natural land cover types and human features. Ohio's land cover was mapped to the ecological system (multiple Alliance) level. The alliance level represents vegetation based on species composition of the dominant vegetation type. This map was produced using Landsat Thematic Mapper (TM) satellite imagery at a 30 by 30 meter resolution acquired between 1999–2002. Nine scenes were required to cover the land area of Ohio. In addition, land cover classification efforts incorporated georeferenced digital color aerial photographs, vegetation field samples to validate and ground-truth the photointerpretation, and image processing techniques (supervised classification) to classify all satellite pixels covering the state.

Predicted Vertebrate Species Distributions

The OH-GAP vertebrate species modeling effort produced predicted range and predicted habitat maps for 38 amphibians, 42 reptiles, 176 birds, and 54 mammals that breed in the state. General range maps were produced using existing location data and published range maps. These draft range maps were reviewed by experts who had the opportunity to provide an update based on the most recent occurrence data and their expert knowledge. Predicted habitat maps were created using wildlife habitat relation models for each species. Each model relates the habitat associations of the species to GAP land cover classes and other ancillary datasets. The predicted habitat map for each species was clipped with the general range map, resulting in a spatially explicit map of predicted habitat for each species within its range.

Species richness measured by the number of species present varied geographically for each of the four major taxonomic groups. Amphibian species richness was highest in the central to south central part of the state. Reptile species richness was highest in the south central part of the state. Mammal species richness was highest in the north central part of the state. Bird species richness was highest in the southwestof the state.

Land Stewardship

The land stewardship layer represents the permanence and intent of the management based on information in management plans or agency mandates for specific land units. Status 1 and 2 represent permanently protected lands that are managed for biological diversity, with Status 1 representing the highest level of protection. Status 3 lands are those lands under a management plan that prevents conversion to non-natural cover types but allows either intensive local or extensive resource extraction. Status 4 lands are not managed for biodiversity or are not under a management plan.

The analysis of land stewardship showed that a small proportion of the State is under any sort of protection for biodiversity. In fact, 3.7 percent of the State was under management; and of that, 29.3 percent was federally managed and approximately 50 percent was managed by State agencies.

Lands with high protection for biodiversity (GAP Status 1 or 2) comprised only 0.7 percent of Ohio's land. State Management, primarily the Ohio Department of Natural Resources (ODNR) (43.4 percent) along with The Nature Conservancy (30.3 percent), accounted for the majority of the status 1 and 2 lands. Status 3 lands were managed primarily by ODNR (54.5 percent).

Gap Analysis—Land Cover

Six of the 59 natural cover types in the state have less than 1 percent of their distribution on Status 1 and 2 lands.

Status 1 lands in Ohio are mainly comprised of small parcels dispersed across the state.There is a concentration of Status 1 lands along the Lake Erie coast in Ottawa and Erie Counties, another in Fairfield and Hocking Counties, and a third in Adams and Scioto Counties. In Fairfield and Hocking Counties, Status 1 lands include Central Ohio Metro parks and State Nature Preserves. An example of these, the Clear Creek Valley, is one of the most pristine and secluded natural areas in Central Ohio. Variations of land surfaces, soils and climates have produced habitats that hold more than 800 plant species and 150 species of birds, many of them rare. In Adams and Scioto Counties, Status 1 lands include The Nature Conservancy's "Edge of Appalachia," Shawnee State Forest. This area is one of the most biologically diverse collections of natural systems in the Midwestern United States.

Gap Analysis—Vertebrates

Information System (GIS) analysis of stewardship status for terrestrial vertebrates showed 44 of 177 (24.8 percent) birds, 19 of 54 (35.1 percent) mammals, 12 of 39 (30.7 percent) reptiles, and 3 of 37 (30.7 percent) amphibians have less than 1 percent of their predicted distribution (Table 1) in status 1 or 2 lands.

Only 3 of 177 (3.4 percent) birds, 0 mammals, 1 reptile (2.5 percent), and 0 amphibians have over 10 percent of their predicted distribution in status 1 or 2 lands.

Table 1. Summary of species at different thresholds of biodiversity management in Ohio.

[Biodiversity management is defined as the percent of predicted distribution on GAP Status 1 and 2 lands divided by the total predicted distribution. **Abbreviations:** <, less than; >, more than]

Taxa	Less than 1 percent	1–2 percent	2–5 percent	5–10 percent	Greater than 10 percent	Total number of species
Amphibians	3	19	12	3	0	37
Birds	44	78	46	6	3	177
Mammals	19	25	10	0	0	54
Reptiles	12	13	12	1	1	39
All Species	78	135	80	10	4	307

Appendix D: The Nature Conservancy – Matrix Forest Block Assessment

Matrix Forest Assessment

Background

One of the goals of ecoregional planning is to identify viable occurrences of all types of natural communities at appropriate scale to conserve their component species and processes. The Natural Heritage Programs have provided the basis for identifying many of these occurrences, but have not to date developed a comprehensive method of identifying the major natural communities that constitute the background "matrix" within which most biodiversity is found. Matrix Forest Assessment within ecoregional planning has been developed to fulfill this need. The methodology has evolved significantly during the past three years and has been applied to a broad range of ecoregions varying from the Northern Appalachian Plateau where forests remain large, contiguous, and in good condition to the Chesapeake Bay Lowlands where forest remnants occur only in small areas and are in poor condition. The work to conserve the conservation values of there formerly contiguous forested areas will range from identifying areas within intact forests where old growth features can reemerge over time to intensive restoration efforts to reclaim the best possible minimal thresholds for the reestablishment and persistence of the forest matrix.

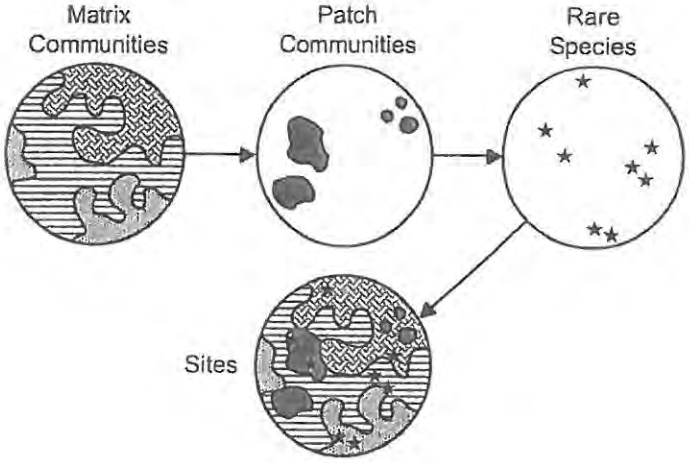
The Concepts

Natural communities vary greatly in terms of their size of occurrence and ecological specificity, with some types covering huge areas of varying topography, geology, and hydrology, while others exist only in small patches under unique environmental conditions. Based on these qualities, we classify natural communities into one of three types, referred to as *matrix, large patch* and *small patch*. **Matrix** (or dominant) **communities** form extensive cover, often blanketing 80% of the undeveloped land, and covering thousands to millions of contiguous acres. These types have broad ecological amplitude and are shaped by regional scale processes. They are important as coarse filters for most common species, migratory birds, wide-ranging fauna such as large herbivores and predators, and area-sensitive species.

Nested within the matrix forests are smaller scale "patch" communities with more specific ecological amplitudes and often more restricted species. **Large patch communities** may form extensive cover and usually are related to some localized soil condition or disturbance regime; their boundaries are often correlated with a single dominant local process, such as a hydrologic or fire regime. These large patch communities often support distinctive fauna. Even more restricted are **small patch communities**, which have very narrow ecological amplitudes and occur where a series of local physical features, such as bedrock, elevation and land form, come together in a precise way. Although the boundaries of small patch communities are often easy to delineate, these communities are usually inextricably linked to the landscapes in which they occur. Small patch communities may not be viable over the long term without preservation of the larger system in which they are embedded. Small patch communities often occur in stressful or unusual conditions, serving as refuges for species which are otherwise poor competitors. Many of these species are rare. Generally, isolated small patch communities do not support viable populations of animals with the exception of some groups of insects which are also associated with unusual ecological settings.

Matrix communities, large and small patch communities, and locations of habitat for rare species typically nest and interdigitate to form complex mosaics reflecting the environmental heterogeneity of the landscape. Virtually all sites are mosaics of community types. The ideal reserve consists of large, viable example of matrix forest communities embedded with many and diverse large and small patch communities and rare species occurrences (*Figure 1*).

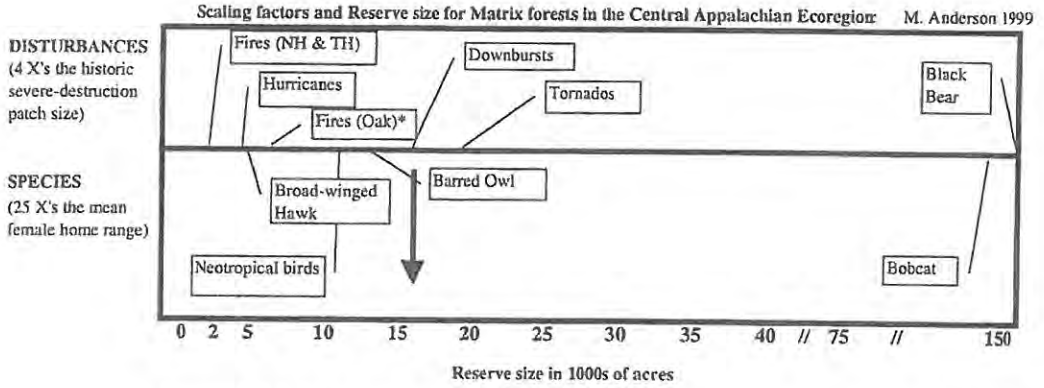
Figure 1. The ideal conservation site consists of a mosaic of matrix, large and small patch communities, and rare species occurrences.



In reality, within the areas we are working, not all types of patch communities or rare species are found embedded within viable examples of large matrix communities. To preserve all types and levels of biodiversity, it is necessary to develop reserves at a variety of functional scales, some targeting matrix communities and others targeting patch communities or species not captured by sites with matrix communities.

Scaling Factors for Matrix Forests- How big do occurrences need to be?

One goal of ecoregional planning is to identify and conserve multiple occurrences of the full range of matrix forming communities in each ecoregion. To establish how large occurrences of matrix communities should be, two features are considered: the size and frequency of natural disturbances and the habitat size needs of area-sensitive species. Occurrences of matrix forest communities should be large enough to withstand the full range of natural disturbances that influence the community. In the Northeast these disturbances include hurricanes, tornadoes, fires, ice storms, and downbursts. Sizes of these disturbances can be determined from historical records, vegetation studies, and expert opinion. The minimum size of matrix community occurrences has been set at four times the size of the major disturbances effecting the community so that at any one time there is a range of conditions within the community including recently disturbed areas, areas under recovery, and mature areas. The size of matrix forests based on area-sensitive species is determined by an assessment of the home range of specific animals that breed in the matrix forest type. In the Northeast, these species include broad-winged hawk, barred owl, marten, and fisher. Miniumum area for these species has been scaled to support 25 breeding pairs which theoretically allows an export of individuals from the site.



