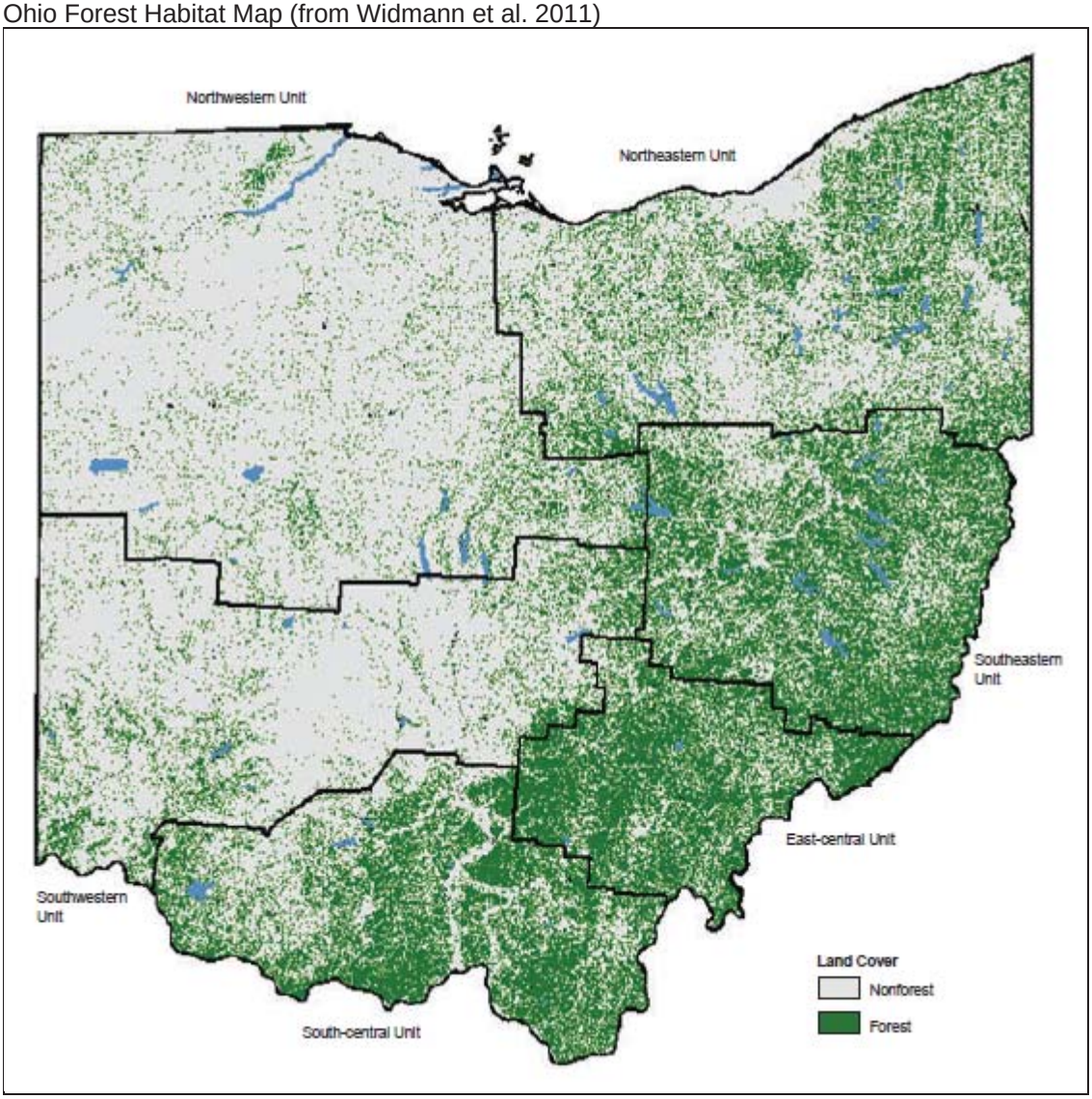
6.5 Forest Habitat

Ohio Forest Habitat Map (from Widmann et al. 2011)



6.5.1 Status

Since 2006, forest land has increased by 2.1 percent in Ohio. Currently, forestland comprises about 31 percent of the State's land area (approx. 8.1 million acres). Forestlands are not uniformly distributed across the state. Forest cover in glaciated, western counties averages less than 15 percent, whereas counties in unglaciated southeastern Ohio average 67 percent forest cover. Overall Ohio's forests are maturing and trees continue to shift to larger diameter size classes. By volume, red maple, yellow poplar and sugar maple dominate. Fourteen percent of Ohio's forestland acreage is in public ownership, with the remaining 86% privately owned (Widmann et al. 2011).

6.5.2 Description

Forest habitat is classified by composition (ex., oak-hickory, beech), and growth stage (early successional through mature) for management purposes.

The Ohio landscape has undergone dramatic changes since the late 1700s, when nearly 95 percent of the state was forested. Massive deforestation occurred throughout Ohio during settlement as land was cleared and swamps were drained for farmland. Forest cover was reduced to a low of 12 percent in Ohio by 1942. This destruction of forest habitat, along with unregulated hunting, resulted in the extirpation of many native animals from Ohio including the gray wolf, elk, mountain lion, and the extinction of the passenger pigeon.

Since the 1940s, Ohio's forestlands have more than doubled in area due to the reversion of unproductive and abandoned farmland and pastures back to forests. The steady increase in forest habitat in recent decades has been the major factor leading to the successful reintroduction, return, or resurgence of many forest-dependent wildlife species such as white-tailed deer, wild turkey, beaver, and bobcat.

The vast majority of forestlands are owned by private landowners in Ohio. Forest fragmentation and development pressures present an increasing threat as private woodland owners choose to sell forestland to developers. Few landowners have management plans for their forests and many do not know where to turn for technical advice. Increasing the capacity and delivery of forest habitat technical guidance will be an important goal to increase the amount of private forestland that is being sustainably managed in Ohio.

Acorns are an important food source for many forest wildlife species. Numerous studies have linked the abundance of acorn mast crops to body condition, winter survival, and reproductive success of wildlife (McShea and Healy 2002). However, an emerging shift in tree species composition has become apparent in Ohio's forests. Although oak-hickory is still the dominant forest type and provides an important wildlife food resource in Ohio, an analysis of tree species composition by diameter class reveals a lack of oak and hickory, and a predominance of shade-tolerant species such as red maple, in smaller tree diameter classes (Widmann et al. 2009). The virtual absence of oak regeneration has been attributed to fire suppression and silvicultural practices that favor shade tolerant species and inhibit oak establishment.

Early-successional habitat important to many forest wildlife species is declining as Ohio's forests are maturing. Since 1968, acreage in the seedling/sapling size class (trees < 5 inches d.b.h.) has declined by 73% from 3.7 to 1.0 million acres, whereas acreage in the sawtimber size class (trees ≥11 inches d.b.h.) more than doubled from 1.9 to 4.8 million acres (Widmann et al. 2009). As of 2006, the age/size class distribution of Ohio's forestland habitat was 12% seedling/sapling, 24% pole timber, and 63% saw timber (Widmann et al. 2009). The ruffed grouse has declined dramatically since the early 1980s due to loss of early-successional habitat. Furthermore, several bird species that use early-successional forest habitats including the American woodcock, prairie warbler, and blue-winger warbler have been identified as species of highest conservation priority by the Appalachian Mountains Joint Venture.

The Forest Habitat chapter addresses the major issues facing forestlands in Ohio. Increasing the capacity and delivery of forest habitat technical guidance will be an important goal to increase/improve the amount of private forestland being managed. Maintaining oak-hickory forest types and providing a sustainable balance of forest age classes, including early-successional habitats, on publicly-owned lands will be critical to provide habitat for diverse and abundant wildlife populations. Implementation of the Forest Habitat conservation actions in this section will foster healthy forest ecosystems, create/maintain opportunities for forest wildlife recreation, and improve public awareness, understanding, and appreciation of Ohio's forest wildlife on both public and private lands.

6.5.3 Associated Species of Greatest Conservation Need

Ohio's forestland historically supported hundreds of avian species, mammals, reptiles, amphibians, lepidopterans, and many other invertebrates. This wide assemblage of native fauna is dependent on forest habitat for survival and reproduction. Each species has unique habitat requirements. Some species can survive and reproduce only in the earliest stages of forest succession, whereas others need mature forest with large, tall trees. Some species require a broken forest with a good interspersion of age classes, whereas others need large expanses of unbroken mature forest with little or no edge.
The following species have been identified as Forest habitat species of greatest conservation need (conservation status rank in parentheses):

Amphibians

Northern Spring Salamander (1)	*Gyrinophilus porphyriticus porphyriticus*
Streamside Salamander (2)	*Ambystoma barbouri*
Kentucky Spring Salamander (3)	*Gyrinophilus porphyriticus duryi*
Smallmouth Salamander (4)	*Ambystoma texanum*
Mud Salamander (5)	*Pseudotriton montanus*
Green Salamander (6)	*Aneides aeneus*
Jefferson Salamander (7)	*Ambystoma jeffersonianum*
Northern Red Salamander (7)	*Pseudotriton ruber ruber*
Eastern Tiger Salamander (9)	*Ambystoma tigrinum tigrinum*
Marbled Salamander (10)	*Ambystoma opacum*
Four-toed Salamander (11)	*Hemidactylium scutatum*
N. Ravine Salamander (12)	*Plethodon richmondi*
Longtailed Salamander (13)	*Eurycea longicauda longicauda*
Eastern Spadefoot (15)	*Scaphiopus holbrookii*
Northern Dusky Salamander (17)	*Desmognathus fuscus fuscus*
Mountain Chorus Frog (18)	*Pseudacris brachyphona*
Red-spotted Newt (20)	***Notophthalmus viridescens viridescens***
Western Chorus Frog (20)	*Pseudacris triseriata triseriata*
Wood Frog (22)	*Rana sylvatica*

Birds

Cerulean Warbler (1)	*Dendroica cerulea*
Blue-winged Warbler (10)	*Vermivora pinus*
Sharp-shinned Hawk (10)	*Accipiter striatus*
Worm-eating Warbler (10)	*Helmitheros vermivorus*
Black-billed Cuckoo (24)	*Coccyzus erythropthalmus*
Red-headed Woodpecker (24)	*Melanerpes erythrocephalus*
Whip-poor-will (24)	*Antrostomus vociferus*
American Woodcock (24)	*Scolopax minor*
Wood Thrush (24)	*Hylocichla mustelina*
Prairie Warbler (24)	*Setophaga discolor*
Acadian Flycatcher (38)	*Empidonax virescens*
Wood Duck (38)	*Aix sponsa*
Yellow-billed Cuckoo (38)	*Coccyzus americanus*
Great Crested Flycatcher (38)	*Myiarchus crinitus*
Yellow-throated Vireo (38)	*Vireo flavifrons*
Blue-gray Gnatcatcher (38)	*Polioptila caerulea*
Veery (38)	*Catharus fuscescens*
Black-and-white Warbler (38)	*Mniotilta varia*
American Redstart (38)	*Setophaga ruticilla*

Terrestrial Invertebrates

Grizzled Skipper (3)	*Pyrgus centaureae wyandot*
Olympia Marble (4)	*Euchloe olympia*
Gold-banded Skipper (5)	*Autochton cellus*
Confused Cloudy Wing (6)	*Thorybes confusis*
Duke's Skipper (6)	*Euphyes dukesi*
Diana Fritillary (9)	*Speyeria diana*
Mottled Dusky Wing (9)	*Erynnis martialis*
Cobweb Skipper (14)	*Hesperia metea*
Silvery Blue (22)	*Glaucopsyche lygdamus*
Atlantis Fritillary (23)	*Speyeria atlantis*
Gray Comma (23)	*Polygonia progne*
Zebra Swallowtail (25)	*Eurytides marcellus*
Dusky Azure (26)	*Celastrina nigra*

Northern Oak Hairstreak (27)	*Fixsenia favonius ontario*
Falcate Orange Tip (28)	*Anthocharis midea annickae*
Eastern Pine Elfin (28)	*Incisalia niphon*
Northern Metalmark (28)	*Calephelis borealis*
Early Hairstreak (31)	*Erora laeta*
Edward's Hairstreak (33)	*Satyrium edwardsii*
White M Hairstreak (34)	*Parrhasius m-album*
Compton Tortoise Shell (34)	*Nymphalis l-album*
Goatweed Butterfly (37)	*Anaea andria*
Hayhurst's Scalloped Sootywing (37)	*Staphylus hayhurstii*
Hickory Hairstreak (39)	*Satyrium caryaevorum*
Leonard's Skipper (41)	*Hesperia leonardus*
West Virginia White (45)	*Pieris virginiensis*
Brown Elfin (45)	*Incisalia augustinus croesoides*
Appalachian Blue (45)	*Celastrina negelectamajor*
Pepper & Salt Skipper (45)	*Amblyscirtes hegon*
Monarch (n/r)	*Danaus plexippus*
American Burying Beetle (n/r)	*Nicrophorus americanus*

Mammals

Eastern Small-footed Bat (1)	*Myotis subulatus leibii*
Northern Long-eared Bat (2)	*Myotis septentrionalis*
Rafinesque's Big-eared Bat (3)	*Corynorhinus rafinesquii*
Silver-haired Bat (4)	*Lasionycteris noctivagans*
Evening Bat (5)	*Nycticeius humeralis*
Red Bat (6)	*Lasiurus borealis*
Indiana Bat (7)	*Myotis sodalis*
Tri-colored bat (7)	*Perimyotis subflavus*
Hoary Bat (9)	*Lasiurus cinereus*
Southern Flying Squirrel (9)	*Glaucomys volans*
Little Brown Bat (14)	*Myotis lucifugus*
Big Brown Bat (14)	*Eptesicus fuscus*
Pine Vole (19)	*Microtus pinetorum*
Smoky Shrew (19)	*Sorex fumeus*
Hairy-tailed Mole (22)	*Parascalops breweri*
Woodland Jumping Mouse (22)	*Napaeozapus insignis*
Allegheny Woodrat (24)	*Neotoma magister*
Eastern Chipmunk (25)	*Tamias striatus*
Bobcat (25)	*Felis rufus*
Black Bear (28)	*Ursus americanus*

Reptiles

Eastern Smooth Earth Snake (2)	*Virginia valeriae valeriae*
Rough Green Snake (3)	*Opheodrys aestivus*
Eastern Hognose Snake (6)	*Heterodon platirhinos*
Broadhead Skink (12)	*Eumeces laticeps*
Eastern Box Turtle (13)	*Terrapene carolina carolina*
Black Kingsnake (13)	*Lampropeltis getula nigra*
Northern Copperhead (17)	*Agkistrodon contortrix mokasen*
Timber Rattlesnake (18)	*Crotalus horridus horridus*
Copperbelly Water Snake (22)	*Nerodia erythrogaster neglecta*

6.5.4 Forest Conservation Opportunity Areas (COAs)

The Division of Wildlife's approach to enhancing and maintaining the highest level of terrestrial wildlife diversity in the state is to use a conservation opportunity 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 landscapes of major habitat types, along with the remnants of several unique habitats, for species that are of limited distribution or have low populations.

In the Division's last strategic plan, two forest conservation opportunity areas were identified - the Appalachian Foothills and Tecumseh Forest Conservation Opportunity Areas, both of sufficient size (>60,000 acres) to maintain viable populations of most native forest dependent wildlife species, except black bears. Important partnerships were developed and great strides were made to inventory forest resources and discuss cooperative management of forest conservation opportunity areas during the last several years. The next steps will require development of specific habitat objectives to benefit priority wildlife species as identified in state, federal, and regional conservation plans, and conducting a coordinated monitoring protocol to determine the success of these efforts.

Addition of forest conservation opportunity areas in the future will be considered on a case-by-case basis as opportunities arise. Identification of private lands of strategic conservation value within existing COA's, and working with private landowners are high priority conservation actions for forest habitats (see Table 20).

6.5.4.1 Appalachian Foothills Forest Conservation Opportunity Area

The Appalachian Foothills Conservation Opportunity Area, primarily located in Vinton and Athens counties, includes the Zaleski State Forest (28,604 ac.), Vinton Furnace State Experimental Forest (12,089 ac.), Waterloo (2,635 ac.), Turkey Ridge Wildlife Area (377 ac.), Vinton Furnace Wildlife Area (3,405 ac.), Lake Hope State Park (2,635 ac.), and surrounding private lands (Figure 11). Current habitat conditions on inholdings and adjacent privately-owned properties within the focus area landscape will be identified with satellite imagery and considered along with public lands as forest management plans are developed within the conservation opportunity area. Private lands of strategic conservation value within the area will be identified and prioritized for acquisition and/or conservation easements.

The Appalachian Foothills Conservation Opportunity Area landscape is primarily an oak-hickory forest type, and contains a heterogeneous composition of forest species referred to as the Central Upland Hardwoods. Mixed oak species are located on upper slopes and ridges, with mixed mesophytic trees of more tolerant and later climax species located in the hollows and low areas. Principal species include red, white, and black oak, red and sugar maple, various hickories, beech, yellow poplar, ash, and occasional walnut and scattered other species. Plantations of conifers are common throughout the area. Principal species include white, red, and shortleaf pine.

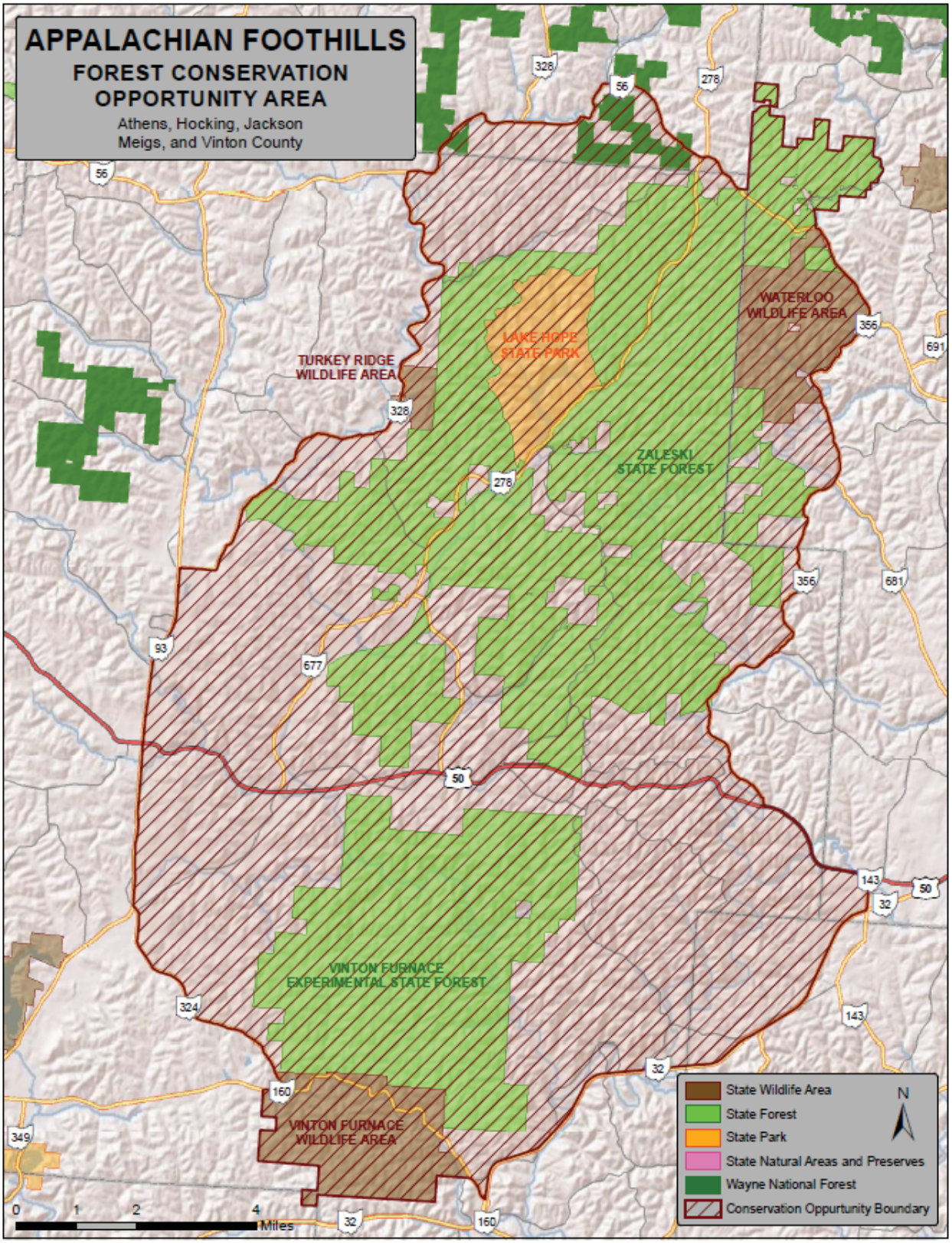


Figure 11. Appalachian Foothills Forest Conservation Opportunity Area.