Factors to the left of the arrow should be encompassed by a 15,000 acre reserve NH = N. hardwoods (Maple-Beech-Birch)
TH = Transitional Hardwoods (High elevation Red Oak or Red Oak -Sugar Maple)
* Oak forests are dependent on relatively high-frequency, moderate fires, info on catastrophic fires is sketchy
Neotropical estimates based on Robbins et al. 1989, see text for full explanation.

Figure 2. Illustrative justification for selecting matrix blocks of at least 15,000 acres in size.

Disturbance regimes and area sensitive species details differ considerably between ecoregions and should be analyzed separately for each area. In some ecoregions (NAP and parts of CAP and LNE), it is possible to select among a series of possibilities to undertake matrix forest conservation at appropriate scale. In other ecoregions (NAC, CBY, and STL), remnants of some matrix forest types are well below any minimum size based on disturbance patterens and areas sensitive species needs. For these matrix types, restoration can be considered in areas with limited permanent fragmentation features and potential for the restablishment of a forested landscape. In the ecoregions in the East, the minimum size for a viable occurrence of a matrix site (or block) has been set at 15-25,000 acres (*Figure 2*).

Steps to selecting areas that support matrix communities:

The approach we use to select matrix community occurrences has been refined in matrix block selection work done for five ecoregions (NAP, CAP, LNE, CBY and HAL). It includes four steps:

1- *Preliminary ecoregional analysis for matrix block characteristics:*

The first step is to develop basic ecoregional matrix forest concepts. During the assessment of ecoregional plant communities, the matrix communities in the ecoregion are identified. For each of these communities, which usually number less than five, general distributions in the ecoregion are established. A discussion is initiated concerning scaling factors to determine a size minimum for matrix forest work. A draft scaling factors diagram is developed for discussion during the two experts meetings.

Prior to a first meeting, a set of locations is developed for potential matrix community occurrences based on a GIS analysis of road-bounded areas greater than 15,000 acres. These locations are referred to as "matrix blocks" and are the starting point for a broad discussion of matrix forests which includes experts who are familiar with the sites. These meetings are attended by TNC/Heritage staff and knowledgeable partners who know the study area well.

The preliminary GIS data layers developed for this meeting include:

- A map of the ecoregion tessellated into "blocks" bounded by roads, transmission lines, and major shorelines (lake and river polygons) from ESRI streets and USGS 1:100,000 DLGs. Paved and

unpaved roads from class 1 to 4, as well as railroads and powerlines, are displayed with various line symbols.

- A generalized land cover map, developed from GAP and MRLC classified 30 meter Landsat TM imagery, showing forest, nonforest, agriculture, urban, cleared/disturbed, and water categories.

- A color-shaded relief map of the ecoregion developed from 30 or 90 meter USGS Digital Elevation Models overlaid with managed area parcels (conservation lands) from various sources.

For each of the largest matrix block units resulting from this GIS assessment, a report is produced which includes:

1-Identifiers:	Block ID number Subsection Place names to orient experts who will review the blocks
2-Size:	Acreage of the bounded area
3-Condition:	Roadedness, amount and type of dangling roads within the block Percentage of natural features divided by type: coniferous forest, deciduous forest, wetland, etc Percentage developed features: agriculture by type, residential and industrial development
4-Diversity:	Known element occurrences (number and types)
5-Ownership:	Amount and type of managed area

These maps and "block reports" are sent to TNC staff in the field for review. Field staff assemble a team of experts to broaden the local matrix block selection review and add detailed field-oriented data. In CBY two meetings were held, one for Virginia and a combined meeting for Delaware and Maryland.

2- ***A first meeting with experts***:

The goal of this first meeting is to broaden the discussion of matrix forests within a group of experts familiar with the ecoregion and to identify potential areas for further study. Scaling factors for matrix forest conservation sites are presented and feedback is collected on disturbance regimes in the ecoregion and which species that use matrix forests are area sensitive. Each of the potential matrix blocks is reviewed to assess whether they qualify for inclusion in the analysis based on size and condition. Some of these blocks may be discarded from the analysis because they are unsuitable due to new internal roads, have been repeatedly logged and sprayed, have poor quality aquatic features due to acid mine drainage, or are otherwise in poor condition.

Additional blocks are also added to the list of potential blocks based on expert knowledge. These are often in areas identified by GIS as having fragmenting features that in fact are not serious biological barriers for species. Examples include seasonally closed roads, jeep trails, narrow utility transmission lines, and abandoned railroad lines.

The placement of the block boundaries is reviewed for each candidate block to make sure that they are accurate, i.e. that the bordering roads are fragmenting features, and assess whether or not interior

roads present barriers not recognized by the GIS rules. Based on these assessments and expert field knowledge, some adjacent blocks are aggregated to form new blocks; others are split apart.

Each of the remaining blocks is evaluated for a series of biological features, physical conditions, and ownership patterns that will have bearing on successful conservation work. Data are collected on the types of matrix forests, other natural communities and significant biological features within the block. Information is also collected on logging/spraying/management history, other anthropogenic impacts, and other disturbances. Each block is ranked by the group as a potential occurrence of a matrix forest block into one of five categories: Yes, Maybe Yes, Maybe, Maybe No, and No for selection as a matrix forest occurrence.

3- ***Further analysis***:

Following the first experts' meeting, new data are compiled and boundaries adjusted in GIS to reflect this revised set of potential matrix blocks.

Basis data block data are recalculated for:

Size
Roadedness
Percent cover of natural features
Percent cover of disturbed areas
Documented element occurrences
Percent managed areas by ownership

Each block is then evaluated for its diversity of landscape features by an analysis of Ecological Land Units. Ecological Land Units (ELU's) represent physical characterizations of unique combinations of bedrock, surface geology, slope, elevation, and aspect. ELUs are used as a *surrogate* for the actual diversity of matrix-forming forest types and large and even small patch communities within each matrix block with an assumption that the diversity of vegetation types is highly correlated to the diversity of these physical features.

The type and extent of all ELU's within each block boundary are tabulated. Standard quantitative ordination, classification, and cluster analysis programs (e.g. TWINSPAN) aggregate these matrix blocks into similar groups, i.e. sets of blocks that are relatively interchangeable as to their ELU features. An ecoregion can have anywhere from five to twelve of these groups, depending on the range of physical features with the ecoregion. Within each of these groups, individual blocks are then assessed for comparison to other blocks in their group based on their relative condition, diversity of documented element occurrences, ELU diversity, complementarity, feasibility for protection, threats, and proximity to other features.

A series of GIS maps and reports are produced for use in a second meeting. These include:

- Maps of newly configured matrix blocks with land cover and topography
- An ELU map for the entire ecoregion showing block locations
- An entire map of the ecoregion showing matrix block groupings
- Block reports

Important Caveat

It is important to recognize that matrix blocks are not sites. They are intermixed occurrences of matrix-forming communities with embedded patch communities bounded by fragmenting features. Site conservation planning has been conducted to date for only a few of these blocks. Later, planning will result in sites that may be considerably smaller or larger than the blocks identified during the ecoregional planning process. Matrix blocks identified through this process should be viewed as surrogates for sites whose boundaries will be defined later with detailed assessments of site specific features.

4- ***A second meeting to select blocks for the portfolio***:

At a second meeting with experts assembled for the entire ecoregion, matrix block groupings are reviewed to make sure that they make sense and capture the logical range of diversity within the ecoregion. Goals are established for each of these groups, including numbers of examples per matrix block group and numbers of overall matrix blocks per subsection. Generally, one goal is to select at least one matrix block in each subsection and at least two matrix blocks in each block grouping. Blocks within each block-group are prioritized in a table based on a value of "good, fair, or poor" or 1 to 3 (with 1=good and 3=bad) for: size, condition, landscape context, threats, feasibility, and connectivity to other blocks.. Some blocks may still be rejected during this review. The overall result of this meeting is a series of blocks selected as high priority or preferred, with all others as alternatives.

Results for Matrix-Forming Ecosystems

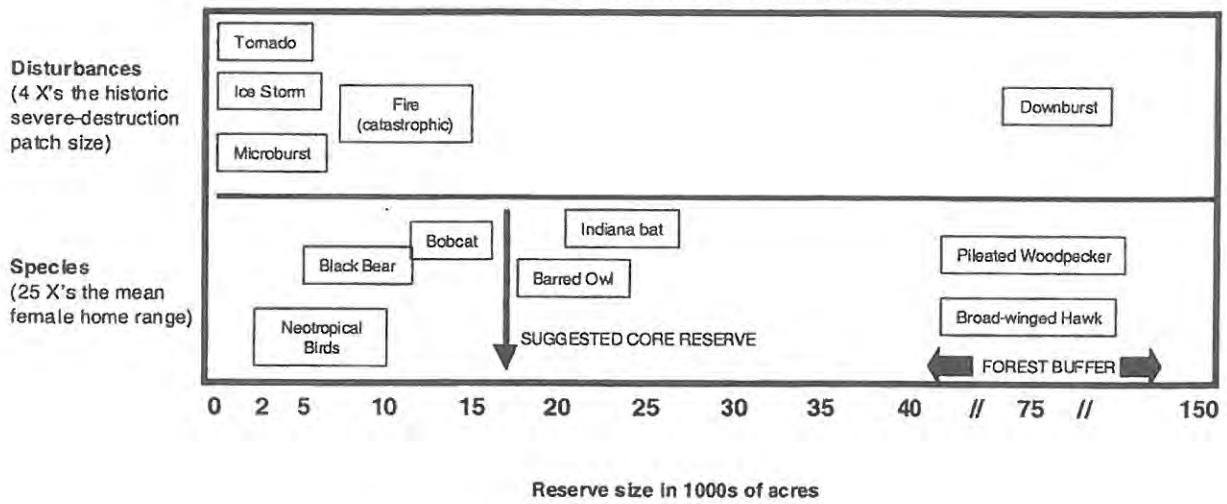
Modifications to Standard Method

Size Criteria

For area-sensitive species and breeding territory analysis of species, we focused on neotropical migrants as a key group. The unglaciated Allegheny Plateau supports exceptionally high proportions of the world population for many species, including the Cerulean Warbler, Blue-winged Warbler, Acadian Flycatcher, Worm-eating Warbler, and Louisiana Waterthrush (Partners in Flight, 2004). Over 10% of all Yellow-throated Warblers, Scarlet Tanagers, and Kentucky Warblers are also estimated to occur here (Partners in Flight, 2004). Forest-interior dependent non migratory species considered include the Barred Owl, Pileated Woodpecker, Red-headed Woodpecker. There are no mammals in this ecoregion that are completely dependent on forest-interior habitat, but there are several that need blocks of forest including the Allegheny woodrat (*Neotoma magister*), black bear (*Ursus americanus),* bobcat (*Lynx rufus),* gray fox (*Urocyon cinereoargenteus*), and Indiana bat (*Myotis sodalis*).

We adopted Robbins' (1989) 10,000 acres guideline assuming it takes 10,000 acres of road-bounded area to get a 7500 acre core area for retaining all neotropical bird species based partially on a recommendation from Bob Askins who had found similar patterns and results in southern Connecticut (Askins et al. 1987) a region he considered roughly similar to Robbins' study area with regard to forest cover (Askins pers. comm.). Review of the literature and discussion among experts on scaling factors specific to Western Allegheny Plateau forest systems is a big data gap need. The diagram below is included as a starting point for discussion and a preliminary estimate for a suggested minimum dynamic area (15,000 – 20,000 acres) for a "forest core reserve" embedded within a matrix forest landscape occurrence.

Preliminary Scaling factors and Reserve size for Matrix forests in the Unglaciated Western Allegheny Plateau Ecoregion



Literature review and expert input needed to agree on most appropriate scaling factors and their size.

Condition criteria

Fragmenting features: Roads were chosen as the main measurable feature to determine possible examples of matrix-forming ecosystems. Blocks were based on primary highways, primary roads, and secondary roads from Macon USA TIGER 1994 1:100,000 scale with major road class updates from Geographic Data Technology (GDT) 1997.

Ecosystem structure and biological legacies: Forests in the unglacited Western Allegheny Plateau are relatively young in age, have little structural diversity and lack important features such as large coarse woody debris or big standing snags. There are just a few scattered pockets of mature growth forest left. However, the current trend in percent forest cover is increasing from less than 3% in the early 1900's to approximately 40% today. Historical and current impacts on these forests have resulted in structural changes and slight shifts in tree species composition – forest systems are unlikely to have reached any type of equilibrium state at this time. However, legacies of biological origin that persist through time are undoubtedly influencing system recovery directing it toward a new future state. Natural Heritage Program plant and natural community element occurrence data and expert opinion were used as sources to document biological legacies.

Exotic or keystone species: We focused on the presence/absence of harmful exotics as one indicator of past landuse and of the overall likelihood of successful restoration outcomes. Exotic species discussed included tree-of-heaven, honey suckle, Russian olive, multiflora rose, stilt grass and the presence of high densities of the native white-tailed deer. Keystone species highlighted as positive indicators include cerulean warbler, timber rattlesnake, and neotropical migrants as a group.

Block development

Vector data at 1:100,000-scale covering the entire Western Allegheny Plateau boundary plus 1 mile of buffer was merged and clipped to the ecoregional boundary. Data merged included the Geographic Data Techology (GDT) roads layer, BASINS utilities right of way layer, BASINS railroad layer and the rf-3 streams layer. The combined line features were used to create a mosaic of "road-bounded" polygons representing areas lacking major dissections potentially representing matrix-forming forest ecosystems. The first layer of road-bounded polygons was created road categories 1, 2, 3 and 4. This effort yielded 216,515 polygons in two different size categories: 2,500 – 5,000 acres and 5,000 acres – 10,000 acres. Streams were used as a dissecting feature only where the streams layer represented a stream with separate shores. Road class 3 provided a clear defining cut-off for polygons and is consistent across all states included in the ecoregion. This category is defined as secondary and connecting roads, mostly state roads, always paved, that connect small roads and towns. The next small road class 4 is defined as small local roads that can be paved or unpaved. There was inconsistency between states on this road layer which allowed for some small roads to be included within some polygons in rural areas. This issue was dealt with to the extent possible by expert knowledge during the selection process.

We assembled expert teams for each state to review these polygons for nomination as potential matrix-forming forest ecosystem occurrences. Polygons were identified and boundaries marked and/or created directly on the maps provided for review.

Table x. Block bounding feature types

- Primary highway with limited access: Interstate highways and some toll highways. Distinguished by the presence of interchanges, access ramps, and opposing traffic lanes separated by a median strip. - Primary road without limited access: Nationally and regionally important highways that do not have limited access. Mostly US highways but also includes some state highways that connect larger cities and towns. May be divided or undivided and have multilane or single land characteristics. - Secondary and connecting road: Mostly state highways that connect towns. Must be concrete or asphalt and are usually undivided with single-land characteristics. - Waterbodies: Lakes and wide rivers. - Railroads - Major Utility Lines: Pipelines or Powerlines

A GIS analysis of size, landcover, road density and managed areas of the road-bounded blocks resulted in 48 nominated matrix-forming forest ecosystem occurrences. Potential occurrences were evaluated using the following criteria:

1. Contains ≥ one 10,000 acre road bounded block

2. Area of block is ≥5,000 acres with ≥75% natural land cover **AND**
   a. Contains ≥ 2,000 acres of natural land cover **OR**
   b. Contains ≥80% natural land cover **and** ≥ one 2,000 acre road-bounded polygon **and** managed area ≥ 20% or ≥ 4,000 acres.

Experts began with polygons 5,000 – 10,000 acres in size class adding adjacent polygons if the intervening fragmenting feature was deemed insignificant (canopy closure over road, boundary adjustment based on field knowledge). Smaller polygons were grouped in a similar way, using the above criteria and knowledge of the local area.

The above adjustments to the standard criteria established for matrix-forming forest occurrences in the Northeast were made based on differing patterns of landuse and lack of large major road-bounded polygons. Differences in preliminary scaling factors were also noted in that a core forest interior area in the unglaciated Western Allegheny Plateau may only need to be 10,000 – 15,000 acres in size as opposed to the suggested 20,000 acres for matrix-forming forest occurrences in the Northeast. The inclusion of potential matrix-forming forest occurrences of lesser size and condition, especially occurrences whose size was increased by incorporating lands that are functionally separated by roads, was cause for numerous theoretical discussions on viability and the need to maintain scientific rigor and functional landscapes through the assessment process. Valid concerns were raised regarding whether we were ignoring our own scientific evidence for what constitutes a viable matrix forest occurrence. By doing so, we may have accepted portfolio occurrences that may not be viable over the long term. Furthermore, until we better understand forest systems in the unglaciated Western Allegheny Plateau, minimum core dynamic area and spatial distribution of matrix-forming forest habitats are not clearly answerable questions. This issue was not resolved but it was decided that prudence favored inclusion of smaller matrix forest occurrences

with diminished condition where there was no other alternative due to landuse patterns in this ecoregion. The potential for these forest blocks to provide habitat for some interior forest species and to serve as "seed points" for forest restoration and expansion is great. Precedence has already been set for forest restoration by the increase of forest cover, reduction of human population in some areas and by restoration and consolidation of public lands in the ecoregion's only National Forest.

Forest Block selection

Expert interviews resulted in the identification and ranking of 48 potential matrix-forming forest ecosystem occurrences for further consideration as Yes, Maybe-Yes, or Maybe. Boundaries for these 48 blocks were determined at the expert workshops and grouped within four dominant-forest types; beech-maple, mixed mesophytic, oak-hickory and Appalachian oak (map x). To assess the full range of landscape settings for forest ecosystems in the unglaciated Western Allegheny Plateau, 9 different Ecological Land Unit groups were defined based on physical features of the ecoregion (see Map x: Matrix Blocks by ELU Group) and are listed below in Table x. The 48 potential matrix blocks were further refined to 18 matrix blocks for inclusion in the final Western Allegheny Plateau portfolio based on amount of available condition information. Two of the matrix blocks were combined with other blocks. The remaining 28 potential matrix blocks were not included based on lack of condition knowledge or existence of major fragmenting features and non-native cover based on review of aerial photography.

Table x. A description of the 9 initial Ecological Land Unit groups in the WAP.

ELU Group	Description
A1 Southern Pittsburgh Low Plateau	Very low elevation landforms with numerous slopes and summits, acidic sedimentary with some shale.
A2 Ohio Valley, Hocking Plateau, Lower Scioto Plateau	Very low to low elevation landforms with numerous slopes, summits and streams, acidic sedimentary.
B1a Allegheny Escarpment	Very low elevation landforms, acidic sedimentary and acidic shale with some calcareous features.
B1b Muskingham Plains	Very low elevation landforms with gentle slopes, acidic sedimentary and acidic shale.
B1c Teays and Southern Pittsburgh Low Plateau	Very low to low elevation landforms, acidic sedimentary and acidic shale.
B2a Northern Pittsburgh Low Plateau	Low elevation landforms, acidic sedimentary.
B2b	Very low elevation landform, acidic sedimentary.

Allegheny Plateau	
C Grand River-Pymatuning Lowlands	
Unknown Northern Pittsburgh Low Plateau	

Summary of Results

Expert meetings were held on January 29, 2002 in Columbus, Ohio; March 14, 2002 in Hawk's Nest State Park, West Virginia; and on May 23, 2002 in Pittsburgh, Pennsylvania to select and define initial matrix forest blocks. As a result of these meetings, 48 potential matrix forest blocks were identified. A fourth meeting was held on August 20, 2002 in Columbus by the Western Allegheny Plateau Ecology Working Group where 19 of the 48 matrix forest occurrences were selected for the final portfolio. Two occurrences were merged with adjacent occurrences based on expert opinion of road fragmenting features. Elimination of the remaining 27 matrix block occurrences from the portfolio was based on lack of condition information and/or more careful review of aerial photography. The 27 dropped occurrences included representation of 3 Ecological Land Unit groups. The Ecological Land Unit groups not represented in the final portfolio fall within the Allegheny Plateau and Akron Kames in northern Ohio and the Allegheny and Pittsburgh Low Plateaus in western Pennsylvania. Northern Ohio has become so urbanized that there are no longer any examples of matrix-forming forest ecosystems left. Further analysis of areas in western Pennsylvania, particularly the southwestern corner, may yield possible matrix-forming forest occurrences.

Table x. Initital and final portfolio forest blocks by Ecological Land Unit Group

ELU Group	Initial Blocks	Portfolio Blocks	Decision made
A1 Pittsburgh Low Plateau	8	1	One forest block was combined with an adjacent block and chosen based on Lewis Wetzel Wildlife Management Area. Others dropped for insufficient data.
A2 Ohio Valley, Hocking Plateau, Lower Scioto Plateau	15	11	8 out of 15 chosen based on embedded managed area lands, and 3 chosen for size and condition. *This group was further refined into three different Ecological Land Unit types.*
B1a Allegheny Escarpment	2	1	Two initial blocks were combined into one occurrence based on expert opinion and review of aerial photography.
B1b Muskingham Plains	2	2	Both blocks accepted based on size and condition.
B1c Teays and Southern	5	3	Three blocks chosen based on size and natural forest cover. Two dropped for insufficient information.