6.5.4.2 Tecumseh Forest Conservation Opportunity Area

The Tecumseh Forest Conservation Opportunity Area, located in Scioto and Adams counties, includes Shawnee State Forest (63,747 ac.), Shawnee State Park (852 ac.), Raven Rock State Nature Preserve (95 ac.), and surrounding private lands (Figure 12 – the boundaries of this area are currently being revised). Current habitat conditions on inholdings and adjacent privately-owned properties within the area landscape will be identified with satellite imagery and considered along with public lands as forest management plans are developed within the conservation opportunity area. Private lands of strategic conservation value within the area will be identified and prioritized for acquisition and/or conservation easements.

The Tecumseh Forest Conservation Opportunity Area is part of the overall Central Hardwood Region and contains two major forest types: mixed-mesophytic and oak-hickory, as well as small stands of other forest types spread throughout the forest. The relatively narrow ridges and steep upper slopes typical of the region support trees of the oak-hickory forest type with the occasional stands of native pine. The main hardwood species include scarlet, chestnut, white, black, and northern red oaks, pignut, shagbark and mockernut hickories, and sassafras. Native conifers include Pitch, Virginia, and shortleaf pines. Depending upon the aspect, many sites support mixed-mesophytic hardwood species such as chestnut, white, black, and northern red oaks, red and sugar maple, basswood, yellow-poplar, yellow buckeye, blackgum, white ash, beech, red elm, hackberry, aspen, and several species of hickory. The coves, depending on site class and aspect, support high quality hardwoods such as yellow poplar, black walnut, white ash, black cherry, and red oak.

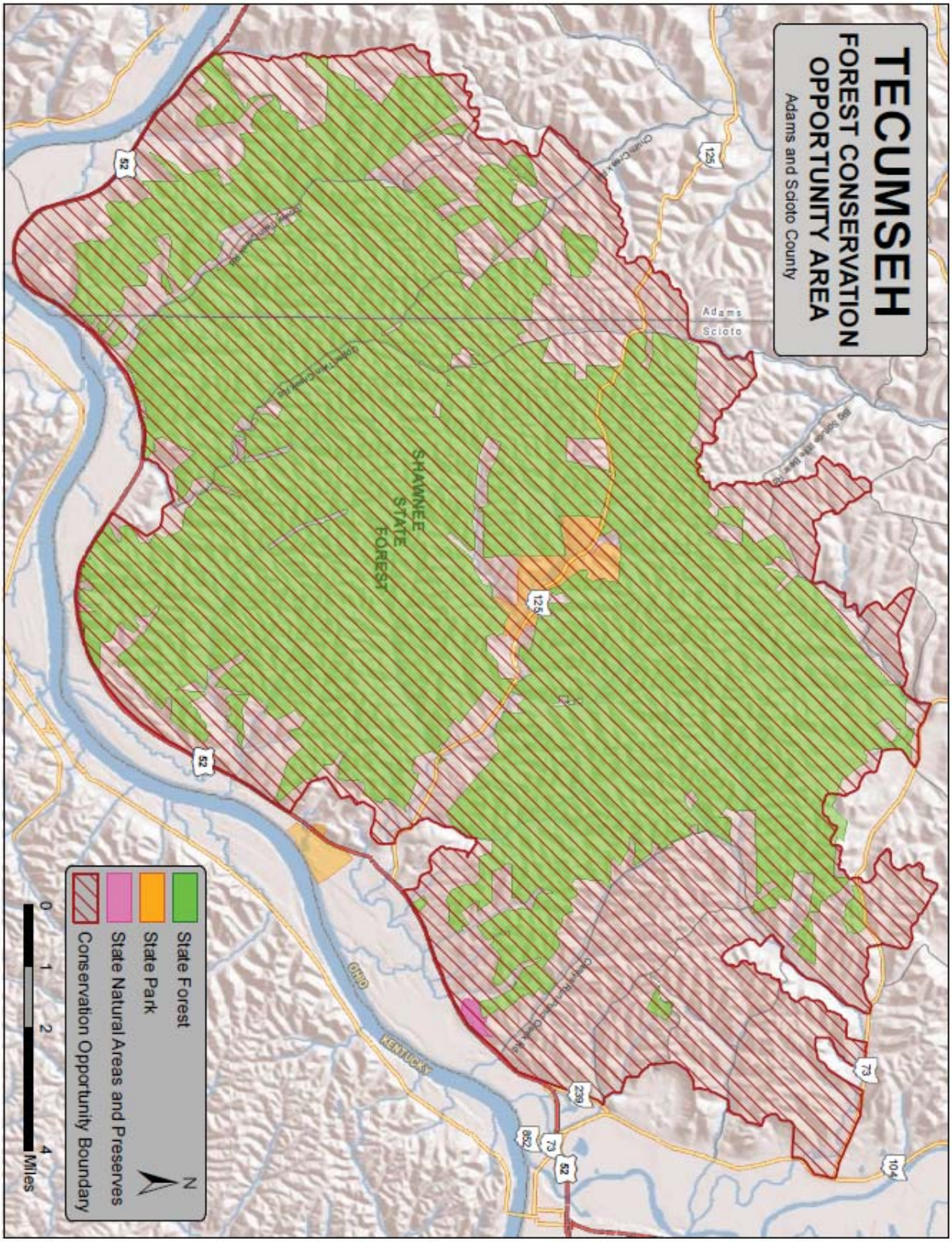


Figure 12. Tecumseh Forest Conservation Opportunity Area.

Table 19. CONSERVATION THREATS TO FOREST HABITAT.
The following threats negatively impact or have the potential to negatively impact Forest habitat. Threat categories/classification from Salafsky et al. (2008), and threat impact rank calculations from Master et al. (2012).

ID	threats	2nd level threat classification(s)	threat impact rank
I	**residential and commercial development**		medium
A	Changing land ownership patterns are increasing fragmentation, parcelization, and urbanization of forestlands	housing & urban areas commercial & industrial areas	high low
B	Habitat destruction, fragmentation, altered hydrology from commercial development	commercial & industrial areas	low
C	Habitat destruction, fragmentation, altered hydrology from urban/suburban development	housing & urban areas	high
II	**agriculture and aquaculture**		low
A	Loss of forest habitat because of conversion to agriculture	annual & perennial non-timber crops livestock farming & ranching	negligible low
B	Loss of forest habitat due to increase in intensity of agricultural practices – conversion of fencerows and other imbedded forest habitat	annual & perennial non-timber crops	negligible
III	**energy production and mining**		high
A	Mining, oil and gas extraction - can directly damage and destroy forest habitat, and indirectly have negative impacts by altering hydrology and causing chemical contamination	oil & gas drilling mining & quarrying	high high
IV	**transportation and service corridors**		low
A	Roads and utilities can destroy and fragment forest habitat, and alter hydrology	roads & railroads utility & service lines	medium medium
V	**biological resource use**		low
A	Logging and timber harvest can destroy and/or alter forest habitat	logging & wood harvesting	medium
VI	**human intrusions and disturbance**		low
A	Incompatible recreational activities	recreational activities	medium
B	Creation of recreational facilities can alter/destroy forest habitat	recreational activities	medium
VII	**natural system modifications**		low
A	Our ability to manage/protect forestlands is limited because nearly 73% of forest land is owned by private landowners in Ohio	other ecosystem modifications	low
B	Increased opposition to prescribed burning in forestlands	fire & fire supression	low
C	Lack of forest inventory data, and a database system to analyze that data limits our ability to manage	other ecosystem modifications	low
D	Our ability to manage forestlands is limited by available staff and funding	other ecosystem modifications	low
E	Forest tree species composition is shifting in Ohio from oaks and hickories – important wildlife habitat – to less desirable species such as red maple	other ecosystem modifications	low

F	Wildlife species dependent on early-successional habitats have declined as Ohio forests have matured into older age classes.	other ecosystem modifications	low
G	Incompatible forestry practices that result in changes to species composition, changes in habitat structural complexity, changes in hydrology – and resulting impacts to wildlife normally associated with these habitats	other ecosystem modifications	low
H	Our ability to address habitat objectives in some forests stands (management by selective cutting) may be limited because there may be no market for the timber	other ecosystem modifications	low
I	Lack of forestland associated species data limits our ability to manage for current threats and limits our ability to develop plans for impending issues like climate change	other ecosystem modifications	low
VIII	**invasive and other problematic species and genes**		medium
A	Introduction and/or spread of invasive plants and animals	invasive non-native/alien species	high
B	Introduction and/or spread of nuisance plants and animals	problematic native species	low
C	Introduction and spread of diseases (plants and animals)	invasive non-native/alien species problematic native species	high low
IX	**pollution**		low
A	Urban effluent	household sewage & urban wastewater industrial & military effluents garbage & solid waste air-borne pollutants	low low low low
B	Agriculture effluent	agricultural & forestry effluents	low
X	**geological events**		low
---	none	---	---
XI	**climate change and severe weather**		low
A	Climate change could effect plant species composition, which in turn could affect wildlife species	habitat shifting & alteration droughts temperature extremes storms & flooding	low low low low

Table 20. CONSERVATION ACTIONS FOR FOREST HABITAT.
The following actions will help abate or have the potential to help abate threats to Forest habitat. Action categories/classification from Salafsky et al. (2008), and action priority rank calculations from Georgia DNR (2005).

ID	actions	2nd level action classification(s)	action priority rank	threat(s) addressed*
I	**LAND/WATER PROTECTION**		high	
1	Annually identify and prioritize properties within the existing Forest Conservation Opportunity Areas for strategic acquisitions, conservation easements, management agreements, or partnerships	site/area protection	high	I, II, VII-D
2	Protect forest lands through strategic acquisitions, easements, and partnerships	resource & habitat protection	med	I, II, III, IV, V, VI
3	Use State Wildlife Grant funds for potential acquisitions	resource & habitat protection	med	I, II, III, IV, V, VI
4	Site new recreational facilities such as golf courses and ball fields on already disturbed land whenever possible to limit disturbance to higher quality habitats in the area	resource & habitat protection	med	VI-B
II	**LAND/WATER MANAGEMENT**		high	
1	Develop a forest wildlife monitoring protocol	habitat & natural process restoration	high	VII-C,I
2	Assure that wildlife/habitat interests are considerations in all forestry practices	habitat & natural process restoration	high	V, VII-G
3	Support research on wildlife species for which knowledge of habitat requirements and/or population status is incomplete	habitat & natural process restoration	high	VII-C,I
4	Collect and evaluate data from legitimate citizen scientist-based monitoring surveys, such as the Ohio Lepidopterist Society's Long-term Butterfly Monitoring Program, the Breeding Bird Survey, and the Frog and Toad Call Survey	habitat & natural process restoration	high	VII-C,D,I
5	Assign lower priority to potential Forest Conservation Opportunity Area acquisitions in which mineral or timber rights have been severed from surface rights	habitat & natural process restoration	high	I, II, III
6	Work with the National Resource Conservation Service to increase the number and the promotion of forest habitat management practices eligible for cost-share funding in WHIP, CSP, HFRP, and EQIP programs	habitat & natural process restoration	high	VII-A
7	Train additional wildlife management staff in oak ecology and silvicultural methods	habitat & natural process restoration	high	VII-E,F
8	Collaborate with the Division of Forestry to accomplish appropriately-timed burns on forestlands to promote oak regeneration	habitat & natural process restoration	high	VII-B,E,F
9	Seek technical assistance from Division of Forestry land management foresters when implementing silvicultural techniques to promote oak regeneration	habitat & natural process restoration	high	VII-D,E

10	Obtain forest inventory data to develop stand maps and silvicultural prescriptions to maintain and regenerate oak species	habitat & natural process restoration	high	VII-C,E
11	Contract with a forest consulting firm to obtain forest stand inventory data for all wildlife areas with >500 contiguous acres of forestland	habitat & natural process restoration	high	VII-C,D
12	Collaborate with Division of Forestry (DOF) to reduce inventory costs and acquire data that are compatible with the DOF's Genus database management system	habitat & natural process restoration	high	VII-C,D
13	Use forest inventory to identify and protect large blocks of mature forest, streamside management zones, and unique/rare habitats	habitat & natural process restoration	high	I, II, III, IV, V, VI
14	Use annual timber sale revenue to pay for inventory and data management costs	habitat & natural process restoration	high	VII-C,D
15	Update and improve the accuracy of landcover data in Ohio by using advanced GIS modelling to determine habitat distribution and quality	habitat & natural process restoration	high	VII-C
16	Develop a database management system to store, access, map, and analyze forest inventory data	habitat & natural process restoration	high	VII-C,I
17	Obtain forest stand inventory data to assess current age composition of forest landscapes in unglaciated Ohio	habitat & natural process restoration	high	VII-C
18	Develop plans to manage invasive species on forest management and reclamation projects	invasive/ problematic species control	high	VIII
19	Treat invasive plant species as an integral component of forest management plans on wildlife areas	invasive/ problematic species control	high	VIII
20	Establish an early-detection rapid-response system for dealing with invasive and nuisance species	invasive/ problematic species control	high	VIII
21	Promote forest restoration/reclamation on lands impacted by surface mines or other disturbances	habitat & natural process restoration	high	I, II, III
22	Partner with the Wildlife Management Institute to secure additional funds to achieve early-successional forest habitat objectives	habitat & natural process restoration	high	VII-D,F
23	Actively market and offer timber sales to achieve early-successional forest habitat objectives	habitat & natural process restoration	high	VII-D,H
24	Work towards a sustainable balance of early, mid, and late-successional habitats within forested landscapes in unglaciated Ohio	habitat & natural process restoration	high	VII-E,F
25	Identify ecosystem or population-level threats through research, surveillance, monitoring, and inventory	habitat & natural process restoration	high	I, II, III, IV, V, VI, VII-I, VIII, IX, XI
26	Develop compatible recreational activities criteria that can be used to evaluate impacts to habitat/species from recreational activities	habitat & natural process restoration	high	VI
27	Manage Forest Conservation Opportunity Areas to provide appropriate habitat to sustain viable populations of all forest dependent wildlife species native to Ohio	site/area management	med	VII-E,F VIII, IX

28	Develop habitat objectives for Forest Conservation Opportunity Areas based on Habitat Suitability Index (HSI) modeling results for forest wildlife species of highest conservation priority	site/area management	med	VII-C,I
29	Conduct annual wildlife population monitoring of SGCN within Forest Conservation Opportunity Areas to evaluate wildlife population status in response to forest management strategies	site/area management	med	VII-C,E,F,G,I
30	Annually hire a research technician and seasonals to conduct wildlife population surveys in Forest Conservation Opportunity Areas	site/area management	med	VII-D,I
31	Obtain information on habitat requirements and HSI models for all native forest wildlife species that occur in Forest Conservation Opportunity Areas	site/area management	med	VII-C,I
32	Create a Division of Wildlife/Division of Forestry jointly-funded forest habitat biologist position to conduct Forest Conservation Opportunity Area habitat modeling, and to provide wildlife habitat consultations to agencies and partners	site/area management	med	VII-D,G,I
33	Develop forest management plans to maintain, restore, or regenerate oak-hickory forest types totaling 10,000 acres on at least 5 different wildlife areas by 2020	site/area management	med	VII-E
34	Obtain current timber inventory data to model wildlife habitat quality in Forest Conservation Opportunity Areas	site/area management	med	VII-C
35	Annually review and provide wildlife habitat recommendations for all 21 Division of Forestry State Forest Management Plans and applicable Wayne National Forest management projects	site/area management	med	V, VI, VII-G
36	Identify 5 early-successional management units totaling at least 5,000 acres on Wildlife Areas outside of Forest Conservation Opportunity Areas	site/area management	med	VII-F
37	Develop management plans and create at least 500 acres of habitat on 5 early-successional management units on Wildlife Areas outside of Forest Conservation Opportunity Areas	site/area management	med	VII-F
III	**SPECIES MANAGEMENT**		high	
1	Develop species-specific conservation plans as needs are identified to clearly define the actions the Division will/or will not implement concerning the state-listed species	species management	high	VII-F,G,I
2	Identify, design, and conduct appropriate species-specific surveys, inventories, or monitoring projects to determine species distribution and abundance	species management	high	VII-C,F,G,I
3	Develop a feral hog management plan designed to minimize introductions and control expansion	species management	high	VIII-B
4	Reintroduce and restore forestland species where appropriate	species reintroduction	med	I, II, VII-F,G,I
5	Continue to support research and develop plans for restoration of American chestnut on surface mine reclamation areas	species reintroduction	med	I, II, VII-E

IV	EDUCATION AND AWARENESS		high	
1	Enhance forest wildlife habitat technical guidance by providing assistance to landowners through partnerships and education	training	high	VII-A
2	Provide forest wildlife habitat management practices training to Division of Forestry service foresters, Soil and Water Conservation District wildlife specialists, and National Research Conservation Service biologists every 2 years	training	high	V-A VII-G
3	Conduct additional forest habitat field days in conjunction with OSU-Extension, Farm Science Review, Woodland Owner groups, and Wildlife Conservation NGOs	training	high	V-A VII-A,G
4	Provide additional training to wildlife management staff to increase knowledge of forestry practices	training	high	VII-D,G
5	Maintain a corps of Division of Wildlife-trained partners and volunteers to assist, lead, and promote special programs	training	high	V-A VII-A,G
6	Increase the amount and delivery of technical assistance to non-industrial private forest landowners in Ohio	awareness & communications	low	VII-A
7	Target forest landowners for technical services through a variety of media based on enrollment in Forest Tax Law or similar programs	awareness & communications	low	VII-A
8	Inform forest landowners about services available to them and who to contact for management guidance or to obtain professionally designed management plans	awareness & communications	low	VII-A
9	Develop and coordinate an advertising campaign for forest wildlife management advice similar to Call Before You Cut program	awareness & communications	low	V-A VII-A,G
10	Publish a comprehensive forest wildlife habitat management technical guide for private landowners and forest practitioners	awareness & communications	low	V-A VII-A,G
11	Partner with The Ohio State University – Extension and the Terrestrial Wildlife Ecology Laboratory to reduce costs and increase distribution of a forest wildlife habitat management technical publication	awareness & communications	low	V-A VII-A,G
12	Revise and incorporate existing Division of Wildlife woodland habitat management factsheets and OSU-extension bulletins into a comprehensive forest wildlife habitat management technical publication	awareness & communications	low	V-A VII-A,G
13	Provide guidance to landowners for eradication/control of invasive and nuisance species	awareness & communications	low	VII-A VIII-A,B
14	Educate the public about the negative effects of exotic and nuisance animals – encourage responsible disposal of unwanted animals	awareness & communications	low	VIII-A,B
15	Develop additional wildlife habitat interpretation/educational materials for the Division of Forestry's forest management driving tours and/or demonstration areas at Mohican-Memorial State Forest, Zaleski State Forest, and the Vinton Furnace State Experimental Forest	awareness & communications	low	V-A VII-A,G