Pittsburgh Low Plateau			
B2a Pittsburgh Low Plateau	2	0	Insufficient data.
B2b Allegheny Plateau	2	1	One forest block was considered for further study (Ravenna Arsenal) because it is the only example of a matrix-forming forest occurrence in the entire glaciated Allegheny Plateau. The other nominated forest block was not considered viable due to urbanization.
C Grand River-Pymatuning Lowlands	1	0	Forest blocks were not considered viable due to urbanization.
Unknown Northern Pittsburgh Low Plateau	11	0	Insufficient data.

Ecological Land Unit Group A2 was further refined into three separate ecological land unit groups based on differences in dominant matrix-forming forest types, ecological land type phase descriptions for the Marietta and Ironton Units of the Wayne National Forest and geographic distribution across ecoregional subsections. Eleven forest blocks were included in the final portfolio, 2 in one group, 3 in the second, and 6 in the third. A total of seven Ecological Land Unit Groups were represented by the 18 matrix forest occurrences chosen for inclusion in the final portfolio.

The 18 matrix forest occurrences were prioritized into two tiers. Tier 1 occurrences were designated as 10-year action sites and Tier II occurrences as alternative sites. Six forest occurrences were prioritized as Tier 1 representing 4 different Ecological Land Unit groups and four out of seven unglaciated ecoregional subsections. The remaining 12 matrix forest occurrences were designated as Tier II because of lack of capacity or as alternative sites in the case of Ecological Land Unit group A2-3.

Only 4 of the 7 possible matrix-forming forest occurrences as defined by Ecological Land Unit groups are captured by Tier I occurrences. However, a lack of information on these forest landscape combinations and distribution of matrix-forming forest types to support this analysis make it suspect and in need of additional work. The five matrix-forming forest types described by NatureServe for the Western Allegheny Plateau occur in mosaics with each other (typically 2-4 types in a given area), in various successional stages and are usually embedded with patch communities. These mosaics reflect stand variation due to environmental gradients, forest practices, historical land use, and disturbances. Matrix-forming forest types for the glaciated plateau are not represented in this portfolio because they no longer exist at this scale. Restoration of potential matrix forest blocks was discussed by the team but there was not consensus among the group that restoration was likely or feasible.

There is a real need for forest inventory data in the Western Allegheny Plateau. Inventory is especially difficult in this ecoregion because most of it occurs in private ownership, and of this, much of the forestland is in smaller tracts. Tier I blocks were identified because they contained

embedded patch-forming ecosystems, aquatic features, and focal species populations that were likely to pass viability criteria. Because conservation action would already be targeted for many of these places due to the clusters of patch features, the addition of a large forest conservation target is an effective way to concentrate conservation action as well as ensure good landscape context for smaller scale targets. In most cases the Tier I and Tier II distinctions were obvious but in some cases the selection of Tier I blocks was arbitrary because blocks appeared roughly identical based on our collected information. The experts felt that more remote and on-the-ground inventory was needed to really assess the original set of 48 matrix forest occurrences and that the best the team could hope for during this plan iteration was to develop as representative a group of Tier I matrix forest occurrences as possible given current knowledge, understanding and capacity.

Table x. Tier I and Tier II matrix forest occurrences

ELU Group	Tier I Blocks	Tier II Blocks	Managed Area Acres	Total Block Acres
A1	**Lewis Wetzel, WV**		9324	59145
A2-1	Hocking Hills, OH		5115	31558
	Lake Katharine, OH		1960	74282
A2-2	Hughes River, WV Little Beaver, OH		3988	48805
	Little Kanawha, WV		0	38482
	Marietta, OH		19164	65983
A2-3	Vinton, OH		?	35,850
	Lake Vesuvius, OH (Ironton Forest)		49,324	93,459
		Buckeye Furnace, OH	0	38,682
		Bur Oak, OH	10895	32915
		Young's Branch, OH (Ironton Forest)	20506	39019
		Tick Ridge, OH	2924	52920
B1a	**Shawnee, OH**		72216	134788
B1b	**Little Beaver, OH**		2349	25987
	Kokosing, OH		383	21447
B1c	**Cabwaylingo, WV**		19568	80885
	Steer Creek, WV (Bear Fork)		0	84243
	Walback, WV		3354	12729

Bold = nominations for regional priority

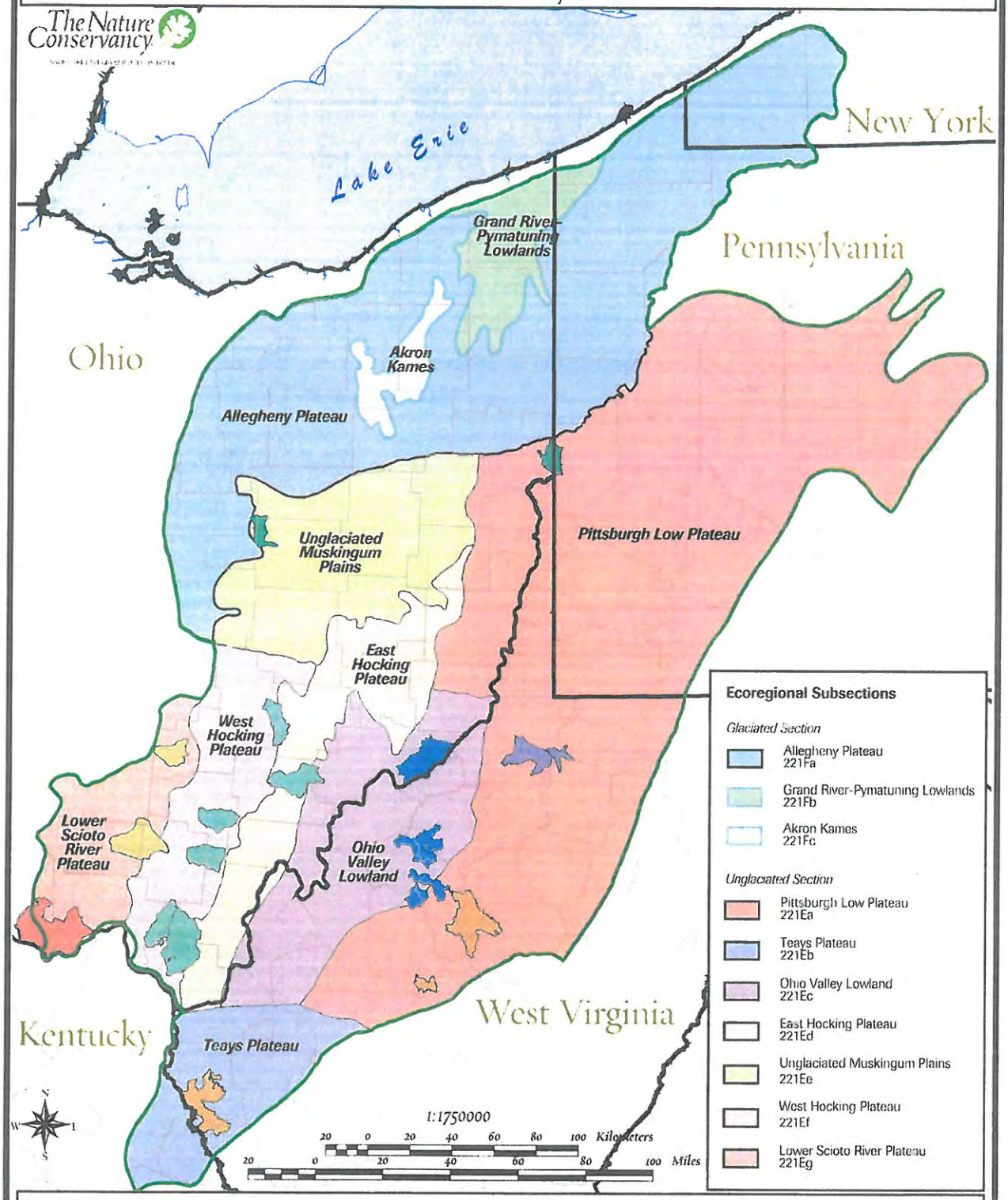
Table x. List of Expert Participants

Name	Title	Affiliation
Laura Belleville	Assistant State Director	The Nature Conservancy of Ohio
Kendra Cipollini, PhD	Director of Conservation Science	The Nature Conservancy of Ohio
August Froehlich	GIS Manager	The Nature Conservancy of Ohio
Rick Gardner	Field Botanist	The Nature Conservancy of Ohio
Todd Hutchinson	Botanist	USFS Delaware Research Station
Louis Iverson	GIS	USFS Delaware Research Station
Marleen Kromer	Director of Interagency Relations	The Nature Conservancy of Ohio
Erin Larson	Botanist	USFS Wayne National Forest
Dave Minney	Southern Ohio Land Steward	The Nature Conservancy of Ohio

Pete Whan	Edge of Appalachia Program Manager	The Nature Conservancy of Ohio
Robert Zaremba	Ecologist	The Nature Conservancy Eastern Resource Office
Charles Bier	Director, Pennsylvania Natural Diversity Inventory West	Western Pennsylvania Conservancy
Gary Frank	Forester, District #8	Pennsylvania Department of Conservation & Natural Resources Bureau of Forestry
Nels Johnson	Director of Conservation Programs	The Nature Conservancy of Pennsylvania
Robert Schweitzer	Forester, District #6	Pennsylvania Department of Conservation & Natural Resources Bureau of Forestry
Greg Soche	Forestry Specialist	Western Pennsylvania Conservancy
Paul Whipkey	Forester	Pennsylvania Department of Conservation & Natural Resources Bureau of Forestry
Barbara Breshock	Forester	West Virginia Division of Forestry
Tom Fox		West Virginia Department of Natural Resources
Bill Grafton	Professor	West Virginia University,
Ray Hicks	Professor	West Virginia University, Division of Forestry
Russ Richardson	Independent Forester	Weston, West Virginia
Bob Smith	Forester	West Virginia Division of Forestry
Paul Trianosky	State Director	The Nature Conservancy of West Virginia
Jim Vanderhorst	Community Ecologist	Non-game Wildlife and Natural Heritage Program, West Virginia Division of Natural Resources
James Warren	Forester	West Virginia Division of Forestry
Gerald W. Waybright	Forester	West Virginia Division of Forestry

Western Allegheny Plateau Ecoregion

Sections and Subsections
and Terrestrial Ecosystems



Appendix E: ODNR-Division of Wildlife Forest Focus Area Tactical Plans

Section 2.2.1.1

Appalachian Foothills Forestland Focus Area Tactical Plan

Appalachian Foothills Forestland Focus Area Tactical Plan

Goal: To provide the habitat requirements necessary to maintain and enhance the existing forest wildlife community within the Appalachian Foothills Focus Area.