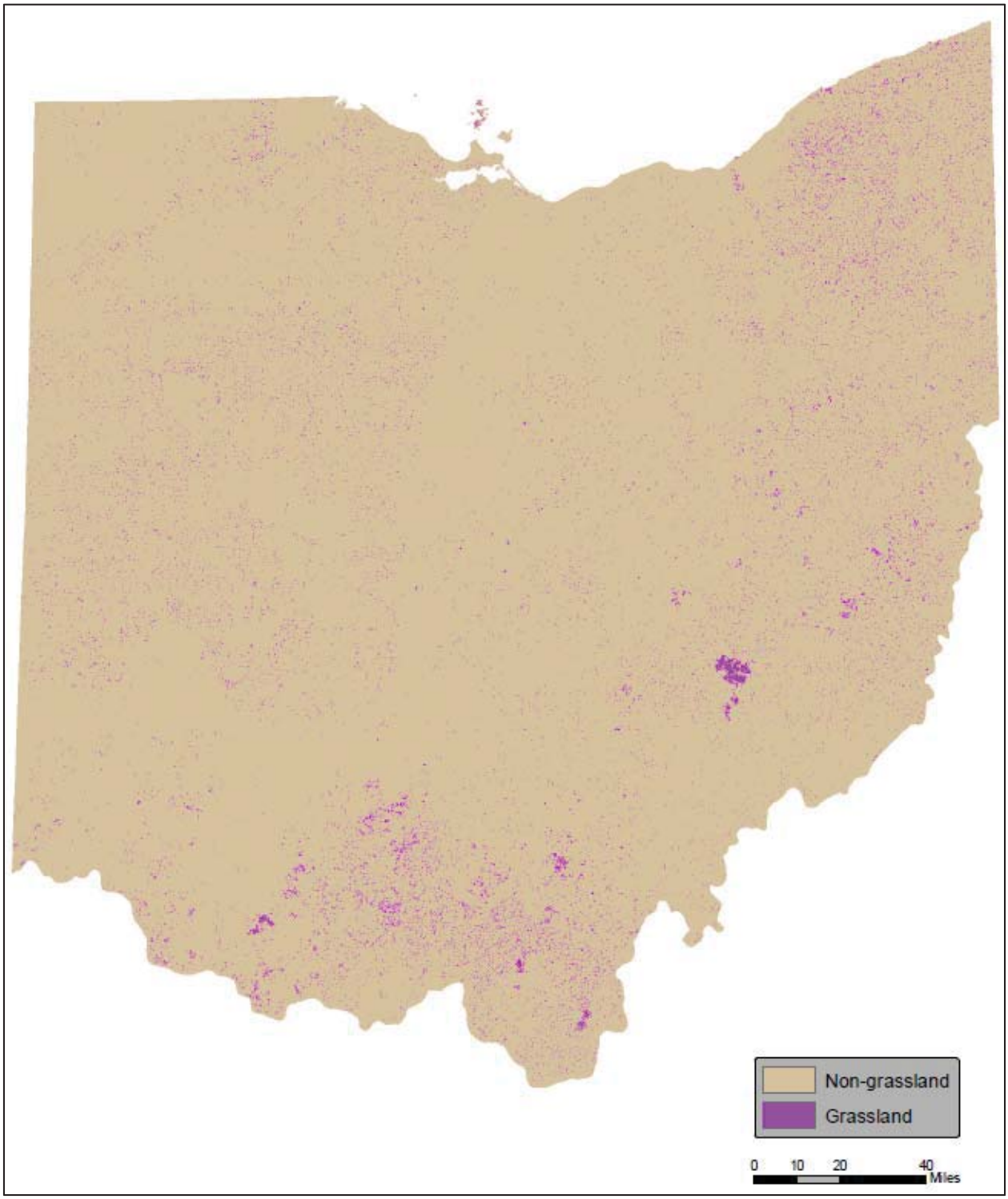
16	Synthesize research results from the Ohio State University's Terrestrial Wildlife Ecology Laboratory's forest wildlife research projects into practical management guidelines	awareness & communications	low	V-A VII-C,D,G
17	Educate landowners, maintenance staff, municipalities, etc. on ways to reduce impacts to adjacent forest habitat	awareness & communications	low	I, II VII-A
18	Resolve the issue of various, and often conflicting, sources of forest management technical information are available through multiple outlets, agencies, and organizations	awareness & communications	low	VII-A
V	**LAW AND POLICY**		high	
1	Balance the needs of fish and wildlife with the needs of people by mitigating incompatible ecosystem uses	policies & regulations	high	I, II, III, IV, V, VI
2	Participate in the policy-making process at Federal level to influence conservation programs	policies & regulations	high	VII-A,G
3	Support legislation promoting eco-friendly energy development and use	legislation policies & regulations	high high	III-A
4	Encourage the preservation of habitat connectivity in all land use planning	policies & regulations private sector standards & codes	high med	I, IV
5	Create incentives (laws, policies) to prevent loss and/or minimize impacts to forest lands due to development	policies & regulations	high	I, II, IV
6	Develop regulations to deter introduction of invasive/nuisance species	legislation policies & regulations	high high	VIII
7	Develop and implement a risk-assessment system in the approval process for bringing live animals/plants into Ohio, or moving them within the state	legislation policies & regulations	high high	VIII
VI	**LIVELIHOOD, ECONOMIC AND OTHER INCENTIVES**		low	
1	Support the creation of incentives for the protection and restoration of forest habitat	linked enterprises & livelihood alternatives substitution market forces conservation payments non-monetary values	low low med med med	I, II, III, IV, VII-A

2	Support incentives that encourage landowners to maintain/preserve existing forest habitat on agricultural lands	market forces conservation payments non-monetary values	med med low	II
3	Support incentives for private landowners to practice forest management that focuses on preserving native habitat and wildlife species	conservation payments non-monetary values	med low	VII-A
4	Support creation of incentives to incorporate wildlife habitat into recreational facilities such as parks and golf courses	market forces conservation payments non-monetary values	med med low	VI-B
5	Develop incentives for private landowners to eradicate/control invasive plant species	conservation payments non-monetary values	med low	VII-A VIII
VII	**EXTERNAL CAPACITY BUILDING**		med	
1	Create partnerships among research scientists and other key partners to plan coordinated wildlife monitoring and implement this protocol across ownership boundaries within Forest Conservation Opportunity Areas	alliance & partnership development	med	VII-C,D,I
2	Support and actively participate in an Ohio Prescribed Fire Council	alliance & partnership development	med	VII-B
3	Help create and support partnerships of conservation-minded groups to protect and manage forest habitat	alliance & partnership development	med	I, II, V-A, VII-C,D
4	Support legitimate citizen scientist-based monitoring efforts of wildlife species and habitats	institutional & civil society development	med	VII-C,D,I
5	Create a multiagency invasive species prevention and control group that would be responsible for all invasive species issues	alliance & partnership development	med	VIII
6	Through interagency coordination, work to assure that wildlife interests are taken into consideration in road, bridge, causeway, and utilities design, construction, and maintenance	alliance & partnership development	med	IV

*refers to the Forest Habitat Conservation Threats in Table 19

6.6 Grassland Habitat

Ohio Grassland Habitat



6.6.1 Status

Fair and declining. Never a very abundant habitat in terms of acreage, grassland habitat is second only to wetlands in terms of habitat loss in Ohio. Ohio's grasslands are threatened primarily by conversion to urban/suburban development and agriculture, and to a lesser degree by reversion to forestland. Since the federal government required ethanol to be blended with motor fuels, significant acres of grasslands have been lost to agriculture – including many of those created by the Conservation Reserve Program. The absence of periodic fires (except in intensively managed grassland areas) to retard succession is also responsible for the loss of some of Ohio's grasslands.

6.6.2 Description

Grassland ecosystems, which include prairies, pastures, hayfields, meadows, and old fields, are highly valued by Ohioans for their rich diversity of plant and wildlife resources. Historic grasslands in Ohio, such as native prairies and wet meadows, comprised only 2.5%, or 1,000 square miles of Ohio's landscape before European settlement. Grassland-dependent wildlife was likely not as abundant as during later, post-settlement times. European settlement resulted in broad changes to Ohio's landscape as forests were cleared for agriculture. Grassland habitats, including native grass pasture, hayfields, and small grain fields, increased as a consequence of this activity, and resulted in population and range expansions of grassland-associated wildlife. These wildlife populations are still valued today, including those of northern bobwhite quail, various grassland songbirds, the American badger, and the introduced ring-necked pheasant. After World War II, a growing human population and changes in agricultural practices (including the introduction of cool season, exotic pasture grasses) and agricultural economics decreased or degraded the grassland habitats available to wildlife in Ohio. The dominance of row crops such as corn or soybeans in agricultural systems, the prevalence of larger equipment, and decreased reliance on diversified agricultural operations meant less need for fence field dividers, small pastures, and other areas that once supported diverse wildlife populations. Suburban development, and in some areas, forest regeneration, have further contributed to Ohio's loss of grassland habitats.

6.6.2.1 Identifying Current Ohio Grasslands

Dramatic population declines of many grassland bird species, including northern bobwhite quail, ring-necked pheasant, Henslow's sparrow, bobolink, eastern meadowlark, upland sandpiper, and others have resulted because of reductions in the amount of Ohio's grassland habitats during the last 50 years. Some species like the northern bobwhite and the barn owl have not only experienced population declines but also range contractions and are no longer present in many areas of Ohio. Other grassland bird species like the field sparrow and red-winged blackbird that are perceived to be common have experienced population declines in Ohio and throughout the Midwest.

Grassland-dependent birds and other wildlife are attracted to a variety of habitat features, including tract size, vegetation height and density, availability of shrub cover, and amount of edge, among others. Whereas much effort has been made to identify the distribution and cover types of wetland and forest habitats, similar information is generally lacking for grassland ecosystems throughout Ohio. Grassland habitats are an early successional state and ephemeral on the landscape over the timeframe in which they may be mapped and catalogued (i.e. National Land Cover Database). In addition, grassland habitats that provide sufficient structure and resources for wildlife are often difficult to distinguish from pastured and hayed lands that might offer suitable conditions for only a few species. Nonetheless, knowledge about the distribution and types of grasslands available throughout Ohio can be important in understanding how wildlife populations are distributed, what habitat conditions need to be improved to reverse declines among priority populations, and to identify the grassland types and locations that may be under the greatest threat of conversion to other cover types.

6.6.2.2 Prioritizing Grassland Management Efforts

Providing grassland resources of sufficient quality for Ohio's upland and priority grassland species is a challenge given continued growth in Ohio's human population, changes in agricultural practices, and the resulting alterations to Ohio's landscape. The primary goal for grassland management on private and public lands should be to reverse declines in wildlife populations associated with these habitats. The approach taken in this grassland chapter is to promote intensive management on select critical grassland areas while maintaining no net loss of grassland habitats on DOW-managed properties and private lands,

and preserving large (>50 acres) grassland mosaics wherever possible for the benefit of priority grassland wildlife. Under this approach, intensive management would occur at 1) private and public lands within conservation opportunity areas based on the Partners In Flight model for avian conservation for grassland-dependent wildlife, 2) priority areas that contain expansive grassland tracts to support populations of area-sensitive birds of regional importance, and 3) private and public lands within priority areas designed to benefit northern bobwhite or ring-necked pheasant populations.

6.6.3 Associated Species of Greatest Conservation Need

Grassland wildlife populations are influenced primarily by habitat and weather factors. Habitat quality, also, can be directly impacted by weather conditions. Much of the annual variation shown by small game populations, for example, can be the result of weather conditions during critical periods (i.e., nesting, brood-rearing, and winter). Long-term trends, however, tend to be tied more directly to habitat quality, quantity, and distribution.

Weather, then, is of primary importance in interpreting annual fluctuations in grassland wildlife populations. Severe winter weather, consisting of prolonged periods of deep snow or ice and colder than normal temperatures, tends to result in higher than normal overwinter mortality and, thus, reduced brood stock in the spring. Cold, wet periods in the spring and early summer can impact survival of young wildlife by chilling eggs or young animals or flooding nests. Extended periods of drought can affect vegetation growth and, thus, cover quality. Drought can also make insects and seeds less available as food for growing wildlife. Land-use and technological changes are of primary importance in explaining long-term population trends for grassland species. An increasing human population with the resultant increase in urbanization and residential and commercial development yields fewer acres for wildlife. Likewise, modern farming's emphasis on more efficient and larger equipment and increased reliance on chemicals reduces the quantity and quality of available habitat. On the other hand, federal farm policy that idles agricultural land and requires herbaceous cover crops can improve habitat conditions for farmland wildlife.

Most of Ohio is in private ownership, and, thus, habitat management on public lands is of little value in terms of impacting grassland wildlife populations at the state level. However, land-use practices that benefit grassland wildlife can result from regional or federal government programs and policies. For example, the Conservation Reserve Program (CRP) created by the 1985 Farm Bill and continued by the 1990, 1996, and 2002 bills idled more than 300,000 acres of cropland in Ohio. Most of this acreage now supports a cover crop of grasses, legumes, and wild forbs. To the extent that this acreage is not disturbed during the nesting season, these areas provide moderate to good quality nesting cover for many grassland birds. Pheasants, in particular, showed a numerical response to the availability of additional safe nesting cover resulting from this federal program in its early years. This program has changed focus over time, particularly in the 1996 bill, but continues to provide habitat for grassland nesting species.

Wildlife species that live in grasslands are well adapted to the distinctive habitat that grasslands provide. The grassland species assemblage includes grazing animals that feed on the grasses (deer, rabbits), burrowing animals that avoid predators by spending a significant portion of their lives below ground (mice, voles, groundhogs), and specialized grassland predators (hawks, owls, coyotes, snakes). Grasslands are also home many species of birds – neotropical migrants, short distance migrants, and resident species – that use them as breeding habitat. Species such as the upland sandpiper, ring-necked pheasant, northern harrier, common barn-owl, short-eared owl, horned lark, bobolink, eastern meadowlark, vesper sparrow, savannah sparrow, grasshopper sparrow, Henslow's sparrow, Le conte's sparrow, dickcissel, and sedge wren utilize grassland habitats in Ohio for breeding. Unfortunately, owing to the disappearance and fragmentation of grasslands, grassland birds have declined more than any other group of birds.

The following species have been identified as grassland species of greatest conservation need (conservation status rank in parentheses):

<u>Amphibians</u>

Eastern Tiger Salamander (9)	*Ambystoma tigrinum tigrinum*
Western Chorus Frog (20)	*Pseudacris triseriata triseriata*

Birds

Henslow's Sparrow (1)	*Ammodramus henslowii*
Northern Bobwhite (3)	*Colinus virginianus*
Sedge Wren (3)	*Cistothorus platensis*
Northern Harrier (5)	*Circus cyaneus*
Upland Sandpiper (10)	*Bartramia longicauda*
Bobolink (10)	*Dolichonyx oryzivorus*
Loggerhead Shrike (24)	*Lanius ludovicianus*
Blue-winged Teal (24)	*Anas discors*
Barn Owl (24)	*Tyto alba*
Sandhill Crane (24)	*Grus canadensis*
Cattle Egret (24)	*Bubulcus ibis*
Lark Sparrow (38)	*Chondestes grammacus*
Wilson's Phalarope (38)	*Phalaropus tricolor*
Short-eared Owl (38)	*Asio flammeus*
Bell's Vireo (38)	*Vireo bellii*
Vesper Sparrow (38)	*Pooecetes gramineus*
Eastern Meadowlark (38)	*Sturnella magna*

Terrestrial Invertebrates

Confused Cloudy Wing (6)	*Thorybes confusis*
Mottled Dusky Wing (9)	*Erynnis martialis*
Regal Fritillary (11)	*Speyeria idalia*
Harris Checkerspot (11)	*Chlosyne harrisii liggetti*
Dusted Skipper (17)	*Atryonopsis hianna*
Cobweb Skipper (14)	*Hesperia metea*
Silver-bordered Fritillary (19)	*Boloria selene myrina*
Northern Oak Hairstreak (27)	*Fixsenia favonius ontario*
Edward's Hairstreak (33)	*Satyrium edwardsii*
Goatweed Butterfly (37)	*Anaea andria*
Dog Face (41)	*Colias cesonia*
Leonard's Skipper (41)	*Hesperia leonardus*
Indian Skipper (41)	*Hesperia sassacus*
Long Dash Skipper (41)	*Polites mystic*
Monarch (n/r)	*Danaus plexippus*
American Burying Beetle (n/r)	*Nicrophorus americanus*

Mammals

Pygmy Shrew (11)	*Sorex hoyi*
Least Shrew (12)	*Cryptotis parva*
Thirteen-lined Ground Squirrel (16)	*Spermophilus tridecemlineatus*
Badger (16)	*Taxidea taxus*
Eastern Harvest Mouse (19)	*Reithrodontomys humulis*
Meadow Jumping Mouse (28)	*Zapus hudsonius*

Reptiles

Kirtland's Snake (5)	*Clonophis kirtlandii*
Butler's Garter Snake (8)	*Thamnophis butleri*
Black Racer (8)	*Coluber constrictor constrictor*
Blue Racer (8)	*Coluber constrictor flaviventrus*
Smooth Green Snake (8)	*Liochlorophis vernalis*
Eastern Ribbon Snake (13)	*Thamnophis sauritus sauritus*
Northern Ribbon Snake (13)	*Thamnophis sauritus septentrionalis*

6.6.4 Grassland Conservation Opportunity Areas

The Division of Wildlife's approach to enhancing and maintaining the highest level of terrestrial wildlife diversity in the state is to use a conservation opportunity 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. Grassland conservation opportunity areas were designed to consider the needs of Ohio's grassland-dependent birds, although wildlife populations of other taxa are also expected to benefit. Several of these birds (e.g., upland sandpiper, Henslow's sparrow, bobolink, and savannah sparrow) are highly sensitive to habitat fragmentation and the size of the grassland tract. It is unlikely that many of these species would consistently nest in an area of <250 acres of contiguous grassland habitat. Further, although the exact number of pairs needed for a minimum viable population for each of these species is unknown, this number can be reasonably estimated at 200 breeding pairs. The most sensitive of these species is unlikely to nest at a density higher than 1 pair per 25 acres of suitable habitat in a large grassland complex. Thus, a conservation opportunity area should contain at least 5,000 acres of suitable, undisturbed grassland habitat to have a reasonable likelihood of supporting viable populations of Ohio's grassland-dependent birds (i.e., 200 pairs x 25 acres per pair = 5,000 acres of grass).

Outside of reclaimed mined lands, the Ohio landscape is unlikely to support such a vast sea of grassland habitat given current land ownership patterns and land-use practices. An approach suggested by Partners in Flight (PIF) and others may have merit under these conditions. This approach would allow the 5,000 acres of grass to occur within a 12,500-acre conservation opportunity area centered on a 2,500-acre block of grassland habitat (core area). The 10,000 acres surrounding the core would need to be at least 25% grassland habitat with 50% or more of the grassland tracts at least 250 acres in size. Based on the above, a 12,500-acre grassland conservation opportunity area is likely able to provide all the habitat requirements necessary to support viable populations of Ohio's highly area-sensitive birds and other grassland-dependent species native to the region. Species excluded from this include the northern harrier, short-eared owl, and extirpated greater prairie-chicken due to their extreme area requirements, estimated to equal or exceed 30,000 acres of grassland habitat. This concept also precludes any reintroduction attempt for greater prairie-chickens in the foreseeable future since sufficient habitat is unlikely to be created to support such an effort. We believe it is simply impractical and unrealistic to attempt to provide such a vast grassland complex in Ohio. The landscapes surrounding Lake LaSuAn Wildlife Area (Williams Co.) and Big Island and Killdeer Plains Wildlife Areas (Marion and Wyandot Co's.) currently offer the best opportunities to utilize this management approach. These 3 sites have been identified by the Audubon Society as Important Bird Areas.