Introduction/Background: The hill counties of southeast and southern Ohio currently exhibit the best examples of the forest wildlife habitat that existed in Ohio prior to European settlement. The Appalachian Foothills Focus Area, located in Vinton and Athens counties, includes the Zaleski State Forest, Waterloo Wildlife Area, Lake Hope State Park and portions of the Mead Corporation's Public Hunting Lands. In addition, some private lands are included in the Focus Area. While no specific activities are planned for immediately adjacent lands and inholdings that are privately owned, current habitat conditions on these areas will be considered as forest management plans are developed for public lands. Private lands comprise nearly 19,000 acres or about 28% of the 66,000+ acre tract (See Figure 1).

During the early 1800s, a vibrant iron ore industry developed in this area which used huge amounts of timber to operate the furnaces. Between 1818 and 1873, 69 pig iron furnaces flourished throughout the hanging rock area with two furnaces within the boundaries of the Zaleski State Forest. In the late 1800s, better iron ore reserves were discovered in Michigan and Missouri, causing the iron industry to quickly fade within the Appalachian Foothills area. By the turn of the 20th century, the iron ore industry was completely gone from Appalachian Foothills along with much of the timber. Subsistence farming was attempted in the area, but the steep slopes and thin soils proved too unproductive. It was during this time period that deep mining for coal became an important industry.

In 1935, under the direction of the U. S. Department of Agriculture and the Ohio Division of Forestry, the Zaleski Land Utilization Project was established. The objective of the Zaleski project was to return the land to its most productive capacity by establishing a forest community, providing flood control and preventing soil erosion. In the 1930s, the State of Ohio acquired 3,400 acres of the Strong Estate and Lake Hope was constructed along with 14 vacation cabins, 35 miles of roads, 21 miles of firebreaks and several fire towers.

In 1930, the distribution of natural cover in the Appalachian Foothills area was 29% openland, 35% brushland and 36% woodland. Today over 85% of the area is in some stage of forest cover. Current size class on Zaleski State Forest for all stands is 71% sawtimber, 22% poles and 7% seedling/sapling.

Currently, tree age classes in the Focus Area are shifting from less shrub/brush to more pole/mature with a slow but steady shift in tree species composition from oak and hickory dominated stands to maple and tulip poplar stands.

One-hundred-twenty-five species have been identified on Ohio's Native and Naturalized Terrestrial Wildlife Species List as having viable, broadly distributed populations around the state (e.g., robins, chipmunks, etc.). They occur as viable populations in most, if not all, of the focus areas. While these species are obviously part of the wildlife communities in the focus

areas, it is not critical to meet the habitat objectives in each focus area to ensure these species continued viability. Therefore, habitat guidelines were developed to address the needs of the species in the Appalachian Foothills Focus Area with more limited distribution and/or lower population levels. There are 57 species (12 mammals, 31 birds, 8 reptiles, 5 amphibians and 1 invertebrate) in this category found within the Focus Area (See Appendix 1).

Need/Justification: The Division of Wildlife's approach to enhancing and maintaining the highest level of terrestrial wildlife diversity in the state is to use a "focus area" concept to sustain viable populations of as many native species of wildlife as possible. The idea is to concentrate efforts and resources to provide all the necessary habitat requirements in a few large units of the major habitat types, along with the remnants of several unique habitats, for species that are of limited distribution or have low populations. Several widely separated focus areas for each of the major habitat types (forest, grassland and wetland) have been selected to reduce the risk of extirpation of species from natural disaster, disease outbreak, etc. Typically focus areas are associated with relatively large holdings of public land where future land use practices can be managed.

When considering the needs of several species of forest birds (pileated woodpecker, broad-winged hawk, yellow-throated vireo, worm-eating warbler, cerulean warbler, ovenbird and the American redstart), the literature suggests that the minimum forestland acreage needed before these species would likely be present is 300 acres. A viable population would require at least 200 breeding pairs. In a large forestland area or complex, the most area-sensitive of these avian species, the pileated woodpecker and broad-winged hawk, could be expected to nest at a density of 1 nest per 300 acres. Therefore, conservation areas designed to maintain viable populations of these species would need to have approximately 60,000 acres of suitable forest habitat (200 pairs x 300 acres/pair). The higher the proportion of forest habitat (as opposed to other cover types such as agriculture or post-stripmine grasslands) within the focus area the better with 80% or more being the most desirable. This approach assumes that the needs of less area-sensitive species along with the common, broadly distributed species will be met if the habitat requirements of the most area-sensitive species are provided.

To meet the habitat requirements of all of the forest-wildlife species found at the Appalachian Foothills, a variety of age and size classes of timber must be distributed throughout the Focus Area. An age/size class distribution of 30% seedling/sapling, 25% pole timber, 25% saw timber and 20% mature forest (i.e., no harvest activity) would meet the habitat needs required to sustain a healthy forest wildlife community (See Forest Habitat Tactical Plan). Based on the best currently available information, this approach (approximately 60,000 acres of forest habitat that comprises at least 80% of a focus area with a mixture of 30%, 25%, 25% and 20% seedlings, poles, saw timber and mature forest respectively) would sustain viable populations of all of Ohio's forest wildlife species with one exception – black bears. The literature suggests that the minimum acreage needed to sustain a viable population of black bears is 224,000 acres. Since this essentially quadruples the size of forest focus areas and since Ohio's bear population is clearly on the rise with substantial suitable, unoccupied habitat throughout the eastern and southern portions of the state, it has been determined not to base forestland focus area size on the needs of black bears. It should also be noted that while there is a reasonable likelihood that populations of species listed in Appendix 1 for this Focus Area will be viable if planned habitat management and restoration efforts are completed in a timely manner, not all species have the same probability of reaching viable levels because their populations may be impacted by factors other than habitat conditions on the Focus Area (e.g., location of Focus Area to species'

geographic range or habitat quality and availability on migratory routes and wintering areas).

The Appalachian Foothills Focus Area was chosen because Zaleski State Forest, Waterloo Wildlife Area, Lake Hope State Park and Mead Public Hunting Area comprise nearly 72% of the tract (Figure 1) and nearly 60,000 acres of the 66,000+ acre Focus Area are currently forested (Figure 2). It represents one of the best and largest examples of forest wildlife habitat currently found in the state.

Objective: To establish and maintain quality forest habitat that will support viable populations of the 57 species listed in Appendix 1 of this Plan in addition to the numerous species with viable, broadly distributed populations also found within the Focus Area.

Approach: Achieving this Plan's Goal and Objective will require a three-phased approach. The Information Phase will involve presentation of the Plan to the Division of Forestry, Division of Parks and Recreation and the Mead Paper Company to determine their willingness to cooperate with implementation. Assuming all are in agreement, the Plan would then need approval by the Director of the Department of Natural Resources. Assuming the Director approves the Plan, we would contact county commissioners, township trustees, private landowners and other individuals in the vicinity of the Focus Area to inform them of the Plan.

Inventory Phase – After the Plan is approved, an inventory of the structure and composition of the wildlife habitat within the Appalachian Foothills Focus Area will be conducted. Inventory information will come from existing forest stand inventories of the Division of Forestry, Mead Paper Company records, GIS inventories and other available sources. An aerial inspection will be conducted of Division of Parks and Recreation land, Mead Paper Company land, privately owned inholdings and a 1/4-mile buffer of privately owned land around the outer boundary of the Focus Area to inventory the wildlife habitat on those properties. Some limited inventories may be collected from the ground during this phase of the Plan. Additional habitat evaluation will be conducted at sites scheduled for vegetative treatment during the Implementation Phase of this Plan.

Planning and Implementation Phase – This phase of the Appalachian Foothills Plan will begin after the Inventory Phase is completed. Planning will involve comparing existing habitat inventories to planned habitat objectives as described in the **Needs/Justification** and determining what adjustments need to be made in the proportions of the various habitat types. The mature forest portion of the desired habitat will be partially represented by the habitat on Lake Hope State Park (3,103 acres). Based on the planned habitat objectives, the mature forest component of the Focus Area will need to encompass approximately 13,000 acres. Therefore, around 10,000 acres, in addition to the habitat on Lake Hope State Park, will be selected to comprise the mature forest component of the Focus Area. The habitat objectives will be achieved by: limiting management activities and allowing natural succession to continue in the designated mature forest tracts (e.g., riparian corridors, threatened and endangered plant communities that are found in maturing forest habitat, etc.), and on other selected portions of the Focus Area by slowing natural succession in stands of hawthorn/crabapple, old orchards and other old field conditions, returning mature and pole habitats to seedling/sapling stands, and performing activities that will change the structure and/or composition of different forest stands. Some of the management options for achieving the desired habitat will include timber and firewood sales, controlled

burning, herbicide application, release cutting and mowing.

Habitat management decisions will relate to the current habitat inventory and the planned habitat objectives. Critical components of habitat planning and establishment must include: when to apply activities, where to apply activities and the rate to apply activities. Ultimately, a diverse array of habitat types should be interspersed throughout the Focus Area versus locating all of the similar age/size/composition characteristics lumped together in a few large and widely spaced locations (the exception may be the mature forest component). The rate of applying management activities will vary with the degree of difference between the existing and desired amounts of the various habitat types. For instance, if the habitat inventory shows significantly higher percentages of mature forests than desired, the rate at which management occurs and the number of active sites will both be initially high. Once the desired structure and composition is reached, the rate of application and the number of sites will be reduced to maintaining the desired structure and composition. On the other hand, if the existing habitat is similar in structure and composition to the desired habitat, the rate of management activity and the number of sites will initially be lower. Regardless of the current habitat, the long-range amount of annual activity should eventually level off to a maintenance mode. A specific management plan that identifies what activities will be applied when and where will be developed and used to guide the "on the ground" progress toward meeting the planned habitat objectives.

Habitat objectives for all the focus areas were developed based on the best information currently available in terms of species-habitat relationships and the population ecology of associated wildlife species. Assumptions were made so that habitat work could proceed toward meeting plan goals and objectives. Clearly, evaluation and monitoring will be required periodically in each focus area for select species of interest to assess the validity of assumptions made during this planning process and to guide future revisions of these conservation activities. Thus, along with projects designed to attain focus area habitat goals, appropriate surveys and research evaluations need to be developed and implemented to ensure that habitat projects are producing measurable and desirable results for the intended wildlife community.