Habitats for Area-sensitive Species: Bird Priority Areas

Ideally, concentrating management on individual 5,000 acre tracts of habitat likely provides the best opportunity for maintaining populations of area-sensitive birds. Former surface-mined lands that have been planted in herbaceous cover (primarily grasses) as part of the reclamation process provide unique opportunities for management of grassland-dependent wildlife that are not available throughout the rest of Ohio's landscape. Currently, Woodbury Wildlife Area (Coshocton Co.), Tri-Valley Wildlife Area (Muskingum Co.), Egypt Valley Wildlife Area (Belmont Co.), and Crown City Wildlife Area (Gallia Co.) are the only Division of Wildlife properties containing large tracts of contiguous grasslands that are suited to this management approach as Bird Priority Areas. Populations of Henslow's sparrows have been documented on these 4 sites and have been present in high enough densities that these locations are likely regionally and nationally important. Being under public ownership and management, these sites can offer long-term conservation protection for these populations. Grassland habitats that are similar in type and expanse to the above 4 wildlife areas, created through surface-mine reclamation at The Wilds property in Noble County, have already been recognized by the Audubon Society as an Important Bird Area.

6.6.4.1 Killdeer Plains/Big Island Grassland Conservation Opportunity Areas

The Killdeer Plains and Big Island Wildlife Areas currently exhibit some of the best examples of the grassland wildlife habitat that existed in western Ohio prior to European settlement. The Killdeer Plains Wildlife Area is located primarily in Wyandot County, and the Big Island Wildlife Area is located in Marion

County, approximately 12 miles to the south of Killdeer (Figure 13). The majority of land adjacent to and between these 2 Wildlife Areas is in private ownership, characterized by large farms in continuous row crop production.

These 2 Wildlife Areas are part of the Sandusky Plains, historically known as one of the largest prairies that existed in Ohio. Prior to European settlement of this area, the Sandusky Plains was comprised of islands of open grassland prairie that covered over 80,000 acres in portions of Crawford, Marion and Wyandot Counties. Intensive agricultural development of the area did not begin until the late 1800s because of poor drainage of the land. With the advent of modern drainage equipment in the early 1900s, most of these prairies were converted to small grains, pasture and small fields of row crops. Further changes in agricultural technologies in the 1950s resulted in a shift from small grains, pasture and hayfields to predominantly row crops, larger farm and field sizes, and increased fall plowing. This extensive loss of native prairie, pasture and small grains has led to a significant decline in grassland-dependent wildlife species throughout both areas, with grassland nesting birds showing the greatest declines.

The Killdeer Plains and Big Island Wildlife Areas are both owned and managed by the Division of Wildlife, and comprise nearly 13,000 acres of public land, with grassland acreage totaling 4,300 acres. Because of the 12 mile distance between these 2 wildlife areas, a separate Grassland Conservation Opportunity Area has been centered on each. Efforts will be made to link the Killdeer Plains and Big Island Conservation Opportunity Areas with smaller grassland patches and corridors resulting in a large grassland complex with 2 core areas.

Killdeer Plains Conservation Opportunity Area
This area consists of 13,404 acres, with private land accounting for 5,395 acres, or 40%. Approximately 61% of the area consists of agricultural land, 21% wetland, and 18% woodland. Currently 2,493 acres of the agricultural land in the conservation opportunity area is established in grassland habitat, with the vast majority of this grassland located on the wildlife area. As of 2002, approximately 371 acres of grassland currently occur on private lands within the conservation opportunity area.

Big Island Conservation Opportunity Area
This area consists of 13,541 acres, with private land accounting for 8,532 acres, or 63%. Approximately 80% of the area consists of agricultural land, 7% wetland, and 13% woodland. As of 2002, 2,445 acres of the agricultural land in the conservation opportunity area is established in grassland habitat, with the vast majority of this grassland located on the wildlife area. Approximately 253 acres of grassland currently occur on private lands within the conservation opportunity area.

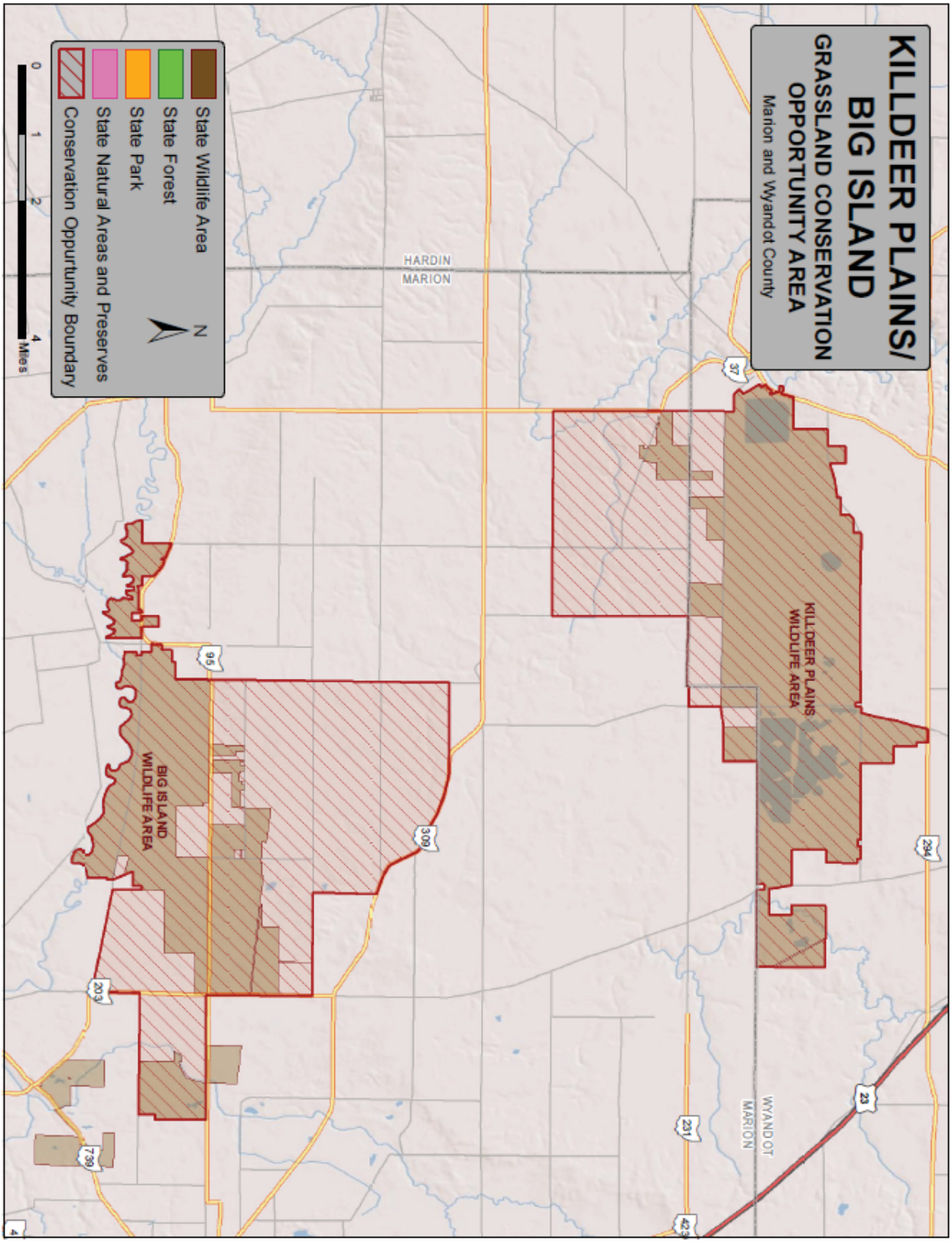


Figure 13. Killdeer Plains/Big Island Grassland Conservation Opportunity Areas.

6.6.4.2 Lake LaSuAn Grassland Conservation Opportunity Area

The Lake LaSuAn Grassland Conservation Opportunity Area, located in Williams County, is an important breeding, foraging and/or migration area for numerous grassland-dependent wildlife species. Lake LaSuAn Wildlife Area is included in the Conservation Opportunity Area (Figure 14). The Wildlife Area is 2,430 acres, of which approximately 1,073 acres are in cool and warm-season grasses. The majority of land adjacent to the wildlife area is in private ownership, characterized by row crops, CRP fields and woodlots. Private land comprises about 85% of the Conservation Opportunity Area. This area is home to the majority of Ohio's endangered copperbelly water snake population.

The Lake LaSuAn Conservation Opportunity Area is situated on the Wabash end moraine deposited during the Wisconsin glaciation. At the time of European settlement, the Lake LaSuAn Focus Area was a beech-maple hardwood forest with scattered poorly-drained wooded wetlands. Post-European settlement resulted in a dramatic decrease in forested acres as the land was cleared for agriculture. Further changes in agricultural technologies in the 1950s resulted in a shift from small fields supporting a variety of crops, hayfields, pastures and single family livestock operations to predominantly row crops, larger farm and field sizes, and increased fall plowing which greatly reduced grassland habitat in the region. Implementation of the 1985 USDA Farm Bill resulted in Williams County leading Ohio in Conservation Reserve Program set-aside acres.

The Lake LaSuAn Conservation Opportunity Area is in a very rural area of northwestern Ohio with little development. The area is characterized by gentle rolling hills carved out by many creeks and rivers. The soils in the area formed mainly in stratified, water-deposited material. Most of the soils within the area are classified as highly erodible and offer an opportunity to reduce the efforts of erosion within the St. Joseph River watershed through grassland management on both private and public lands.

This Conservation Opportunity Area consists of 14,500 acres. Once habitat work is accomplished, the area is expected to provide all habitat requirements necessary to support a viable population of Ohio's area-sensitive grassland bird species, and is thus likely to support viable populations of all other native grassland species, with the exception of northern harriers, short-eared owls, and prairie chickens (extirpated).

To meet the minimum habitat requirements, at least 5,800 acres of undisturbed grassland will need to be provided within the Conservation Opportunity Area, including a 2,500 acre core area. Lake LaSuAn Wildlife Area currently does not meet the core area requirement of 2,500 acres of grassland habitat. LaSuAn currently has about 800 acres of warm-season and cool-season grasses planted; an additional 550 acres of grassland can be planted in the next 10 years. Private land within the Conservation Opportunity Area is comprised of row-crop agriculture and a limited amount of pasture (250 acres) and hay crop (100 acres). There are also at least 3,400 acres enrolled in the Conservation Reserve Program on private lands in the area. These acreage figures suggest that the biggest challenge in the area may be creating a spatial arrangement of grassland habitats that produces a core area.

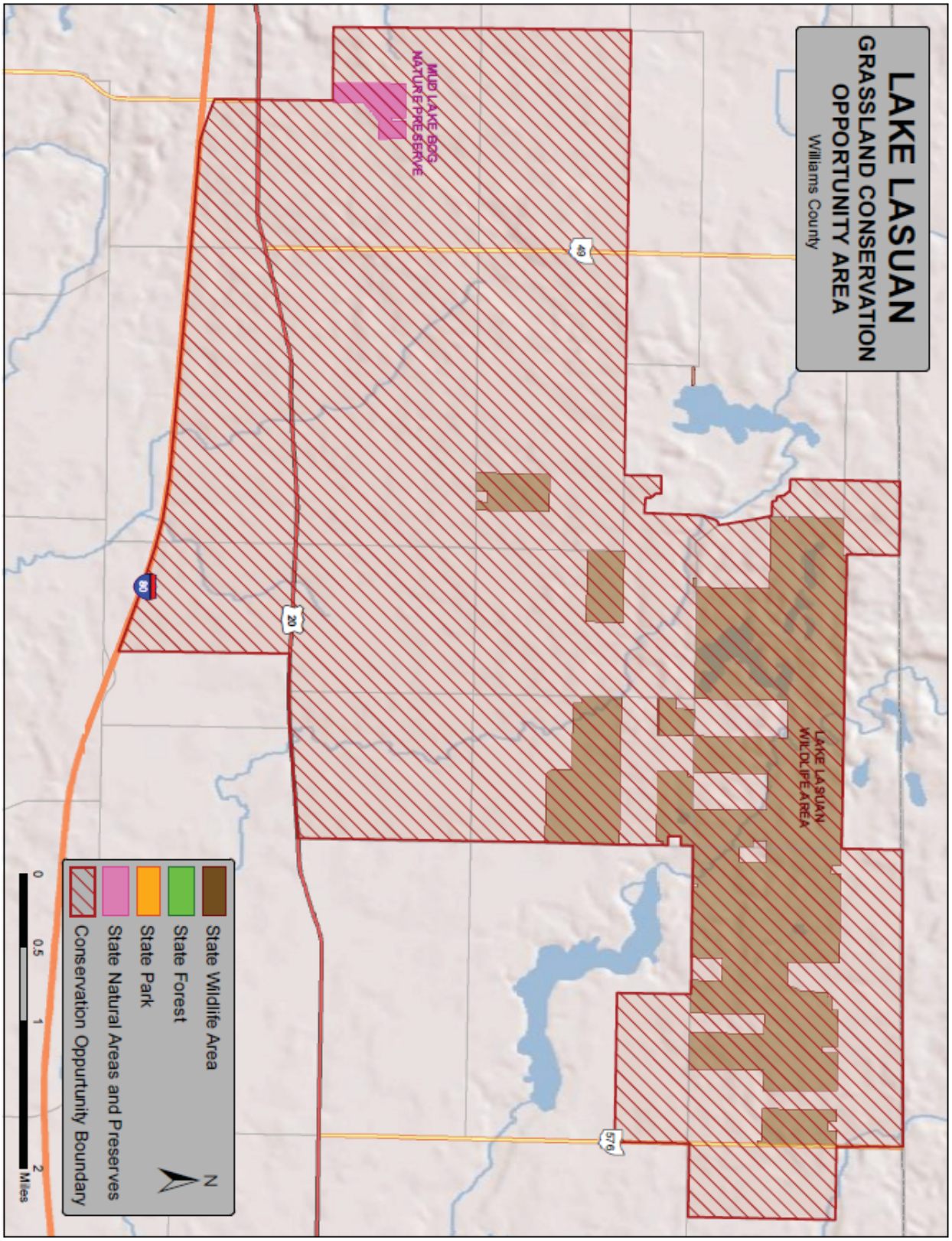


Figure 14. Lake LaSuAn Grassland Conservation Opportunity Area.

Table 21. CONSERVATION THREATS TO GRASSLAND HABITAT.
The following threats negatively impact or have the potential to negatively impact Grassland habitat. Threat categories/classification from Salafsky et al. (2008), and threat impact rank calculations from Master et al. (2012).

ID	threats	2nd level threat classification(s)	threat impact rank
I	**residential and commercial development**		low
A	Large tracts of grassland habitats, and the wildlife species dependent upon them, have declined in Ohio because of changes in land ownership patterns	housing & urban areas	low
B	Habitat destruction, fragmentation, altered hydrology from commercial development	commercial & industrial areas	low
C	Habitat destruction, fragmentation, altered hydrology from urban/suburban development	housing & urban areas	low
II	**agriculture and aquaculture**		medium
A	Loss of grassland habitat because of conversion to agriculture	annual & perennial non-timber crops livestock farming & ranching	very high low
B	Loss of grassland habitat due to increase in intensity of agricultural practices – conversion of fencerows and other imbedded grassland habitat	annual & perennial non-timber crops	very high
C	It is unlikely that we will meet habitat objectives within the Big Island/Killdeer Plains Conservation Opportunity Area because of the amount of land (>10,000 acres) owned by corporate farming operations in the area	annual & perennial non-timber crops	very high
III	**energy production and mining**		low
A	Mining, oil and gas extraction - can directly damage and destroy grassland habitat, and indirectly have negative impacts by altering hydrology and causing chemical contamination	oil & gas drilling mining & quarrying	low low
B	Wind turbines can negatively impact birds and bats that utilize grassland habitat	renewable energy	low
IV	**transportation and service corridors**		negligible
A	Roads and utilities can destroy and fragment grassland habitat, and alter hydrology	roads & railroads utility & service lines	negligible negligible
V	**biological resource use**		negligible
A	Biofuels could threaten grassland habitat	gathering terrestrial plants	negligible
VI	**human intrusions and disturbance**		low
A	Incompatible recreational activities	recreational activities	negligible
B	Creation of recreational facilities can alter/destroy grassland habitat	recreational activities	negligible
VII	**natural system modifications**		low
A	Losing grassland habitat – or missing out on opportunities to create additional grassland acreage – because financial benefits of some conservation programs may be insufficient to encourage private landowner enrollment	other ecosystem modifications	low
B	Lack of periodic burning resulting in habitat cover change and impacts to grassland wildlife species	fire & fire supression	negligible

C	Lack of grassland inventory data, and a database system to analyze that data limits our ability to manage	other ecosystem modifications	low
D	Our ability to manage grasslands is limited by available staff and funding	other ecosystem modifications	low
E	Habitat program availability generally relies on the political climate and funds made available through the Farm Bill	other ecosystem modifications	low
F	Lack of private landowner participation in available habitat programs in critical areas	other ecosystem modifications	low
G	Habitat destruction, fragmentation, altered hydrology due to proximity of development	other ecosystem modifications	low
H	The Division of Wildlife has no regulatory authority over federal conservation programs, and so has limited influence over the quality of habitats established under the Conservation Reserve Program (CRP)	other ecosystem modifications	low
I	Lack of grassland associated species data limits our ability to manage for current threats and limits our ability to develop plans for impending issues like climate change	other ecosystem modifications	low
VIII	**invasive and other problematic species and genes**		high
A	Introduction and/or spread of invasive plants and animals	invasive non-native alien species	medium
B	Introduction and/or spread of nuisance plants and animals	problematic native species	high
C	Introduction and spread of diseases (plants and animals)	invasive non-native alien species problematic native species	medium high
IX	**pollution**		low
A	Urban effluent	household sewage & urban wastewater industrial & military effluents garbage & solid waste	negligible negligible negligible
B	Agriculture effluent	agricultural & forestry effluents	medium
X	**geological events**		negligible
---	none	---	---
XI	**climate change and severe weather**		low
A	Climate change could effect plant species composition, which in turn could affect wildlife species	habitat shifting & alteration droughts temperature extremes storms & flooding	low low low negligible

Table 22. CONSERVATION ACTIONS FOR GRASSLAND HABITAT.
The following actions will help abate or have the potential to help abate threats to Grassland habitat. Action categories/classification from Salafsky et al. (2008), and action priority rank calculations from Georgia DNR (2005).