Section 2.2.1.2

Appalachian Foothills Focus Area Maps

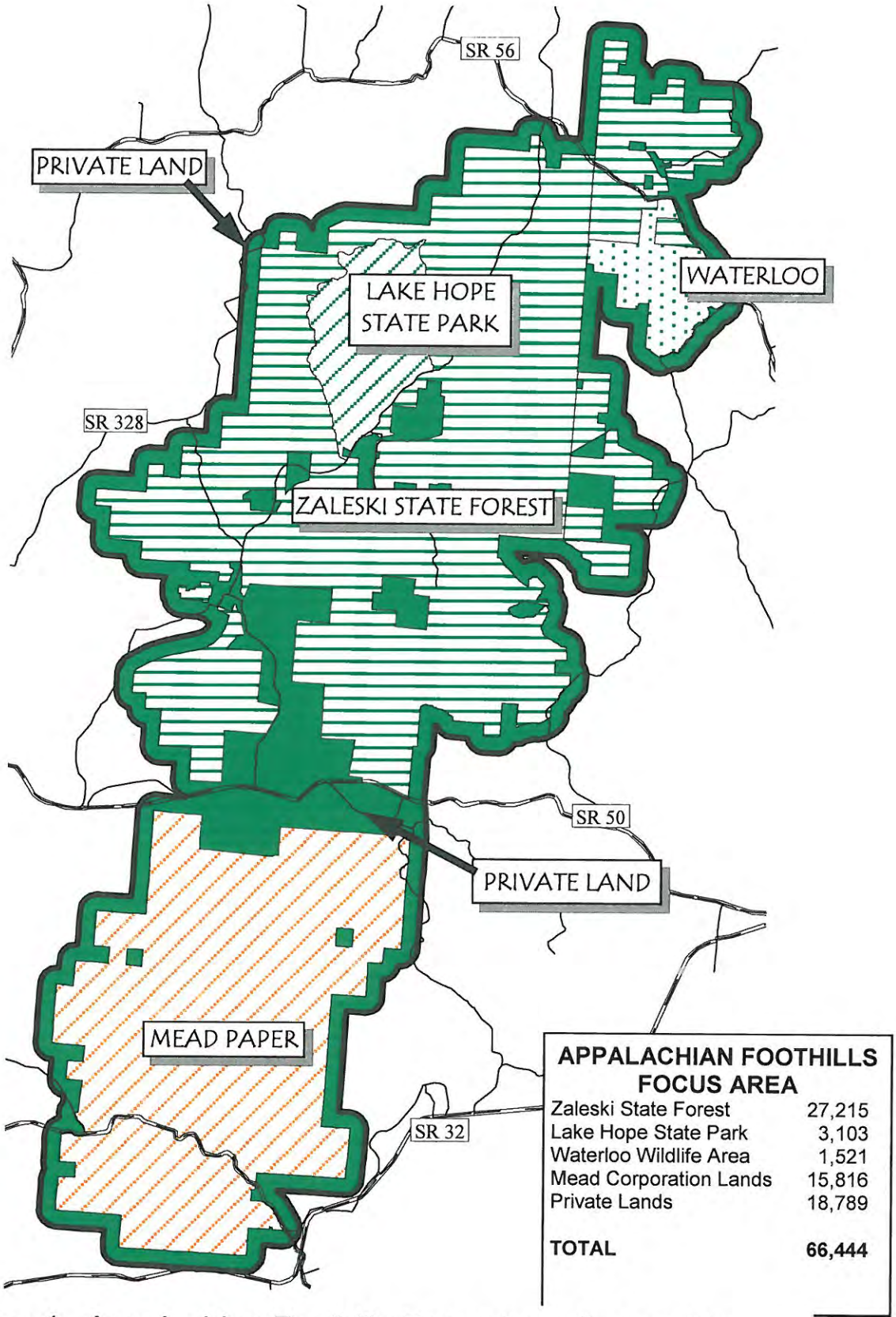


Figure 1. Appalachian Foothills Focus Area Ownership

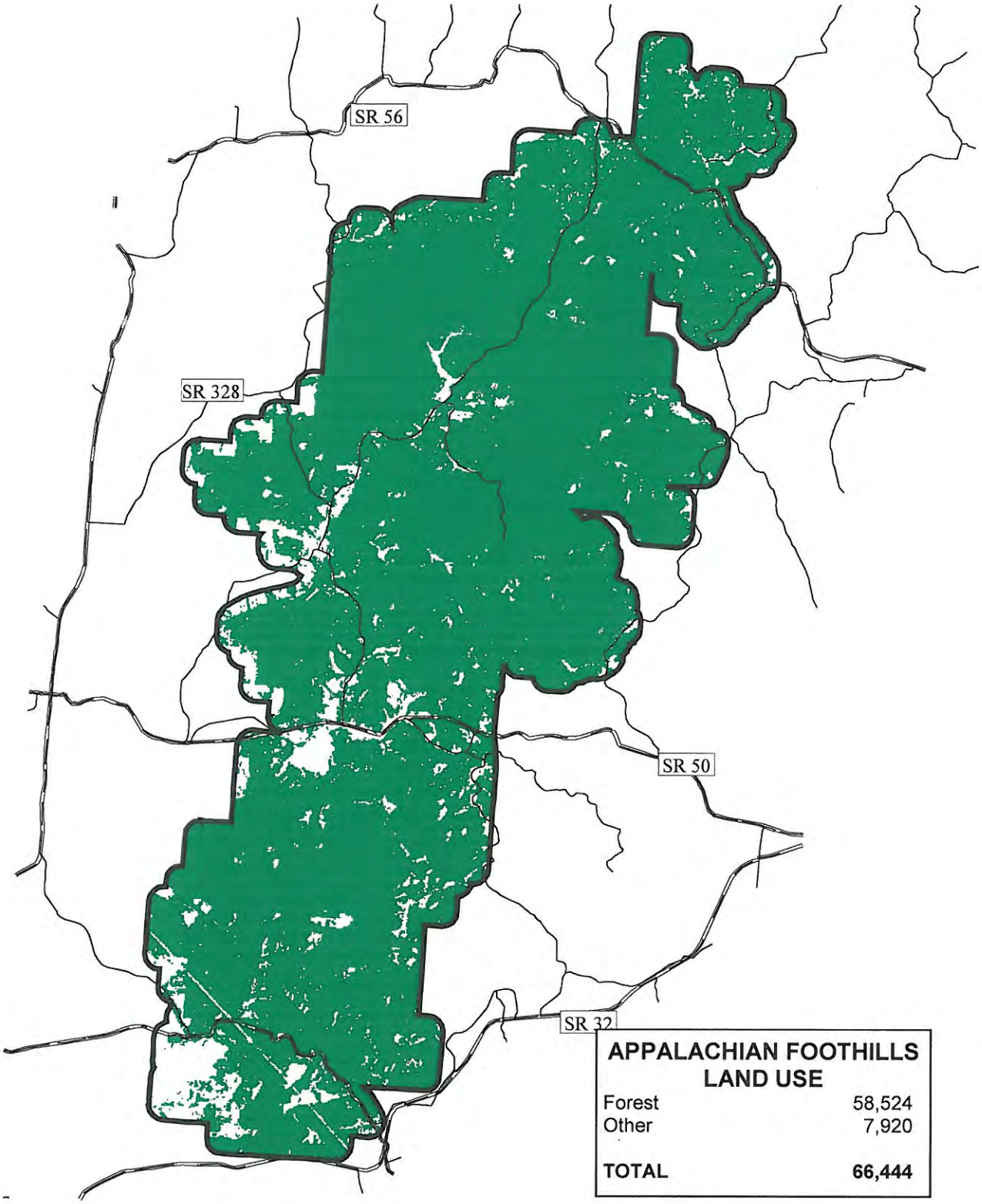


Figure 2. Appalachian Foothills Focus Area Land Use

Section 2.2.1.3

Appalachian Foothills Forestland Focus Area Species Expected to Benefit

Appendix 1 - Species expected to benefit within the Appalachian Foothills Focus Area*	
Common Name	**Scientific Name**
Mammals	
Bobcat	*Felis rufus*
Evening Bat	*Nycticeius humeralis*
Hairy-tailed Mole	*Parascalops breweri*
Hoary Bat	*Lasiurus cinereus*
Indiana Bat	*Myotis sodalis*
Meadow Jumping Mouse	*Zapus hudsonius*
Northern Long-eared Bat	*Myotis septentrionalis*
Pine Vole	*Microtus pinetorum*
Pygmy Shrew	*Microsorex hoyi*
Red Bat	*Lasiurus borealis*
Silver-haired bat	*Lasionycteris noctivagans*
Smoky Shrew	*Sorex fumeus*
Birds	
American Redstart	*Setophaga ruticilla*
Bewick's Wren	*Thryothorus bewickii*
Black and White Warbler	*Mniotilta varia*
Black-billed Cuckoo	*Coccyzus erythropthalmus*
Blue-headed Vireo	*Vireo solitarius*
Black-throated Green Warbler	*Dendroica virens*
Blackburnian Warbler	*Dendroica fusca*
Blue-gray Gnatcatcher	*Polioptila caerulea*
Blue-winged Warbler	*Vermivora pinus*
Broad-winged Hawk	*Buteo platypterus*
Cerulean Warbler	*Dendroica cerulea*
Chestnut-sided Warbler	*Dendroica pensylvanica*
Golden-winged Warbler	*Vermivora chrysoptera*
Great-crested Flycatcher	*Myiarchus crinitus*
Hermit Thrush	*Catharus guttatus*
Hooded Warbler	*Wilsonia citrina*
Louisiana Waterthrush	*Seiurus motacilla*
Northern Parula	*Parula americana*
Pileated Woodpecker	*Dryocopus pileatus*
Pine Warbler	*Dendroica pinus*
Red-headed Woodpecker	*Melanerpes erythrocephalus*
Red-shouldered Hawk	*Buteo lineatus*
Rose-breasted Grosbeak	*Pheucticus ludovicianus*
Sharp-shinned Hawk	*Accipiter striatus*
Summer Tanager	*Piranga rubra*
Veery	*Catharus fuscescens*
Whip-poor-will	*Caprimulgus vociferus*
Worm-eating Warbler	*Helmitheros vermivorus*
Yellow-billed Cuckoo	*Coccyzus americanus*
Yellow-throated Vireo	*Vireo flavifrons*
Yellow-throated Warbler	*Dendroica dominica*
Reptiles & Amphibians	
Black Kingsnake	*Lampropeltis getula nigra*
Broadhead Skink	*Eumeces laticeps*
Eastern Box Turtle	*Terrapene carolina carolina*
Eastern Smooth Earth Snake	*Virginia valeriae valeriae*
Ground Skink	*Scincella lateralis*
Kentucky Spring Salamander	*Gyrinophilus porphyriticus duryi*
Mountain Dusky Salamander	*Desmognathus ochrophaeus*
Mud Salamander	*Pseudotriton montanus*
Northern Coal Skink	*Eumeces anthracinus anthracinus*
Northern Spring Salamander	*Gyrinophilus porphyriticus porphyriticus*
Rough Green Snake	*Opheodrys aestivus*
Smallmouth Salamander	*Ambystoma texanum*
Timber Rattlesnake	*Crotalus horridus horridus*
Invertebrates	
American burying beetle	*Nicrophorus americanus*
*Does not include species with viable populations broadly distributed throughout Ohio as identified on the Native & Naturalized Terrestrial Wildlife Species List.	