ID	actions	2nd level action classification(s)	action priority rank	threat(s) addressed*
I	**LAND/WATER PROTECTION**		high	
1	Protect grasslands through strategic acquisitions, easements, and partnerships	resource & habitat protection	high	I, II, III, IV, V, VI
2	Use State Wildlife Grant funds for potential acquisitions	resource & habitat protection	high	I, II, III, IV, V, VI
3	Obtain through purchase or permanent easement sufficient acreage to meet core area requirements (2,500 acres of managed grasslands) at Killdeer Plains, Big Island, and Lake LaSuAn Conservation Opportunity Areas	site/area protection	high	II-C
4	Obtain through purchase or permanent easement 1,000 acres of land to serve as a link between Big Island and Killdeer Plains Conservation Opportunity Areas	site/area protection	high	II-C
5	Strive for no net loss of large grassland tracts on DOW-managed and private lands to benefit area-sensitive species	resource & habitat protection	high	I, II, VII-A
6	Site new recreational facilities such as golf courses and ball fields, on already disturbed land	resource & habitat protection	high	VI-B
II	**LAND/WATER MANAGEMENT**		med	
1	Inventory the distribution and quantity of grassland habitats and priority grassland wildlife species	habitat & natural process restoration	high	VII-C,I
2	Investigate alternative management strategies to promote diverse stands of grassland habitat compatible with multiple wildlife species	habitat & natural process restoration	high	VII-C,I
3	Make use of existing data, including National Land Cover Database (NLCD), National Agricultural Statistics Service (NASS), North American Breeding Bird Survey (BBS), the Second Ohio Breeding Bird Atlas, DOW surveys, and others to develop best estimates of grassland availability and bird distribution in Ohio	habitat & natural process restoration	high	VII-C,I
4	By 2016, develop statewide grassland habitat goals required to stabilize grassland wildlife populations	habitat & natural process restoration	high	VII-C,I
5	Review and summarize relevant literature since Swanson (1996) and Herkert (1993) papers about grassland bird habitat use	habitat & natural process restoration	high	VII-C,I
6	Collect and evaluate data from legitimate citizen scientist-based monitoring surveys, such as the Ohio Lepidopterist Society's Long-term Butterfly Monitoring Program, the Breeding Bird Survey, and the Frog and Toad Call Survey, through 2020	habitat & natural process restoration	high	VII-C,D,I

7	Identify gaps in knowledge relative to wildlife populations and grasslands, and address through research	habitat & natural process restoration	high	VII-C,I
8	Identify collaborative partners (The Wilds, USFS, AEP, etc.) that manage similar habitats to exchange information on management strategies and possibly cost-share on equipment or other management expenses	habitat & natural process restoration	high	VII-C,D,I
9	Work with conservation partners like the USDA Farm Services Agency to make use of geospatial data about grassland habitats restored or established through federal programs	habitat & natural process restoration	high	VII-C
10	Incorporate habitat and population estimates for priority species identified within the Ohio Bird Conservation Initiative All-Bird Plan and other regional and Joint Venture plans	habitat & natural process restoration	high	VII-I
11	Use grasslands established through reclamation efforts on former strip-mined lands as opportunities to manage large (e.g., >5,000 acre) tracts of grassland habitats for area-sensitive species	habitat & natural process restoration	high	VII-A,E,F,H,I
12	Annually maintain grassland parcels of >75 acres on DOW managed areas that are outside of grassland conservation opportunity areas, area-sensitive bird priority areas, or gamebird priority areas	habitat & natural process restoration	high	VII-A,E,F,H
13	On private lands outside of gamebird priority areas and grassland conservation opportunity areas, promote grassland tracts ≥50 acres for the benefit of area-sensitive grassland wildlife species	habitat & natural process restoration	high	VII-A,E,F,H,I
14	Research alternative grassland habitats that would not be affected by farm commodity prices (ex. - wind turbine fields, solar panel fields, livestock haying/grazing operations, new urban development design, roadsides, carbon sequestration fields, corporate facility landscaping, well fields, urban green space, etc)	habitat & natural process restoration	high	VII-C
15	Update and improve the accuracy of landcover data in Ohio by using advanced GIS modelling to determine habitat distribution and quality	habitat & natural process restoration	high	VII-C
16	Determine Ohio-specific population and trend estimates for wildlife species to aid our ability to identify appropriate habitat objectives	habitat & natural process restoration	high	VII-C,I
17	Determine the importance of native warm season vs. exotic cool season grass management relative to avian community structure, species density, and population demographics	habitat & natural process restoration	high	VII-C,I
18	Develop habitat programs where the DOW establishes rules for participation and sets standards for habitat quality - identify target townships and market aggressively to landowners	habitat & natural process restoration	high	VII-A,E,F,H
19	Increase management efficiency by increasing communication among wildlife area managers regarding common solutions to management issues - use management plans and GIS tools to help identify common solutions and prioritize management activities	habitat & natural process restoration	high	VII-D

20	Identify ecosystem or population-level threats through research, surveillance, monitoring, and inventory	habitat & natural process restoration	high	I, II, III, IV, V, VI, VII-I, VIII, IX, XI
21	Develop compatible recreational activities criteria that can be used to evaluate impacts to habitat/species from recreational activities	habitat & natural process restoration	high	VI
22	Develop ways to encourage mega-farm, hobby farm, and rural estate owners to participate in habitat programs	habitat & natural process restoration	high	VII-A,F
23	Manage Grassland Conservation Opportunity Areas to provide appropriate habitat to sustain viable populations of all grassland dependent wildlife species native to Ohio	site/area management	med	VII-B,G VIII, IX
24	Conduct research on species-habitat relationships within grassland conservation opportunity areas to help direct management decisions	site/area management	med	VII-C,I
25	Obtain information on habitat requirements and HSI models for all native grassland wildlife species that occur in Grassland Conservation Opportunity Areas	site/area management	med	VII-C,I
26	Annually manage 2,500 acres of diverse grasslands as habitat cores within Killdeer Plains, Big Island, and Lake LaSuAn Grassland Conservation Opportunity Areas	site/area management	med	II-C
27	Establish and maintain large grassland mosaics (at least 250 acres) on Big Island, Killdeer Plains, and Lake LaSuAn Grassland Conservation Opportunity Areas	site/area management	med	II-C
28	Within Grassland Conservation Area boundaries, promote managed grasslands on private lands with a goal of establishing 2,500 acres of grassland around each conservation opportunity area core by 2020 - of these grassland acres, 50% should be in tracts of at least 250 acres in size	site/area management	med	VII-A,E,F,H
29	Designate 4 Bird Priority Areas for area-sensitive bird populations of regional significance at Woodbury, Tri-Valley, Crown City, and Egypt Valley Wildlife Areas	site/area management	med	I-A, VII-I
30	On each Bird Priority Area, annually manage multiple fields of continuous grassland habitats that are >250 acres to provide a diverse mosaic of large (e.g. >5,000 acres) grassland habitat	site/area management	med	I-A, VII-I
31	Establish staffing/funding levels commensurate with the amount of management activities at grassland conservation opportunity areas	site/area management	med	VII-D
32	Prevent introduction and control the spread of harmful species through legislation, regulation, policy, management practices, education, and partnerships	invasive/ problematic species control	med	VIII
33	Investigate methods of invasive species management appropriate to the spatial scale of wildlife area grasslands on former strip-mined lands	invasive/ problematic species control	med	VIII
34	Establish an early-detection rapid-response system for dealing with invasive and nuisance species	invasive/ problematic species control	med	VIII
III	**SPECIES MANAGEMENT**		med	
1	Reintroduce and restore grassland species where appropriate	species reintroduction	med	I, II, VII-B,G

2	Develop species-specific conservation plans as needs are identified to clearly define the actions the Division will/or will not implement concerning the state-listed species	species management	med	VII-I
3	Identify, design, and conduct appropriate species-specific surveys, inventories, or monitoring projects to determine species distribution and abundance	species management	med	VII-C,I
4	Develop a feral hog management plan designed to minimize introductions and control expansion	species management	med	VIII-B
IV	**EDUCATION AND AWARENESS**		med	
1	Provide workshops or training opportunities to learn management techniques and exchange ideas	training	high	VII-D
2	Educate USDA Farm Service Agency staff about upland bird management and habitat needs as it relates to CRP and mid-contract management	training	high	VII-H
3	Maintain a corps of Division of Wildlife-trained partners and volunteers to assist, lead, and promote special programs	training	high	VII-A,F
4	Educate private landowners about participation in habitat programs relative to the enrollment process (particularly when multiple agencies/offices are involved), rental equipment available, vendors available to do habitat work, and local program administration	awareness & communications	med	VII-A,F
5	Provide education/information about grassland habitats and wildlife, and opportunities for establishment on private lands; provide technical assistance to landowners for habitat establishment and maintenance	awareness & communications	med	VII-A,F
6	Educate and inform the public and other agency personnel on the importance and necessity for prescribed burning as a safe and effective tool for grassland habitat management	awareness & communications	med	VII-B
7	Provide technical assistance to public and private landowners concerning the use of prescribed burning as a safe and effective management tool	awareness & communications	med	VII-B
8	Educate the public about the negative effects of exotic and nuisance animals – encourage responsible disposal of unwanted animals	awareness & communications	med	VIII-A,B
9	Provide guidance to landowners for eradication/control of invasive and nuisance species	awareness & communications	med	VIII-A,B
10	Educate landowners, maintenance staff, municipalities, etc. on ways to reduce impacts to adjacent grassland habitat	awareness & communications	med	I, II, VII-G
V	**LAW AND POLICY**		med	
1	Support legislation promoting eco-friendly energy development and use	legislation policies & regulations	high med	III-A,B
2	Develop and implement a risk-assessment system in the approval process for importing or moving live animals and plants	legislation policies & regulations	high med	VIII
3	Balance the needs of fish and wildlife with the needs of people by mitigating incompatible ecosystem uses	policies & regulations	med	I, II, III, IV, V, VI

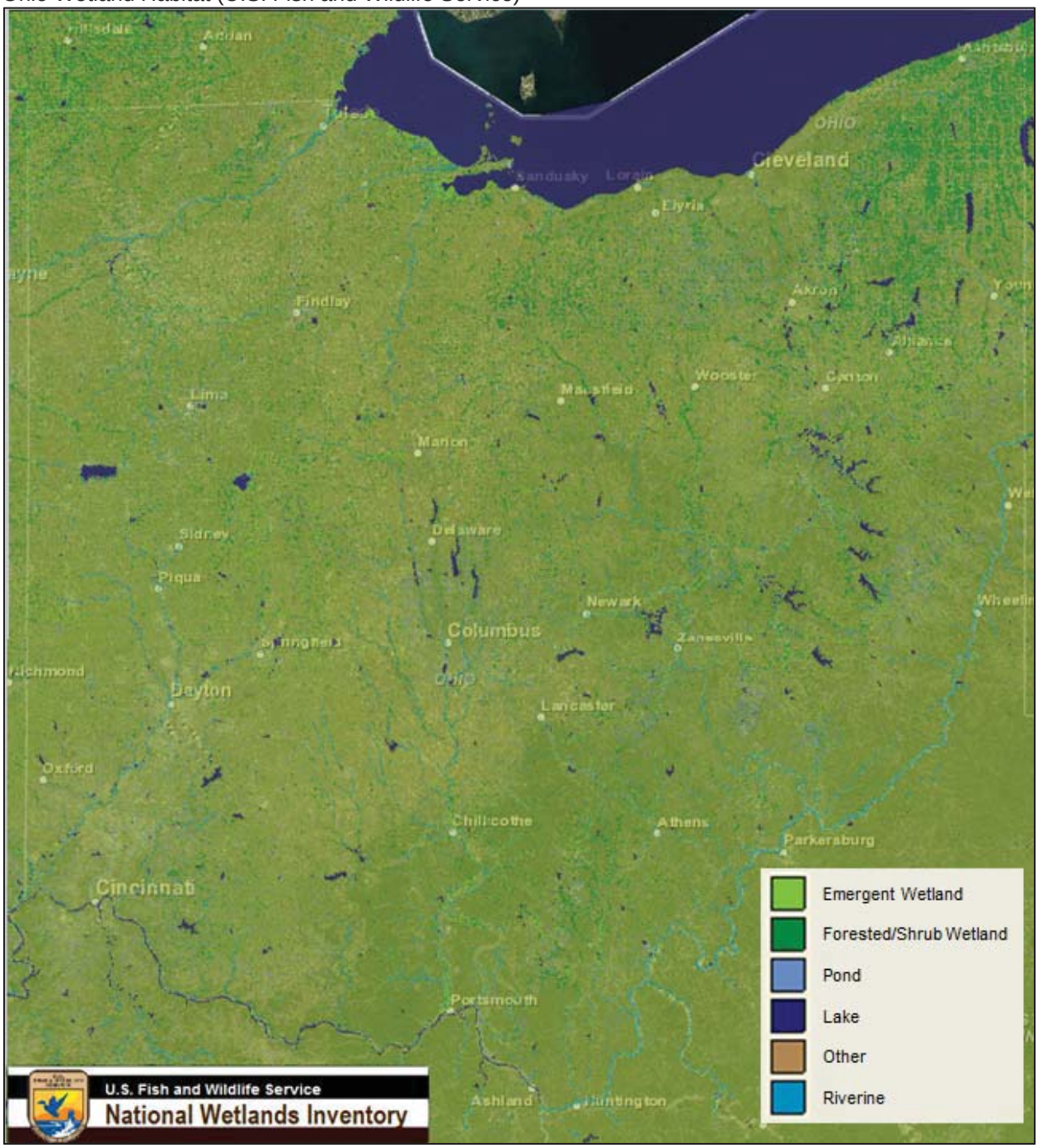
4	Participate in the policy-making process at Federal level to influence conservation programs	policies & regulations	med	VII-A,E,H
5	Encourage the preservation of habitat connectivity in all land use planning	policies & regulations private sector standards & codes	med med	I, IV
6	Create incentives (laws, policies) to prevent loss and/or minimize impacts to grasslands due to development	policies & regulations	med	I, II, IV
VI	**LIVELIHOOD, ECONOMIC AND OTHER INCENTIVES**		med	
1	Provide incentives for grassland establishment on private lands, especially within priority areas or where large tracts could benefit declining wildlife populations - work with private lands conservation partners (NGO's and agencies) to develop funding opportunities	conservation payments non-monetary values	high low	VII-A,E,F
2	Engage in research to understand social and economic influences on landowner decisions to participate in habitat programs, and use information to influence where and how programs are marketed	conservation payments non-monetary values	high low	VII-A,F
3	Support incentives that encourage landowners to maintain/preserve existing grassland habitat on agricultural lands	market forces conservation payments non-monetary values	med high low	II
4	Support the creation of incentives for the protection and restoration of grassland habitat	linked enterprises & livelihood alternatives substitution market forces conservation payments non-monetary values	high med med high low	I, II, III, IV, VII-A
5	Support creation of incentives to incorporate wildlife habitat into recreational facilities such as parks and golf courses	market forces conservation payments non-monetary values	med high low	VI-B

6	Develop incentives for private landowners to eradicate/control invasive plant species	conservation payments non-monetary values	high low	VIII
VII	**EXTERNAL CAPACITY BUILDING**		high	
1	Provide collaborative support to Pheasants Forever Farm Bill biologists in Ohio	alliance & partnership development	high	VII-D
2	Work with cooperating conservation agencies to streamline the enrollment process for new landowners in CRP or similar programs	alliance & partnership development	high	VII-A,F,H
3	Investigate alternative uses or markets for biomass produced by invasive plants on reclaimed strip-mined lands to recover some management costs - seek alternative funding sources (WHIP, USFWS) for woody species management	conservation finance	high	VII-D
4	Create a multiagency invasive species prevention and control group that would be responsible for all invasive species issues	alliance & partnership development	high	VIII
5	Through interagency coordination, work to assure that wildlife interests are taken into consideration in road, bridge, causeway, and utilities design, construction, and maintenance	alliance & partnership development	high	IV
6	Support and actively participate in an Ohio Prescribed Fire Council	alliance & partnership development	high	VII-B
7	Help create and support partnerships of conservation-minded groups to protect and manage forest habitat	alliance & partnership development	high	I, II, VII-D
8	Support legitimate citizen scientist-based monitoring efforts of wildlife species and habitats	institutional & civil society development	high	VII-C,D

*refers to the Grassland Habitat Conservation Threats in Table 21

6.7 Wetland Habitat

Ohio Wetland Habitat (U.S. Fish and Wildlife Service)



6.7.1 Status

Depleted but relatively stable. Ohio contains an estimated 880,000 wetland acres based on the 2009 USFWS National Wetland Inventory (NWI) update. Major wetland classification types within the NWI include wet-woods (35%), shrub swamps (9%), and marshes (11%). Ohio's wetlands have experienced losses unlike any other habitat type in the state. While "no net loss" programs have generally checked overall losses, fragmentation continues to threaten Ohio's wetland habitat. Mitigation wetlands isolated from other wetland complexes significantly contribute to fragmentation. Most of Ohio's wetlands are in private ownership, but the majority of consistently high quality wetlands are managed by the Division of Wildlife, the U.S. Fish and Wildlife Service, and several private hunting clubs. The Division has stepped up wetland protection, restoration, and enhancement efforts throughout Ohio under the North American Waterfowl Management Plan, the National Shorebird Plan, and the All-Bird Conservation Initiative.

6.7.2 Description

Before European settlement, Ohio's wetlands covered 18.9% (5 million acres) of the state. The majority of these wetlands were swamp forest, 3 million acres of which were covered by the Great Black Swamp in northwest Ohio. This massive swamp was approximately 120 miles long and 40 miles wide. As settlers moved west, they drained the wetlands for timber and farming, thus eliminating over 90% of the original wetlands.

Today, Ohio has a diversity of wetland types within its borders. The conservation threats and actions contained within this section apply to all of the wetland types listed below:

- Marsh – a shallow wetland that is subject to frequent or continuous flooding and is characterized by aquatic vegetation such as cattail, arrowhead, and sedges
- Swamp – a wetland fed primarily by surface water (stream, river) and is dominated by trees and shrubs
- Bog – wetland containing spongy peat deposits and is characterized by evergreen trees, sphagnum moss, and acidic water
- Fen – wetland fed by mineral rich groundwater covered with grasses, sedges, willow, and birch trees and containing alkaline or neutral water
- Vernal pools – shallow temporary wetlands that fill annually from rain and/or snow, dry out every year or every other year, and do not have a population of predatory fish

The wetland habitats that remain in Ohio are stressed by a number of factors, reducing our ability to maintain the quality and quantity of wetland acreage. The three primary issues impacting Ohio's wetlands are habitat loss, fragmentation, and aquatic invasive species.

6.7.2.1 Wetland Habitat Loss

Ohio ranks second only to California in percentage of wetland loss since 1780. Ohio's population density per square mile is 9th among all U.S. states, despite the fact that the rate of population growth is slower than most of the nation. Nevertheless, the rate of land converted to urban and commercial use happens at a much faster rate than population growth would indicate. Ohio has seen a decrease in population in core metropolitan areas and a dramatic increase in low-density housing in "exurban" areas. This development pattern puts further expansion and redevelopment in conflict with wetland habitats.

Since the early 1980s, federal and state programs have slowed the loss of wetlands, and several agricultural/conservation programs now exist which provide incentives to restore wetlands. Wetland mitigation also serves to keep wetlands on the map, but compared to the original wetland, the quality, function, and location of mitigated wetlands are oftentimes less than equivalent.

An evaluation of vegetation and wildlife responses to newly constructed wetlands needs to be conducted to ensure that mitigated wetlands are functionally equivalent to the original wetlands they replace. The quantity and quality of Ohio's wetlands must be maintained because a decline in either will decrease the suitability of this critical habitat to support sustainable wildlife populations.

The Upper Mississippi River and Great Lakes Region Joint Venture created habitat objectives for each state in the Joint Venture. Ohio has about 110,000 acres of emergent marsh according to the NWI – however, the JV habitat objectives require 133,000 acres for migrating birds and 118,000 for breeding birds. Restoration of marshes as well as maintenance of existing wetlands is paramount if the habitat objectives are to be met.

6.7.2.2 Fragmentation of Remaining Wetlands

Land use changes continue to fragment Ohio's remaining wetland habitat thus reducing the state's overall ecological capacity. Consequently, many of Ohio's remaining wetlands are small, isolated habitats surrounded by suburbia or farm fields. That isolation decreases habitat suitability for many wildlife species. To counter the fragmentation of the state's remaining wetland habitat, the Division must prioritize landscape-level ecology within concentrated focus areas. The majority of remaining wetlands in the state are in private ownership, which places a premium on the Division to develop strategies for technical assistance and education.

6.7.2.3 Aquatic Invasive Species

The biodiversity of wetlands have been impacted by invasive plants and animals more than other habitat types. Several non-native invasive plant species in particular, are a focus of management/control efforts:

- Common Reed (*Phragmites australis*)
- Purple loosestrife (*Lythrum salicaria*)
- Reed canary grass (*Phalaris arundinacea*)
- Eurasian watermilfoil (*Myriophyllum spicatum)*
- Flowering rush (*Butomus umbellatus)*

6.7.2.4 Wetland Bioassessment Program Update (from the Ohio EPA 2014 Integrated Report)

Numerous grants from U.S. EPA over many years have funded work that is advancing the science of wetland assessment methodologies in Ohio. Published work includes an amphibian index of biotic integrity (AmphIBI) for wetlands, a vegetation index of biotic integrity (VIBI) for wetlands, and a comparison of natural and mitigation (constructed) wetlands. A number of wetland reports are available on the Division of Surface Water web page (http://www.epa.ohio.gov/dsw/wetlands/WetlandEcologySection_reports.aspx) including (1) an assessment of the condition of wetlands in the Cuyahoga River watershed, (2) a study on the condition and functions of urban wetlands, (3) a comparison of the ecological condition of 25 randomly selected mitigation wetlands from around the state with results from Ohio's natural wetlands, and (4) the development of a GIS tool to identify potential vernal pool habitat restoration areas.

Studies currently in progress include (1) an in-depth analysis of the relationship between stream and wetland condition and function in the Big Run Scioto River watershed, (2) incorporating wetland information with data from other surface water resources to develop a total maximum daily load analysis of a watershed, and (3) assessment of the ecological condition of 50 randomly selected natural wetlands located across Ohio in order to generate a "scorecard" of wetland condition. These studies will add to data collected as part of U.S. EPA's National Wetland Condition Assessment conducted across the United States in 2011. Future research will include a detailed study of hydrologic functioning within natural and constructed wetlands, and continued investigations of various taxonomic groups (e.g., birds, bryophytes, algae, etc.) to determine their potential use in new and improved wetland assessment techniques.

6.7.2.5 Ohio EPA Wetland Protection Program

Ohio's Wetland Water Quality Standards (OAC 3745-1-50 to -54) contain definitions, beneficial use designations, narrative criteria and antidegradation provisions that guide Ohio EPA's review of projects in which applicants are seeking authorization to discharge dredged or fill material into wetlands. Ohio Administrative Code 3745-1-53 gives all wetlands the "wetland" designated beneficial aquatic life use. However, wetlands are further defined as Category 1, 2, or 3 based on the wetland's relative functions and values, sensitivity to disturbance, rarity, and potential to be adequately compensated for by wetland mitigation.

Category 1, 2, and 3 wetlands demonstrate minimal, moderate and superior wetland functions, respectively. Category 1 wetlands are typified by low species diversity, a predominance of non-native species, no significant habitat or wildlife use, and limited potential to achieve beneficial wetland functions. Category 2 wetlands are dominated by native species but generally without the presence of, or habitat for rare, threatened or endangered species. Additionally, these wetlands may be degraded, but have reasonable potential for re-establishing lost wetland functions. Category 3 wetlands typically possess high levels of diversity, a high proportion of native species, high functional values, and may contain the presence of, or habitat for rare, threatened and endangered species. Wetlands that are scarce, either regionally or statewide, form a subcategory of Category 3 wetlands for which, when allowable, short-term disturbances may be authorized.

The rigor of the Antidegradation Review conducted under 3745-1-50 through 54 is based on the category of the wetlands proposed to be impacted. Category 1 wetlands are classified as Limited Quality Waters and may be impacted after examining avoidance and minimization measures and determining that no significant impacts to water quality will result from the impacts. Category 2 and 3 wetlands are classified as General High Quality Waters, and may be impacted only after a formal examination of alternatives and a determination that the lowering of water quality is necessary to accommodate social and economic development. In addition, an applicant must demonstrate that “public need” is achieved in order to receive authorization to impact Category 3 wetlands. Compensatory mitigation ratios are based on wetland category, vegetation class, and proximity of the mitigation to the impact site.

6.7.3 Associated Species of Greatest Conservation Need

Ohio's wetland wildlife is a varied resource consisting of both resident and migratory species. Estimates suggest that <25% of Ohio’s original wetland habitat remains today. It’s not surprising that over half of Ohio's threatened and endangered species are dependent on wetlands as crucial habitat. Ohio's wetlands are an essential part of the life cycle of migratory birds which travel through the state each spring and fall between their wintering and nesting grounds. Monitoring populations of wetland wildlife, particularly migratory birds and furbearers, is a complex year-round task that involves the cooperation of many states and countries throughout North America. Participation by the Ohio Division of Wildlife (Division) in the Mississippi Flyway Council, Association of Fish and Wildlife Agencies, Midwest Furbearers Group, Partners-In-Flight, and other conservation groups and initiatives ensures wise monitoring and conservation of wetland wildlife.

Wetland wildlife populations are affected by many factors including habitat quality and quantity, weather, and the actions of humans. For migratory birds these factors may occur far from Ohio, but they have a major impact on the abundance of wetland wildlife species that frequent our state. Ohio’s wetlands were once part of a very complex ecosystem covering millions of acres. An important result of settlement was the “taming” of wetlands through extensive subsurface drains and ditches. Road building also altered the course of water forever. Today, wetland management is an art and science of manipulating water levels to simulate the natural drying and flooding that once occurred in Ohio’s wetlands. These manipulations entail mimicking natural drought and rainfall conditions to simulate these natural cycles. Drawdowns expose mudflats to heat and oxygen which stimulates the germination of seeds and growth of emergent vegetation. Shallow flooding attracts shorebirds that later give way to waterfowl and waders as water levels rise. The end result is an ecosystem that is one of the most productive available for a wide variety of wildlife.

The following species have been identified as Wetland species of greatest conservation need (conservation status rank in parentheses):

<u>Amphibians</u>

Mud Salamander (5)	*Pseudotriton montanus*
Jefferson Salamander (7)	*Ambystoma jeffersonianum*
Eastern Tiger Salamander (9)	*Ambystoma tigrinum tigrinum*
Four-toed Salamander (11)	*Hemidactylium scutatum*
Eastern Spadefoot (15)	*Scaphiopus holbrookii*
Mountain Chorus Frog (18)	*Pseudacris brachyphona*

Red-spotted Newt (20)	***Notophthalmus viridescens viridescens***
Western Chorus Frog (20)	*Pseudacris triseriata triseriata*

Birds

Sedge Wren (3)	*Cistothorus platensis*
King Rail (5)	*Rallus elegans*
Marsh Wren (5)	*Cistothorus palustris*
Northern Harrier (5)	*Circus cyaneus*
Sora (5)	*Porzana carolina*
Virginia Rail (5)	*Rallus limicola*
American Black Duck (10)	*Anas rubripes*
American Bittern (10)	*Botaurus lentiginosus*
Black Tern (10)	*Chlidonias niger*
Black-crowned Night-Heron (10)	*Nycticorax nycticorax*
Common Gallinule (10)	*Gallinula galeata*
Common Tern (10)	*Sterna hirundo*
Great Egret (10)	*Ardea alba*
Least Bittern (10)	*Ixobrychus exilis*
Prothonotary Warbler (10)	*Protonotaria citrea*
American Woodcock (24)	*Scolopax minor*
Blue-winged Teal (24)	*Anas discors*
Snowy Egret (24)	*Egretta thula*
Trumpeter Swan (24)	*Cygnus buccinator*
Sandhill Crane (24)	*Grus Canadensis*
Cattle Egret (24)	*Bubulcus ibis*
Great Blue Heron (38)	*Ardea herodias*
Short-eared Owl (38)	*Asio flammeus*
Wilson's Phalarope (38)	*Phalaropus tricolor*
Wood Duck (38)	*Aix sponsa*

Terrestrial Invertebrates

Mitchell's Satyr (1)	*Neonympha mitchellii*
Swamp Metalmark (6)	*Calephelis mutica*
Duke's Skipper (6)	*Euphyes dukesi*
Harris Checkerspot (11)	*Chlosyne harrisii liggetti*
Two-spotted Skipper (11)	*Euphyes bimacula*
Mulberry Wing Skipper (14)	*Poanes massasoit*
Broad-winged Skipper (14)	*Poanes viator viator*
Silver-bordered Fritillary (19)	*Boloria selene myrina*
Dion Skipper (20)	*Euphyes dion*
Black Dash Skipper (21)	*Euphyes conspicua*
Gray Comma (23)	*Polygonia progne*
Baltimore Checkerspot (32)	*Euphydryas phaeton*
Eyed Brown (34)	*Satyrodes eurydice*
Acadian Hairstreak (39)	*Satyrium acadicum*
Purplish Copper (45)	*Lycaena helloides*
Brown Elfin (45)	*Incisalia augustinus croesoides*

Mammals

Ermine (16)	*Mustela erminea*
Star-nosed Mole (25)	*Condylura cristata*

Reptiles

Spotted Turtle (4)	*Clemmys guttata*
Kirtland's Snake (5)	*Clonophis kirtlandii*
Eastern Ribbon Snake (13)	*Thamnophis sauritus sauritus*

Northern Ribbon Snake (13)	*Thamnophis sauritus septentrionalis*
Common Map Turtle (19)	*Graptemys geographica*
Blanding's Turtle (22)	*Emydoidea blandingii*
Copperbelly Water Snake (22)	*Nerodia erythrogaster neglecta*

6.7.4 Wetland Conservation Opportunity Areas

The Division of Wildlife's approach to enhancing and maintaining the highest level of terrestrial wildlife diversity in the state is to use a "conservation opportunity 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.

6.7.4.1 Lake Erie Marsh Conservation Opportunity Area

The Lake Erie Marsh Conservation Opportunity Area (Figure 15) lies along the Western Basin of Lake Erie. It stretches from the eastern edge of Maumee Bay along the Lake Erie shoreline and ends just west of the City of Sandusky in Sandusky Bay. The Lake Erie Marsh Conservation Opportunity Area is situated in a rapidly developing area of the Great Lakes. Development in the form of marinas, condominiums, and support industries continues to occur. Many small wetlands have succumbed to this development, and larger marsh complexes have been encroached upon. The area is also heavily farmed, with many wetlands converted for agricultural production. The current threat to remaining and restorable wetlands is high.

The region is an important staging area for migrant songbirds as they rest before the passage around or over Lake Erie in the spring. Lake Erie represents the largest migration barrier to many of these species after they cross the Gulf of Mexico. The western Lake Erie shoreline supports one of the most dramatic buildups of neotropical migrants in North America during spring migration.

Wetlands of the Lower Great Lakes are one of the six original continental areas designated as a "priority habitat range" in the North American Waterfowl Management Plan. The Lake Erie marshes are at the crossroads of the Mississippi and Atlantic flyways, and they annually attract hundreds of thousands of migrating waterfowl. The Lake Erie marshes are also the most important migration staging area on the continent for black ducks. This high concentration of black ducks in the marshes represents nearly 17 percent of the continental black duck population. Although predominantly utilized by waterfowl during migration, several species also nest within the region including mallards, blue-winged teal, wood ducks, trumpeter swans and Canada geese.

The Lake Erie Marsh Conservation Opportunity Area includes the Ottawa National Wildlife Refuge (9,000 acres) and several Division of Wildlife-owned properties (Pipe Creek, Pickerel Creek, Willow Point, Little Portage, Toussaint Creek, Metzger Marsh, Magee Marsh, Mallard Club) that total 9,758 acres. Publicly-managed lands constitute 41% of the total wetland acreage within this area.

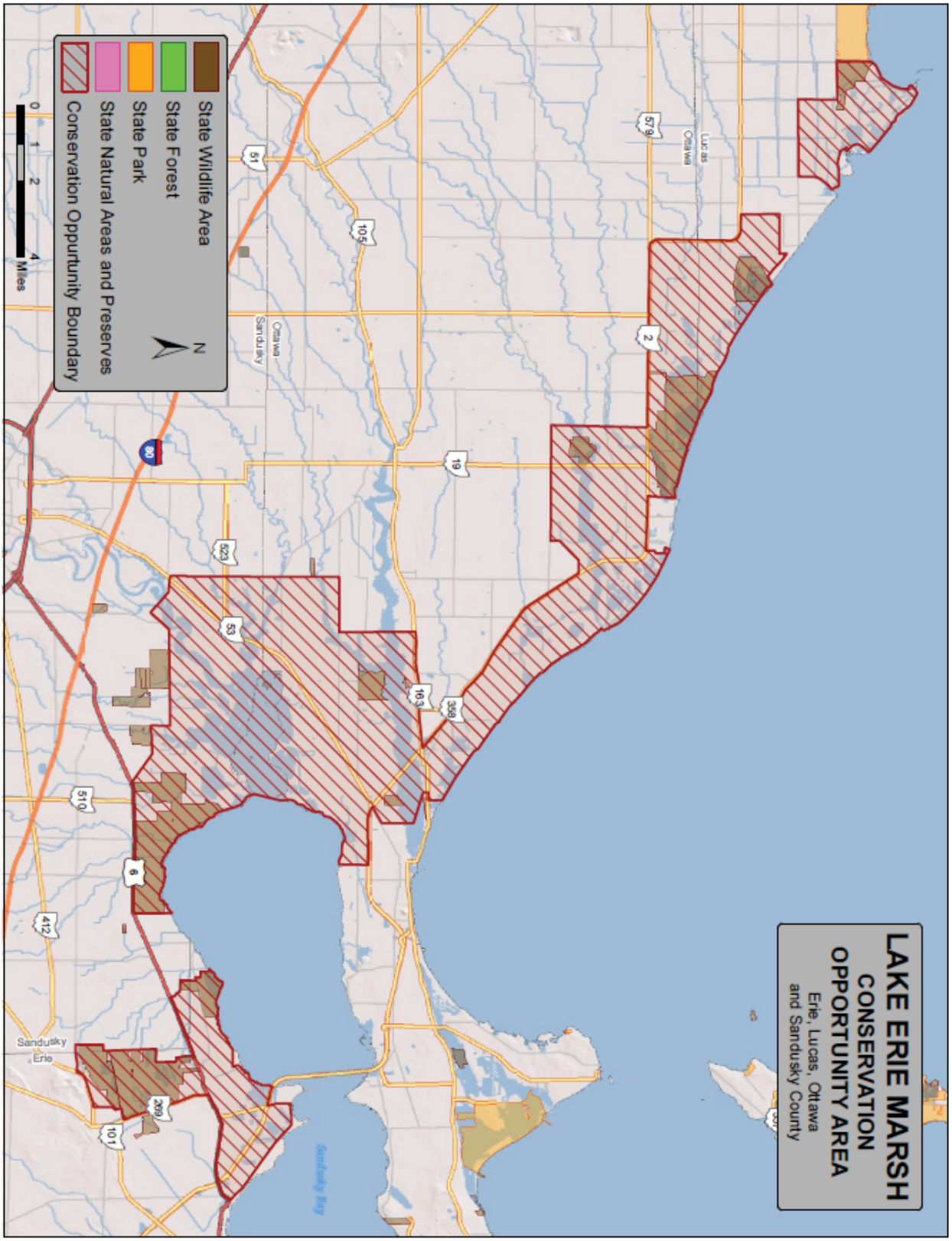


Figure 15. Lake Erie Marsh Conservation Opportunity Area.

6.7.4.2 Killbuck Marsh Conservation Opportunity Area

The Killbuck Marsh Conservation Opportunity Area (Figure 16) in east-central Ohio extends through the Killbuck Creek Valley and through portions of Wayne, Holmes, and Coshocton counties. Killbuck Creek is the central natural feature within the area. Over 40 miles of Killbuck Creek are included within the Conservation Opportunity Area. The creek's low gradient creates many acres of productive, emergent wetlands. The town of Millersburg lies between the two halves of the Conservation Opportunity Area (2.4 stream miles) in a location where past channelization and a narrow valley floor have resulted in reduced wetland habitat. However, from an area south of Millersburg to the confluence of the Killbuck and Walhonding River in Coshocton County, the stream gradient and wetland habitat are similar in nature to the northern portion of the Conservation Opportunity Area, and contain extensive wetlands.

Inland wetlands like those in the Killbuck Conservation Opportunity Area are important staging areas for thousands of waterfowl during spring and fall migration. As many as 23 species of ducks have been identified using the area. Shorebirds and a variety of other wildlife and listed species also depend heavily on these inland wetlands.

In 1988, the first recorded Ohio nesting attempt of the state endangered sandhill crane in more than 60 years was documented nearby at Funk Bottoms Wildlife Area. Sandhills now nest regularly at both the Killbuck Conservation Opportunity Area and Funk Bottoms Wildlife Area. The first recorded nesting of bald eagles in the Killbuck Marsh Conservation Opportunity Area occurred in 2000. In 1991, Killbuck Marsh Wildlife Area was the site for a successful reintroduction of river otters, which have subsequently expanded into adjoining watersheds.

Trumpeter swans were reintroduced in the Killbuck marshes in 1997 to re-establish this endangered species, and two nesting attempts were documented in 2000. Additionally, sightings of the eastern massasauga rattlesnake (currently a candidate species for federal endangered status) are known to have occurred in the Killbuck Valley.

The Killbuck Marsh Wildlife Area in north central Holmes County represents the largest remaining inland marsh in Ohio. This 5,500 acre wetland complex is composed of a wide variety of habitats, including seasonally flooded bottomland hardwoods, shrub-scrub swamps, emergent marshes, shallow ponds with submergent vegetation, and wet meadows. Restoration of diked wetlands such as the Wright Marsh (350 acres in 1990) and the Moore Marsh (50 acres in 1991) have added to the diversity of habitats. Presently 5,650 acres of Division of Wildlife-owned lands (38% of total acreage) are located within the Killbuck Marsh Conservation Opportunity Area.