Section 2.2.2

Tecumseh Forestland Focus Area Tactical Plan

Section 2.2.2.1

Tecumseh Forestland Focus Area Tactical Plan

Tecumseh Forestland Focus Area Tactical Plan

Goal: To provide the habitat requirements necessary to maintain and enhance the existing forest wildlife community within the Tecumseh Focus Area.

Introduction/Background: The hill counties of southeast and southern Ohio currently exhibit the best examples of the forest wildlife habitat that existed in Ohio prior to European settlement. The Tecumseh Focus Area (Figure 1), located in Scioto and Adams counties, includes Shawnee State Forest (60,179 acres, 75% of the total area), Shawnee State Park (587 acres, less than 1% of the total area), Raven Rock State Nature Preserve (93 acres, less than 1% of the total area), and scattered parcels of private land (19,414 acres, 24% of the total area). While no specific activities are planned for immediately adjacent lands and inholdings that are privately owned, current habitat conditions on these areas will be considered as forest management plans are developed for public lands.

Once inhabited by Shawnee Indians, Shawnee State Forest came into existence in 1922 with the purchase of 5,000 acres of land that had been heavily timbered and ravaged by fire. In the 1930s, six Civilian Conservation Corps camps were located in the forest. During this period, many of the roads were constructed in the then nearly inaccessible area. In 1949, the recreation facilities at Roosevelt Lake were transferred to the Division of Parks. The Roosevelt Game Preserve became a part of the forest in 1951.

Shawnee State Forest is managed to improve the growth, yield and quality of the timber on the area. The habitat needs of the wildlife that inhabit the Forest are considered when timber harvest plans are developed. A wilderness area totaling approximately 8,000 acres has been designated within the Shawnee State Forest where all timber management, habitat manipulation and public motorized travel have been eliminated.

Currently tree age classes in the Tecumseh Focus Area are shifting from less shrub/brush to more pole/mature with a slow but steady shift in tree species composition from oak and hickory dominated stands to maple and tulip poplar stands.

One-hundred-twenty-five species have been identified on Ohio's Native and Naturalized Terrestrial Wildlife Species List as having viable, broadly distributed populations around the state (e.g., robins, chipmunks, etc.). They occur as viable populations in most, if not all, of the focus areas. While these species are obviously part of the wildlife communities in the focus areas, it is not critical to meet the habitat objectives in each focus area to ensure these species continued viability. Therefore, habitat guidelines were developed to address the needs of the species in the Tecumseh Focus Area with more limited distribution and/or lower population levels. There are 55 species (13 mammals, 30 birds, 7 reptiles and 5 amphibians) in this category found within the Focus Area (See Appendix 1).

Need/Justification: The Division of Wildlife's approach to enhancing and maintaining the highest level of terrestrial wildlife diversity in the state is to use a "focus area" concept to sustain viable populations of as many native species of wildlife as possible. The idea is to concentrate efforts and resources to provide all the necessary habitat requirements in a few, relatively large units of the major habitat types, along with the remnants of several unique habitats, for species that are of limited distribution or have low populations. Several widely separated focus areas for

each of the major habitat types (forest, grassland and wetland) have been selected to reduce the risk of extirpation of species from natural disaster, disease outbreak, etc. Typically focus areas are associated with relatively large holdings of public land where future land use practices can be managed.

When considering the needs of several species of forest birds (pileated woodpecker, broad-winged hawk, yellow-throated vireo, worm-eating warbler, cerulean warbler, ovenbird and the American redstart), the literature suggests that the minimum forestland acreage needed before these species would likely be present is 300 acres. A viable population would require at least 200 breeding pairs. In a large forestland area or complex, the most area-sensitive of these avian species, the pileated woodpecker and broad-winged hawk, could be expected to nest at a density of 1 nest per 300 acres. Therefore, conservation areas designed to maintain viable populations of these species would need to have approximately 60,000 acres of suitable forest habitat (200 pairs x 300 acres/pair). The higher the proportion of forest habitat (as opposed to other cover types such as agriculture or post-stripmine grasslands) within the focus area the better with 80% or more being the most desirable. This approach assumes that the needs of less area-sensitive species along with the common, broadly distributed species will be met if the habitat requirements of the most area-sensitive species are provided.

To meet the habitat requirements of all the forest-wildlife species found at Tecumseh, a variety of age and size classes of timber must be distributed throughout the Focus Area. An age/size class distribution of 30% seedling/sapling, 25% pole timber, 25% saw timber and 20% mature forest (i.e., no harvest activity) would meet the habitat needs required to sustain a healthy forest wildlife community (See Forest Habitat Tactical Plan). Based on the best currently available information, this approach (approximately 60,000 acres of forest habitat that comprises at least 80% of a focus area with a mixture of 30%, 25%, 25% and 20% seedlings, poles, saw timber and mature forest respectively) would sustain viable populations of all of Ohio's forest wildlife species with one exception – black bears. The literature suggests that the minimum acreage needed to sustain a viable population of black bears is 224,000 acres. Since this essentially quadruples the size of forest focus areas and since Ohio's bear population is clearly on the rise with substantial suitable, unoccupied habitat throughout the eastern and southern portions of the state, it has been determined not to base forestland focus area size on the needs of black bears. It should also be noted that while there is a reasonable likelihood that populations of species listed in Appendix 1 for this Focus Area will be viable if planned habitat management and restoration efforts are completed in a timely manner, not all species have the same probability of reaching viable levels because their populations may be impacted by factors other than habitat conditions on the Focus Area (e.g., location of Focus Area to species' geographic range or habitat quality and availability on migratory routes and wintering areas).

The Tecumseh Focus Area was chosen because Shawnee State Forest, Shawnee State Park and Raven Rock State Nature Preserve comprise nearly 76% of the tract (60,859 acres of 80,273) (Figure 1) and 77,457 acres (96%) of the 80,000+ acre Focus Area are currently forested (Figure 2). It represents one of the best and largest examples of forest wildlife habitat currently found in the state.

Objective: To establish and maintain quality forest habitat that will support viable populations of the 55 species listed in Appendix 1 of this Plan in addition to the numerous species with viable, broadly distributed populations also found within the Focus Area.

Approach: Achieving this Plan's Goal and Objective will require a three-phased approach. The

Information Phase will involve presentation of the Plan to the Division of Forestry, Division of Parks and Recreation and the Division of Natural Areas and Preserves to determine their willingness to cooperate with implementation. Assuming all are in agreement, the Plan would then need approval by the Director of the Department of Natural Resources. Assuming the Director approves the Plan, we would contact county commissioners, township trustees, private landowners and other individuals in the vicinity of the Focus Area to inform them of the Plan.

Inventory Phase – After the Plan is approved, an inventory of the structure and composition of the wildlife habitat within the Tecumseh Focus Area will be conducted. Inventory information will come from existing forest stand inventories of the Division of Forestry, GIS inventories and other available sources. An aerial inspection will be conducted of Division of Parks and Recreation land, Division of Natural Areas and Preserves land, privately owned inholdings and a 1/4-mile buffer of privately owned land around the outer boundary of the Focus Area to inventory the wildlife habitat on those properties. Some limited inventories may be collected from the ground during this phase of the Plan. Additional habitat evaluation will be conducted at sites scheduled for vegetative treatment during the Implementation Phase of this Plan.

Planning and Implementation Phase – This phase of the Tecumseh Plan will begin after the Inventory Phase is completed. Planning will involve comparing existing habitat inventories to planned habitat objectives as described in the **Needs/Justification** and determining what adjustments need to be made in the proportions of the various habitat types. The mature forest portion of the desired habitat will be partially represented by the Wilderness Area of the Shawnee State Forest (8,000 acres). Based on the planned habitat objectives, the mature forest component of the Focus Area will need to encompass approximately 16,000 acres. Therefore, approximately 8,000 acres, in addition to the habitat in the Wilderness Area, will be selected to comprise the mature forest component of the Focus Area. The habitat objectives will be achieved by: limiting management activities and allowing natural succession to continue in the designated mature forest tracts (e.g., riparian corridors, threatened and endangered plant communities that are found in maturing forest habitat, etc.), and on other selected portions of the Focus Area by slowing natural succession in stands of hawthorn/crabapple, old orchards and other old field conditions, returning mature and pole habitats to seedling/sapling stands, and performing activities that will change the structure and/or composition of different forest stands. Some of the management options for achieving the desired habitat will include timber and firewood sales, controlled burning, herbicide application, release cutting and mowing.

Habitat management decisions will relate to the current habitat inventory and the planned habitat objectives. Critical components of habitat planning and establishment must include: when to apply activities, where to apply activities and the rate to apply activities. Ultimately, a diverse array of habitat types should be interspersed throughout the Focus Area versus locating all of the similar age/size/composition characteristics lumped together in a few large and widely spaced locations (the exception may be the mature forest component). The rate of applying management activities will vary with the degree of difference between the existing and desired amounts of the various habitat types. For instance, if the habitat inventory shows significantly higher percentages of mature forests than desired, the rate at which management occurs and the number of active sites will both be initially high. Once the desired structure and composition is reached, the rate of application and the number of sites will be reduced to maintaining the desired structure and composition. On the other hand, if the existing habitat is similar in structure and composition to the desired habitat, the rate of management activity and the number of sites will initially be lower. Regardless of the current habitat, the long-range amount of annual activity should eventually level off to a maintenance mode. A specific management plan

that identifies what activities will be applied when and where will be developed and used to guide the "on the ground" progress toward meeting the planned habitat objectives.

Habitat objectives for all the focus areas were developed based on the best information currently available in terms of species-habitat relationships and the population ecology of associated wildlife species. Assumptions were made so that habitat work could proceed toward meeting plan goals and objectives. Clearly, evaluation and monitoring will be required periodically in each focus area for select species of interest to assess the validity of assumptions made during this planning process and to guide future revisions of these conservation activities. Thus, along with projects designed to attain focus area habitat goals, appropriate surveys and research evaluations need to be developed and implemented to ensure that habitat projects are producing measurable and desirable results for the intended wildlife community.