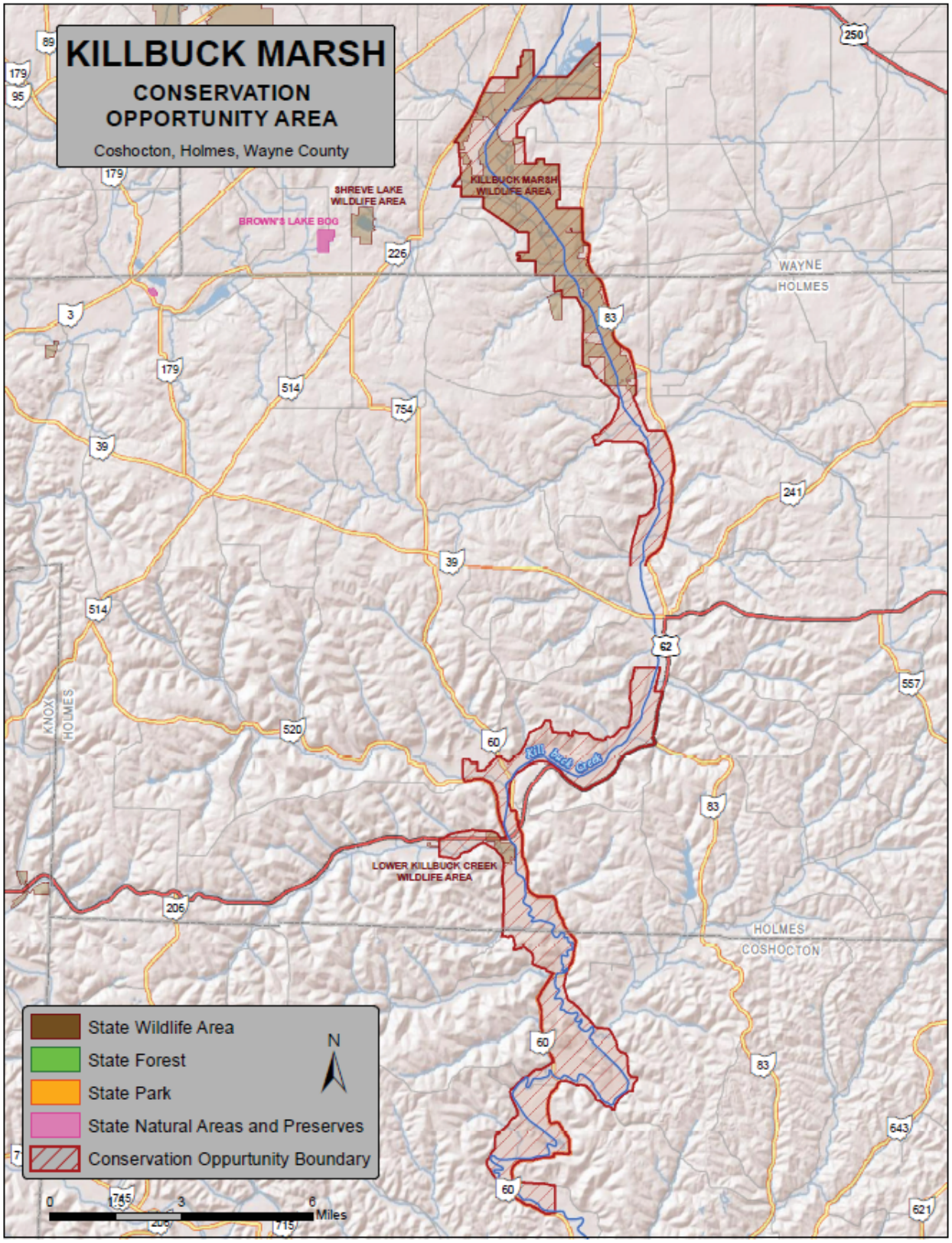


Figure 16. Killbuck Marsh Conservation Opportunity Area.

6.7.4.3 Grand River/Mosquito Creek Conservation Opportunity Area

Approximately 43% of Ohio's human population is located in northeast Ohio, with over 3 million people living within 35 miles of the Grand River/Mosquito Creek Conservation Opportunity Area (Figure 17). Despite this concentration of human activity, productive wetland systems still exist in Northeast Ohio. Together, the Grand River and Mosquito Creek Wildlife Areas comprise 86% of this 16,028 acre Conservation Opportunity Area. Current habitat conditions within the area are characterized by numerous beaver swamps, riparian wetlands, bottomland forests, vernal pools, and adjacent agricultural lands. Topography in the area is extremely flat and the soils are poorly drained.

The western portion of this Conservation Opportunity Area consists primarily of the Grand River Wildlife Area (over 7,400 acres), which was established in 1956 and is located at the southern end of the Grand River Lowlands. The "Lowlands" are recognized as a distinct physiographic region that developed from the ancestral lakebed of a finger lake that once stretched from northern Trumbull County through the western half of Ashtabula County. The Grand River itself has been identified as having the highest diversity of fish and mussels of any river of its size in the Lake Erie drainage. Due to the quality and quantity of the wetland habitat in the vicinity, the Grand River was selected as the first release site for river otters when restoration efforts were initiated in 1986.

The eastern portion of this Conservation Opportunity Area is comprised primarily of Mosquito Creek Wildlife Area (over 9,000 acres) which lies within Ohio's portion of the Ohio River drainage basin. The Mosquito Creek Reservoir Project was authorized in 1938 to provide flood control and a water supply for industry downstream. Full operation of the reservoir by the U.S. Army Corps of Engineers was initiated in 1944. The Ohio Division of Wildlife was granted a license by the Secretary of the Army in 1946 for fish and wildlife management on the over 9,000 acres of land and water north of State Route 88. The federal land was used as a public hunting area from 1946 to 1962. The state of Ohio established a land acquisition unit adjacent to the federal land in 1956.

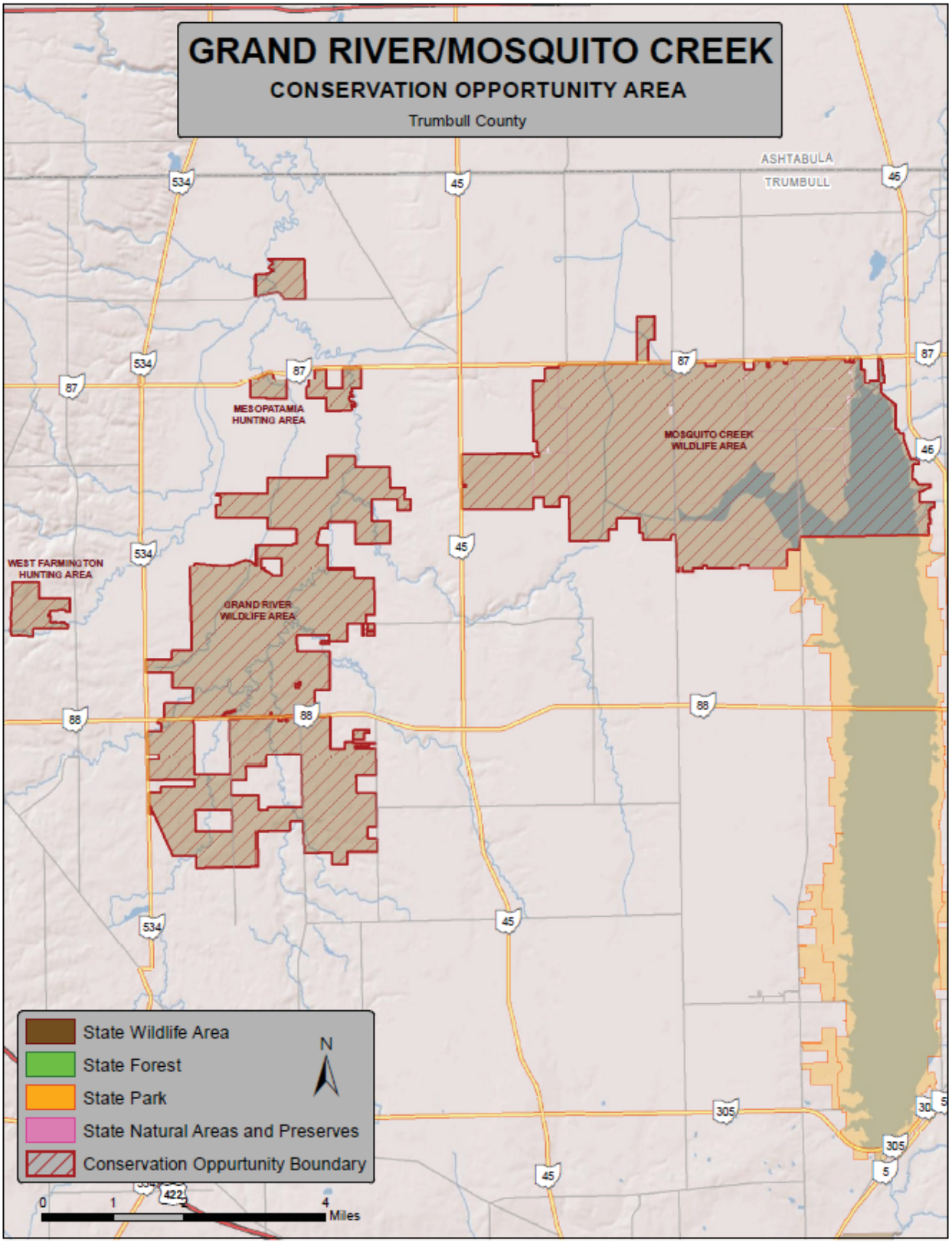


Figure 17. Grand River/Mosquito Creek Conservation Opportunity Area.

Table 23. CONSERVATION THREATS TO WETLAND HABITAT.
The following threats negatively impact or have the potential to negatively impact Wetland habitat. Threat categories/classification from Salafsky et al. (2008), and threat impact rank calculations from Master et al. (2012).

ID	threats	2nd level threat classification(s)	threat impact rank
I	**residential and commercial development**		high
A	Wetlands in Ohio have become highly fragmented due to development	housing & urban areas commercial & industrial areas	high medium
B	Habitat destruction and altered hydrology from commercial development	commercial & industrial areas	medium
C	Habitat destruction and altered hydrology from urban/suburban development	housing & urban areas	high
D	Wetland construction/restoration far from other wetlands (fragmentation) as a result of mitigation from development	housing & urban areas commercial & industrial areas	high medium
E	No authority to control private land uses and development related to federal and state programs supporting wetland restoration	housing & urban areas	high
II	**agriculture and aquaculture**		low
A	Loss of wetland habitat because of conversion to agriculture	annual & perennial non-timber crops livestock farming & ranching	medium low
B	Loss of wetland habitat due to increase in intensity of agricultural practices – conversion of imbedded wetland habitat	annual & perennial non-timber crops	medium
III	**energy production and mining**		medium
A	Oil and gas extraction - can directly damage and destroy wetland habitat, and indirectly have negative impacts by altering hydrology and causing chemical contamination	oil & gas drilling mining & quarrying	low low
B	Wind turbines can negatively impact birds and bats that utilize wetland habitat	renewable energy	medium
IV	**transportation and service corridors**		high
A	Roads and utilities can destroy and fragment wetland habitat, and alter hydrology	roads & railroads utility & service lines	high high
V	**biological resource use**		medium
---	none	---	---
VI	**human intrusions and disturbance**		medium
A	Incompatible recreational activities	recreational activities	medium
B	Creation of recreational facilities can alter/destroy wetland habitat	recreational activities	medium
VII	**natural system modifications**		medium
A	Wetlands could be converted (drained) to CRP as 30 year Wetland Reserve Program (WRP) contracts expire and the landowner no longer receives payment	dams & water management/use	medium

B	Insufficient funds available to build/maintain wetland habitat on private lands – resulting in lack of management and subsequent habitat degradation	dams & water management/use	medium
C	Lack of wetland inventory data, and a database system to analyze that data limits our ability to manage	other ecosystem modifications	low
D	Our ability to manage wetlands is limited by available staff and funding	other ecosystem modifications	low
E	Landowners do not want to cede development rights to the state related to federal and state programs supporting wetland restoration	other ecosystem modifications	low
F	Construction costs associated with restoring private land wetlands continues to rise resulting in fewer wetland acres restored for the price	other ecosystem modifications	low
G	Habitat destruction, fragmentation, altered hydrology due to proximity of development	other ecosystem modifications	low
H	Aging wetland infrastructures can affect the quantity and the quality of wetlands	dams & water management/use	medium
I	Altered hydrologic regimes due to ditching and diking, water control structures, etc	dams & water management/use	medium
J	Lack of wetland associated species data limits our ability to manage for current threats and limits our ability to develop plans for impending issues like climate change	other ecosystem modifications	low
VIII	**invasive and other problematic species and genes**		medium
A	Introduction and/or spread of invasive plants and animals	invasive non-native/alien species	high
B	Introduction and/or spread of nuisance plants and animals	problematic native species	low
C	Introduction and spread of diseases (plants and animals)	invasive non-native/alien species problematic native species	high low
D	Landowners not aware of which species of vegetation to control, and how to control them	invasive non-native/alien species problematic native species	high low
E	Lack of accessibility and cost of herbicides for non-licensed landowners for control of vegetation	invasive non-native/alien species problematic native species	high low
IX	**pollution**		medium
A	Urban effluent	household sewage & urban wastewater industrial & military effluents garbage & solid waste air-borne pollutants	low low low low

B	Agriculture effluent	agricultural & forestry effluents	high
X	**geological events**		low
---	none	---	---
XI	**climate change and severe weather**		high
A	Climate change could effect plant species composition, which in turn could affect wildlife species	habitat shifting & alteration droughts temperature extremes storms & flooding	high high medium high

Table 24. CONSERVATION ACTIONS FOR WETLAND HABITAT.
The following actions will help abate or have the potential to help abate threats to Wetland habitat. Action categories/classification from Salafsky et al. (2008), and action priority rank calculations from Georgia DNR (2005).

ID	actions	2nd level action classification(s)	action priority rank	threat(s) addressed*
I	**LAND/WATER PROTECTION**		high	
1	Annually identify and prioritize properties within the existing Wetland Conservation Opportunity Areas for strategic acquisitions, conservation easements, management agreements, or partnerships	site/area protection	high	I, II, VII-A, D
2	Protect wetlands through strategic acquisitions, easements, and partnerships	resource & habitat protection	med	I, II, III, IV, V, VI
3	Use State Wildlife Grant funds for potential acquisitions	resource & habitat protection	med	I, II, III, IV, V, VI
4	Work with land conservation partners to secure conservation easements and other protection for wetlands coming out of federal contracts	resource & habitat protection	med	VII-A,D
5	Site new recreational facilities such as golf courses and ball fields on already disturbed land	resource & habitat protection	med	VI-B
II	**LAND/WATER MANAGEMENT**		med	
1	Prevent introduction and control the spread of harmful species through legislation, regulation, policy, management practices, education, and partnerships	invasive/ problematic species control	high	VIII
2	Establish an early-detection rapid-response system for dealing with invasive and nuisance species	invasive/ problematic species control	high	VIII-A,B
3	Stop or reduce the spread of wetland invasive vegetation in the three wetland conservation opportunity areas	invasive/ problematic species control site/area management	high low	VIII-A,B

4	Annually control 1,000 to 1,500 acres of wetlands containing invasive species on public land with an emphasis in the conservation opportunity areas	invasive/ problematic species control site/area management	high low	VIII-A,B
5	Utilize aerial spray for invasive species control/eradication in larger problem areas	invasive/ problematic species control	high	VIII-A,B
6	Use seasonal water level management to control invasive species	invasive/ problematic species control	high	VIII-A,B
7	Develop a standardized monitoring program to recognize potential threats from invasive species	invasive/ problematic species control	high	VIII
8	Assist with control of invasive vegetation on 500 acres of private wetlands annually through 2020	invasive/ problematic species control	high	VII-B, VIII-A,B,D,E
9	Use GIS to annually map the extent of invasive plants on selected wetlands, beginning with the wetland conservation opportunity areas	invasive/ problematic species control	high	VII-C, VIII-A,B
10	Increase and maintain adequate Division staffing in core areas for management of invasive species	invasive/ problematic species control	high	VII-D, VIII
11	Maintain 400,000 acres of privately owned, high quality wetlands in Ohio through 2020, as indexed by the private lands database and Conservation Reserve Program (CRP) acreages	habitat & natural process restoration	med	VII-A,B,E,F,H,I
12	Prioritize restoration/maintenance of Division-managed wetlands at greatest risk	habitat & natural process restoration	med	VII-C
13	Work with fisheries biologists to integrate fisheries considerations when restoring wetlands	habitat & natural process restoration	med	VII-G,H,I
14	Conduct aerial surveys of wetlands in selected areas during the summer and autumn - assess the percentage cover of emergent and floating leafed vegetation	habitat & natural process restoration	med	VII-C
15	Assess the quality of privately owned wetlands that have been restored with federal and/or state assistance by 2020	habitat & natural process restoration	med	VII-C
16	Randomly sample restored wetlands to determine their contribution to wildlife habitat	habitat & natural process restoration	med	VII-C,J
17	Use research and monitoring data to increase understanding of how land-use changes impact the watersheds of coastal wetlands	habitat & natural process restoration	med	VII-C,G
18	Develop a survey technique that adequately captures all aspects of the quality of a wetland	habitat & natural process restoration	med	VII-C,J
19	Include private wetlands on the marshbird monitoring protocol	habitat & natural process restoration	med	VII-C,J

20	Focus efforts on monitoring the priority species listed in the Upper Mississippi River and Great Lakes Region Joint Venture Implementation Plan	habitat & natural process restoration	med	VII-C,J
21	Encourage wetland owners to record wildlife use of their particular wetlands, and integrate the data into a database to track wildlife use of wetland types across the state	habitat & natural process restoration	med	VII-C,D,J
22	Collect and evaluate data from legitimate citizen scientist-based monitoring surveys, such as the Ohio Lepidopterist Society's Long-term Butterfly Monitoring Program, the Breeding Bird Survey, and the Frog and Toad Call Survey	habitat & natural process restoration	med	VII-C,J
23	Update and improve the accuracy of landcover data in Ohio by using advanced GIS modelling to determine habitat distribution and quality	habitat & natural process restoration	med	VII-C
24	Increase Division private lands biologist staffing in core wetland areas to work with landowners during CRP mid-contract management checks to insure they are utilizing proper wetland management techniques (*Guidelines for Management of Ohio's Wetland Habitat*)	habitat & natural process restoration	med	VII-D
25	Maintain the private lands biologist program on regional basis	habitat & natural process restoration	med	VII-D
26	Identify ecosystem or population-level threats through research, surveillance, monitoring, and inventory	habitat & natural process restoration	med	I, II, III, IV, V, VI, VII-J, VIII, IX, XI
27	Develop compatible recreational activities criteria that can be used to evaluate impacts to habitat/species from recreational activities	habitat & natural process restoration	med	VI
28	Develop ways to encourage mega-farm, hobby farm, and rural estate owners to participate in habitat programs	habitat & natural process restoration	med	VII-A,B,E,F
29	Manage Wetland Conservation Opportunity Areas to provide appropriate habitat to sustain viable populations of all wetland dependent wildlife species native to Ohio	site/area management	low	I, II, VIII, IX
30	Develop and maintain 28,500 acres of Division-owned wetlands in the wetland conservation opportunity areas as Category III wetlands (as defined by the Army Corps of Engineers) by 2020	site/area management	low	I, II, IX
31	Restore/enhance 600 acres of wetlands in District 1, 1,650 acres in District 2, 450 acres in District 3, and 300 acres in District 5 by 2020, with 3,200 acres of the restorations occurring within the three wetland conservation opportunity areas	site/area management habitat & natural process restoration	low med	I-D
32	Assess the quality of wetlands in the wetland conservation opportunity areas	site/area management	low	VII-C
33	Assure that publicly owned wetlands in wetland conservation opportunity areas are high quality	site/area management	low	VII-G,H,I
34	Conduct biological surveys on Division-managed wetlands within each conservation opportunity area in 2015 and 2020	site/area management	low	VII-C,J