Section 2.2.2.2

Tecumseh Forestland Focus Area Maps

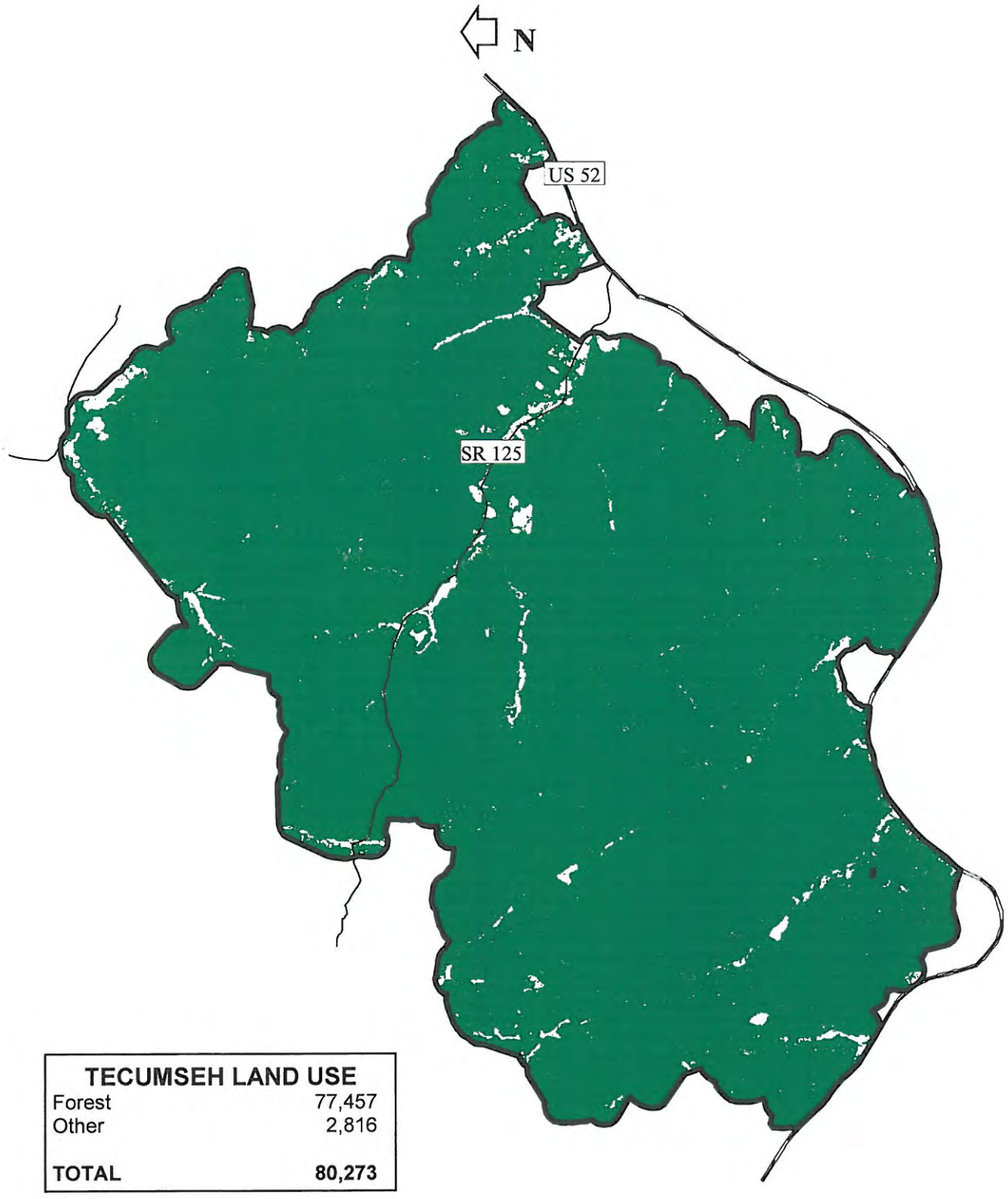
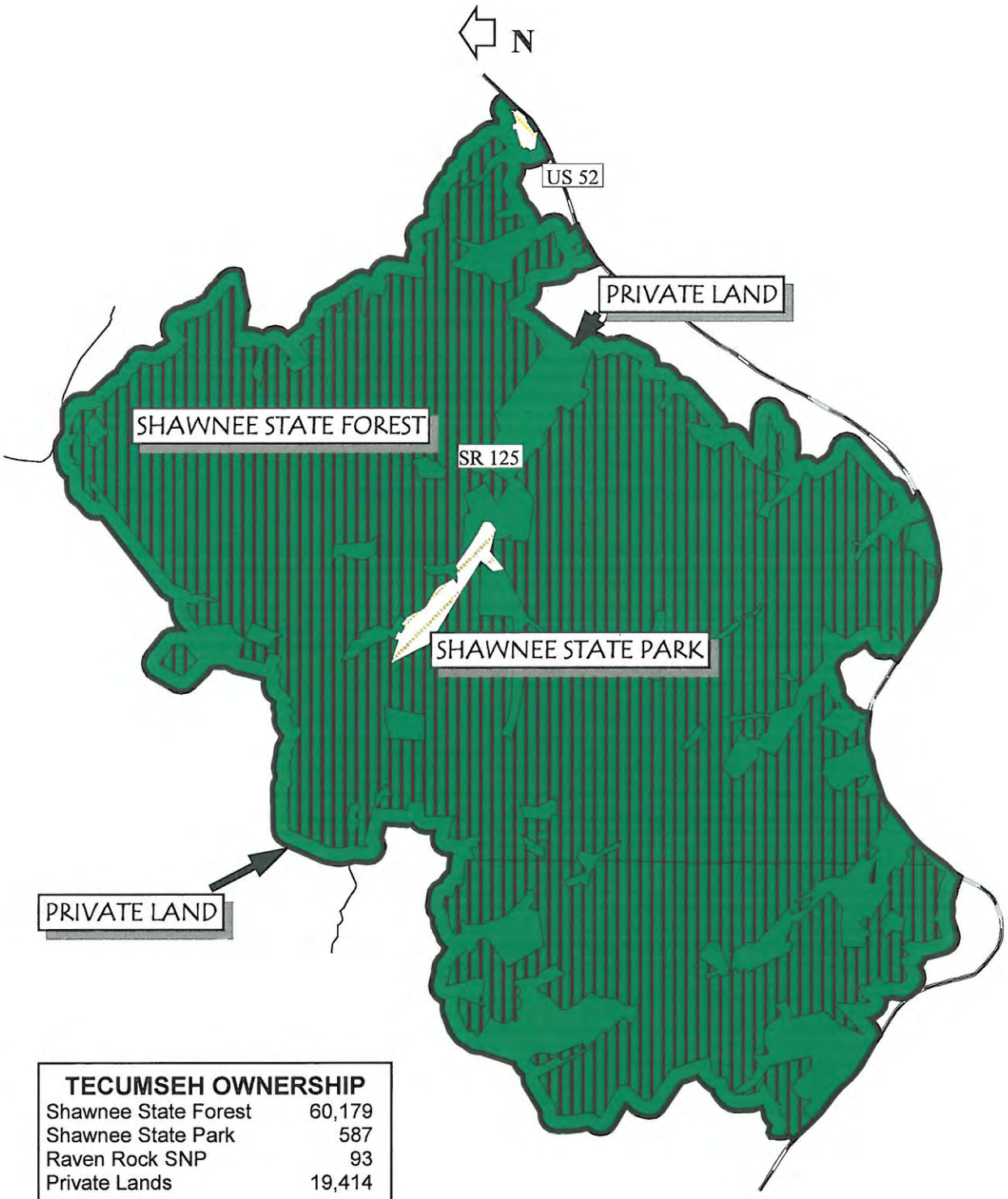


Figure 2. Tecumseh Focus Area Land Use



TECUMSEH OWNERSHIP	
Shawnee State Forest	60,179
Shawnee State Park	587
Raven Rock SNP	93
Private Lands	19,414
TOTAL	**80,273**

Figure 1. Tecumseh Focus Area Ownership

Section 2.2.2.3

Tecumseh Forestland Focus Area Species Expected to Benefit

Appendix 1 - Species expected to benefit within the Tecumseh Focus Area*	
Common Name	**Scientific Name**
Mammals	
Bobcat	*Felis rufus*
Evening Bat	*Nycticeius humeralis*
Hairy-tailed Mole	*Parascalops breweri*
Hoary Bat	*Lasiurus cinereus*
Indiana Bat	*Myotis sodalis*
Meadow Jumping Mouse	*Zapus hudsonius*
Northern Long-eared Bat	*Myotis septentrionalis*
Pine Vole	*Microtus pinetorum*
Pygmy Shrew	*Microsorex hoyi*
Rafinesque's Big-eared Bat	*Corynorhinus rafinesquii*
Red Bat	*Lasiurus borealis*
Silver-haired bat	*Lasionycteris noctivagans*
Smoky Shrew	*Sorex fumeus*
Birds	
American Redstart	*Setophaga ruticilla*
Bewick's Wren	*Thryothorus bewickii*
Black and White Warbler	*Mniotilta varia*
Black-billed Cuckoo	*Coccyzus erythropthalmus*
Blue-headed Vireo	*Vireo solitarius*
Black-throated Green Warbler	*Dendroica virens*
Blackburnian Warbler	*Dendroica fusca*
Blue Grosbeak	*Guiraca caerulea*
Blue-gray Gnatcatcher	*Polioptila caerulea*
Blue-winged Warbler	*Vermivora pinus*
Broad-winged Hawk	*Buteo platypterus*
Cerulean Warbler	*Dendroica cerulea*
Chestnut-sided Warbler	*Dendroica pensylvanica*
Golden-winged Warbler	*Vermivora chrysoptera*
Great-crested Flycatcher	*Myiarchus crinitus*
Hooded Warbler	*Wilsonia citrina*
Louisiana Waterthrush	*Seiurus motacilla*
Northern Parula	*Parula americana*
Pileated Woodpecker	*Dryocopus pileatus*
Pine Warbler	*Dendroica pinus*
Red-headed Woodpecker	*Melanerpes erythrocephalus*
Red-shouldered Hawk	*Buteo lineatus*
Rose-breasted Grosbeak	*Pheucticus ludovicianus*
Sharp-shinned Hawk	*Accipiter striatus*
Summer Tanager	*Piranga rubra*
Whip-poor-will	*Caprimulgus vociferus*
Worm-eating Warbler	*Helmitheros vermivorus*
Yellow-billed Cuckoo	*Coccyzus americanus*
Yellow-throated Vireo	*Vireo flavifrons*
Yellow-throated Warbler	*Dendroica dominica*
Reptiles and Amphibians	
Black Kingsnake	*Lampropeltis getula nigra*
Broadhead Skink	*Eumeces laticeps*
Eastern Box Turtle	*Terrapene carolina carolina*
Eastern Smooth Earth Snake	*Virginia valeriae valeriae*
Green Salamander	*Aneides aeneus*
Ground Skink	*Scincella lateralis*
Kentucky Spring Salamander	*Gyrinophilus porphyriticus duryi*
Mountain Dusky Salamander	*Desmognathus ochrophaeus*
Mud Salamander	*Pseudotriton montanus*
Rough Green Snake	*Opheodrys aestivus*
Smallmouth Salamander	*Ambystoma texanum*
Timber Rattlesnake	*Crotalus horridus horridus*
*Does not include species with viable populations broadly distributed throughout Ohio	
as identified on the Native & Naturalized Terrestrial Wildlife Species List.	