35	Obtain information on habitat requirements and HSI models for all native wetland wildlife species that occur in Wetland Conservation Opportunity Areas	site/area management	low	VII-C,J
36	Evaluate and update management plans for priority species on Division-managed properties in wetland conservation opportunity areas	site/area management	low	VII-C,J
37	Incorporate all wetland conservation opportunity areas into statewide marshbird monitoring protocol	site/area management	low	VII-C,J
38	Increase Division staffing within the three Wetland Conservation Opportunity Areas	site/area management	low	VII-D
39	Annually budget funding for conservation opportunity areas capital projects on a rotating basis to maintain water control structures on highest priority wetlands	site/area management	low	VII-H
III	**SPECIES MANAGEMENT**		high	
1	Develop species-specific conservation plans as needs are identified to clearly define the actions the Division will/or will not implement concerning the state-listed species	species management	high	VII-J
2	Identify, design, and conduct appropriate species-specific surveys, inventories, or monitoring projects to determine species distribution and abundance	species management	high	VII-C,J
3	Identify the causes for the decline of the black-crowned night heron populations and develop a recovery plan by 2016	species recovery	high	VII-C,J
4	Reintroduce and restore wetland species where appropriate	species reintroduction	med	I, II
IV	**EDUCATION AND AWARENESS**		med	
1	Offer wetland management technical assistance to NRCS by providing long-term management plans to landowners enrolled within WRP	awareness & communications	med	VII-A,B
2	Make 40 substantive contacts relating to federal and state programs supporting wetland restoration each year	awareness & communications	med	I-E VII-B,E,F
3	Educate landowners about the importance of land stewardship and the value of wetlands on private lands - and inform them of best management practices for their wetland habitats	awareness & communications	med	VII-A,B,E,F
4	Provide guidance to landowners for eradication/control of invasive and nuisance species	awareness & communications	med	VIII-A,B,D,E
5	Conduct restoration and conservation demonstrations to transfer management capacity to benefit coastal wetland management	training	med	VII-D
6	Maintain a corps of Division of Wildlife-trained partners and volunteers to assist, lead, and promote special programs	training	med	VII-D
7	Educate landowners, maintenance staff, municipalities, etc. on ways to reduce impacts to adjacent wetland habitat	awareness & communications	med	I, II, VII-G
8	Deliver science-based training and information that supports wetland stewardship to decision-makers	training	med	I, II, VII-G
9	Educate the public about the negative effects of exotic and nuisance animals – encourage responsible disposal of unwanted animals	awareness & communications	med	VIII-A,B

V	**LAW AND POLICY**		med	
1	Balance the needs of fish and wildlife with the needs of people by mitigating incompatible ecosystem uses	policies & regulations	med	I, II, III, IV, V, VI
2	Participate in the policy-making process at Federal level to influence conservation programs	policies & regulations	med	I-E, VII-A,B,E,F
3	Create an interagency team to explore streamlining the permitting process for wetland restoration projects	policies & regulations	med	VII-E,F
4	Foster legislative support for private lands wetland conservation to continue the wetlands financial incentives in future Farm Bill titles and editions	legislation	med	VII-A,B
5	Encourage the preservation of habitat connectivity in all land use planning	policies & regulations private sector standards & codes	med med	I, IV
6	Create incentives (laws, policies) to prevent loss and/or minimize impacts to wetlands due to development	policies & regulations	med	I, II, IV
7	Support legislation promoting eco-friendly energy development and use	legislation policies & regulations	med med	III
8	Develop regulations to deter introduction of invasive/nuisance species	legislation policies & regulations	med med	VIII-A,B,C
9	Develop and implement a risk-assessment system in the approval process for importing or moving live animals and plants	legislation policies & regulations	med med	VIII-A,B,C
VI	**LIVELIHOOD, ECONOMIC AND OTHER INCENTIVES**		med	
1	Create incentives for vegetated buffers along all waterways to reduce nutrient loads and sediment	market forces conservation payments non-monetary values	high med low	IX-B
2	Support incentives that encourage landowners to maintain/preserve existing wetland habitat on agricultural lands	market forces conservation payments non-monetary values	high med low	II
3	Support creation of incentives to incorporate wildlife habitat into recreational facilities such as parks and golf courses	market forces conservation payments non-monetary values	high med low	VI-B

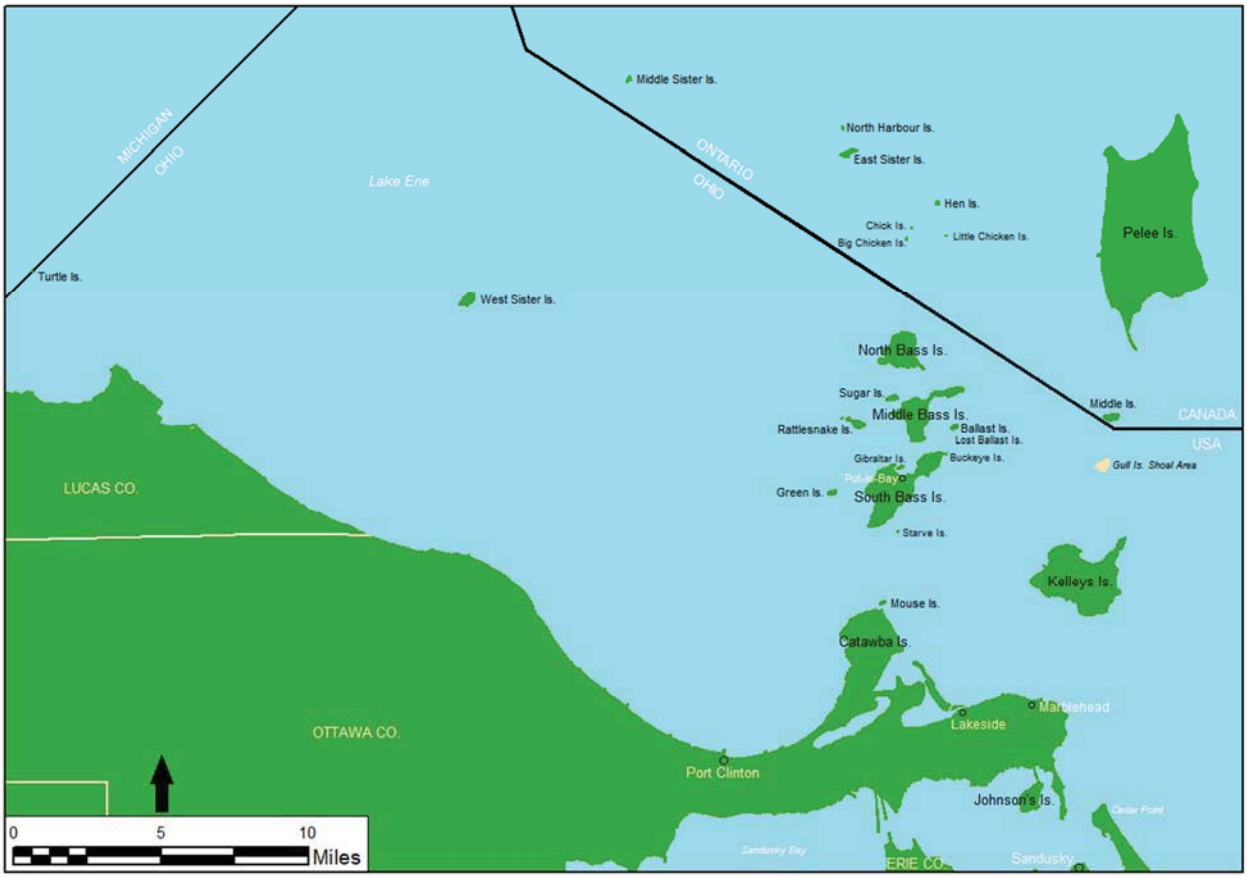
4	Support creation of incentives for landowners to build wetlands	market forces conservation payments non-monetary values	high med low	VII-B
5	Explore tying eligibility for grant money, loans, and cost-share programs to nutrient loading levels for agriculture – the lower the nutrient levels in their effluent, the more money they would be eligible for	conservation payments	med	IX-B
6	Engage in research to understand social and economic influences on landowner decisions to participate in habitat programs, and use information to influence where and how programs are marketed	conservation payments non-monetary values	med low	VII-A,B,E,F
7	Create incentives to promote land use that incorporates wetland habitat friendly planning	linked enterprises & livelihood alternatives market forces conservation payments non-monetary values	med high med low	I, II, III, IV
8	Create incentives for controlled wetland owners to improve water control structures and subsequently improve habitat conditions for fish and wildlife	conservation payments non-monetary values	med low	VII-B,H
9	Develop incentives for private landowners to eradicate/control invasive plant species	conservation payments non-monetary values	med low	VIII
10	Seek Federal grant money to assist with chemical applications to control invasive species	conservation payments	med	VIII-D,E
11	Seek competitive grant funding to support wetland restoration/maintenance efforts	conservation payments	med	VII-B,D,E,F
12	Increase funding for projects which don't meet the Farm Bill requirements	conservation payments	med	VII-A,B,E,F
13	Maintain state matching grants for created wetlands	conservation payments	med	VII-A,B,E,F
VII	**EXTERNAL CAPACITY BUILDING**		med	
1	Utilize partnerships with university research programs to evaluate the most cost-effective technique to determine wetland quality	alliance & partnership development	med	VII-C,D

2	Maintain partnerships with US Fish and Wildlife Service (USFWS), Ducks Unlimited (DU), Farm Service Administration (FSA), National Resource Conservation Service (NRCS), and Ohio Soil and Water Conservation Districts (SWCD)	alliance & partnership development	med	VII-C,D
3	Encourage partnerships of conservation minded groups to protect and manage wetland habitat	alliance & partnership development	med	I, II, VII-D
4	Support legitimate citizen scientist-based monitoring efforts of wildlife species and habitats	institutional & civil society development	med	VII-C,D,J
5	Create a multiagency invasive species prevention and control group that would be responsible for all invasive species issues	alliance & partnership development	med	VIII-A,B,C
6	Through interagency coordination, work to assure that wildlife interests are taken into consideration in road, bridge, causeway, and utilities design, construction, and maintenance	alliance & partnership development	med	IV
7	Facilitate the development of cooperative weed management areas	alliance & partnership development	med	VII-D

*refers to Wetlands Habitat Conservation Threats in Table 23

6.8 Lake Erie Islands

Ohio Lake Erie Islands Habitat Map (Wikipedia)



6.8.1 Status

Lake Erie island habitat varies based upon the level of human development and disturbance. Some islands – particularly North, South, and Middle Bass, and Kelleys – have year round residents, influxes of tourists during the summer, and considerable development supporting the tourism industry. Other islands have no development, and are only occasionally visited by people. Development on populated islands, and habitat destruction from colonies of cormorants on un- or lesser populated islands continue to impact island habitat.

6.8.2 Description

The Lake Erie Islands constitute an archipelago of 22 islands lying between the Canadian and American shores of the western basin of Lake Erie (Figure 18). Ohio has jurisdiction over 13 of the islands (Kelleys, North Bass, Middle Bass, South Bass, Green, Rattlesnake, Sugar, Gibralter, Ballast, Starve, West Sister, Mouse, Johnson's) which range in size from the 1.2-acre Starve Island with 0.186 miles of shoreline, to the 2,824-acre Kelleys Island which has 11.6 miles of shoreline. Twenty-seven percent (1,616 ac) of the 5,892 acres comprising the four largest islands (Kelleys, South Bass, Middle Bass and North Bass) is owned by the Ohio Department of Natural Resources, U.S. Fish and Wildlife Service, and conservation-minded non-governmental organizations.

The Lake Erie islands, although distinct from the neighboring mainland in climate and topography, are considered to be vegetatively indistinguishable from the surrounding mainland. Shoreline characteristics

vary from island to island but consist of beaches of sand, gravel/small stones, loose rocks, alvars, and sheer cliffs – all with varying amounts of vegetative cover.

The conversion of the Lake Erie islands' landscape has been dramatic. Island forests were cleared for agricultural endeavors, and limestone quarrying was an important industry through the 1800s. Since the early 1900s, the islands have been developed at a quickening pace as summertime residences, and to meet the needs of the growing tourism industry. Today, nearly a million tourists visit the islands each summer to camp, bike, boat, sail, fish, and sightsee. Human disturbance, habitat degradation and destruction, coupled with shoreline alteration and development are the most serious threats to island-dependent wildlife. The Lake Erie water snake's population will need to be monitored through 2016 (and beyond) to ensure long-term sustainability.

Data is needed to quantify impacts to colonial waterbirds and other avian communities affected by vegetation changes resulting from roosting/nesting cormorants. Cormorants also compete with these birds for nest sites. Information is needed to determine if the cormorant management plan is effective. On Lake Erie islands, cormorants nest primarily in trees in close proximity to other colonial-nesting species. Habitat alteration and competition is a potential problem given the lack of alternative nesting sites for colonial waterbirds. Consequently, conservation of nesting sites should be the emphasis of management activities for these waterbirds. Finally, fluctuating water levels in the lake, shoreline erosion, pollution/contaminants, and the impacts of aquatic invasive species on the prey base are also unknown factors which may be detrimental to island-dependent wildlife.

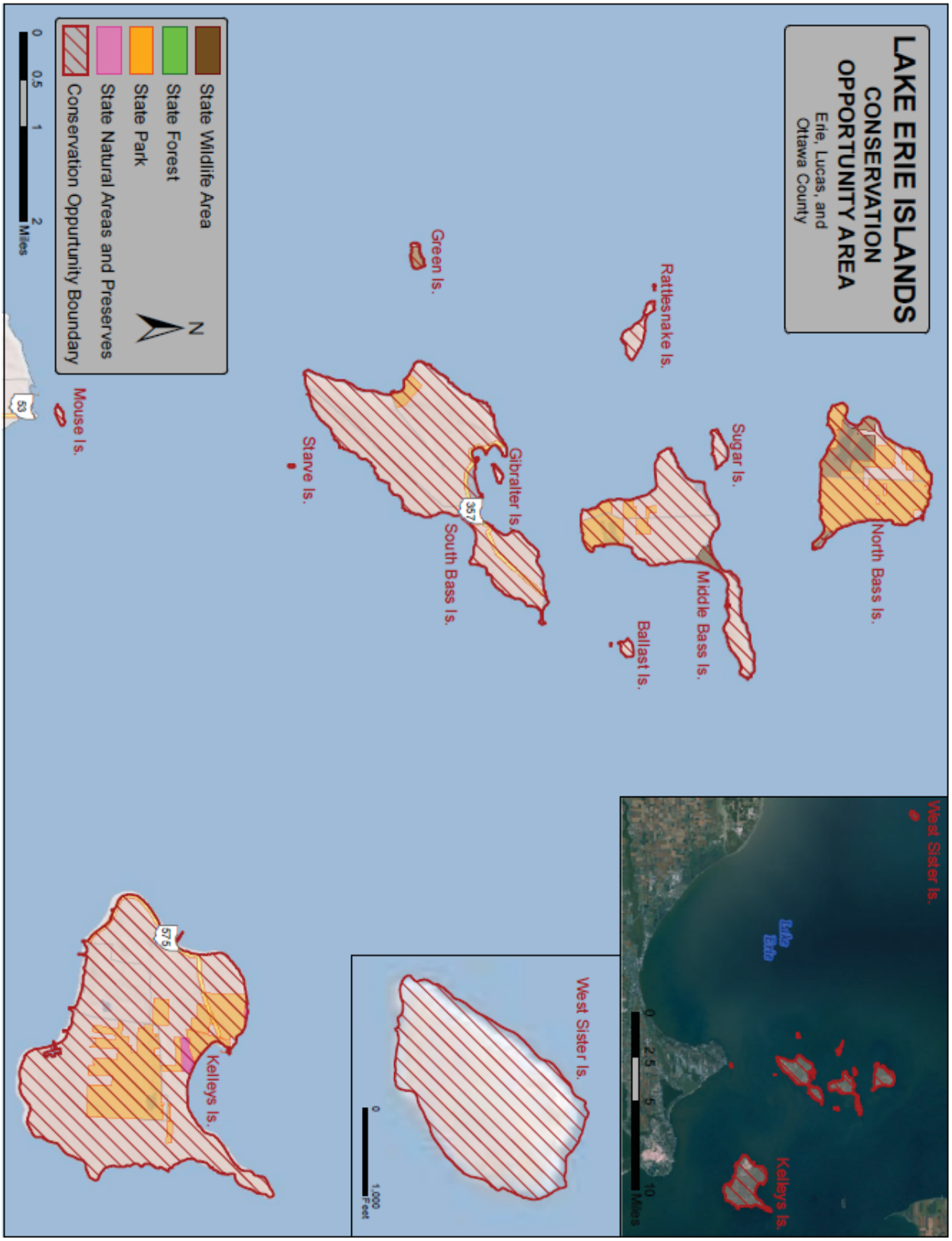


Figure 18. Lake Erie Islands Conservation Opportunity Area.

6.8.3 Associated Species of Greatest Conservation Need

The Lake Erie islands historically have been an important staging and stopover location for a variety of migratory avian species. In addition, West Sister Island currently supports a significant percentage of all the herons and egrets nesting in the U.S. Great Lakes. The islands also support the largest colony of snowy egrets, the only little blue heron colony, and the largest colonies of great blue herons, great egrets, and black-crowned night-herons found within the Great Lakes. The entire population of the Lake Erie water snake is restricted to 8 Lake Erie islands. The snake's population declined through the 1990s resulting in the species being listed as federally threatened in 1999 and state endangered in 2000. Today, with enough protected habitat to sustain a viable population, abundant prey in the form of the round goby, and a significant reduction in direct mortality from people through intensive public outreach efforts, the snake population appears secure and growing throughout its range. In 2011 the snake was removed from the list of federally threatened species, and downlisted to state threatened in 2012.

The following species have been identified as Lake Erie Islands species of greatest conservation need (conservation status rank in parentheses):

Birds

Black-crowned Night Heron (10)	*Nycticorax nycticorax*
Great Egret (10)	*Casmerodius albus*
Snowy Egret (24)	*Egretta thula*
Cattle Egret (24)	*Bubulcus ibis*
Great Blue Heron (38)	*Ardea herodias*

Reptiles

Blanding's Turtle (22)	*Emydoidea blandingii*

Table 25. CONSERVATION THREATS TO LAKE ERIE ISLANDS HABITAT.
The following threats negatively impact or have the potential to negatively impact Lake Erie Islands habitat. Threat categories/classification from Salafsky et al. (2008), and threat impact rank calculations from Master et al. (2012).

ID	threats	2nd level threat classification(s)	threat impact rank
I	**residential and commercial development**		high
A	Habitat destruction, fragmentation, altered hydrology from tourism-related development	tourism & recreation areas	high
B	Habitat destruction, fragmentation, altered hydrology from residential development	housing & urban areas	high
C	The market value of undeveloped land on the Lake Erie Islands is exceptionally, high making land acquisition for protection purposes problematic	housing & urban areas tourism & recreation areas	high high
II	**agriculture and aquaculture**		medium
A	Loss of island habitat because of conversion to agriculture (primarily vinyards)	annual & perennial non-timber crops	high
III	**energy production and mining**		low
A	Mining (primarily quarrying) can directly damage and destroy island habitat, and indirectly have negative impacts by altering hydrology	mining & quarrying	medium
B	Wind turbines can negatively impact birds and bats that utilize island habitat	renewable energy	negligible

IV	**transportation and service corridors**		high
A	Roads and utilities can destroy and fragment island habitat, and alter hydrology	roads & railroads utility & service lines	high medium
V	**biological resource use**		low
A	Killing of Lake Erie watersnakes	hunting & collecting terrestrial animals	low
VI	**human intrusions and disturbance**		high
A	Incompatible recreational activities	recreational activities	high
B	Creation of recreational facilities can alter/destroy island habitat	recreational activities	high
VII	**natural system modifications**		low
A	Fluctuating water levels in Lake Erie and shoreline erosion can negatively impact island-dependent wildlife	other ecosystem modifications	low
B	The use of chemical controls for the control/eradication of the gypsy moth and mosquitoes is known to negatively impact non-target lepidopteran and amphibians	other ecosystem modifications	low
C	Habitat destruction, fragmentation, altered hydrology due to proximity to development	other ecosystem modifications	low
D	Our ability to manage island habitat is limited by available staff and funding	other ecosystem modifications	low
E	The amount of land in private/corporate ownership on the islands limits our ability to manage	other ecosystem modifications	low
F	Lack of island habitat inventory data, and a database to analyze that data limits our ability to manage	other ecosystem modifications	low
G	Lack of island associated species data limits our ability to manage for current threats and limits our ability to develop plans for impending issues like climate change	other ecosystem modifications	low
VIII	**invasive and other problematic species and genes**		high
A	Introduction and/or spread of invasive plants and animals	invasive non-native/alien species	high
B	Introduction and/or spread of nuisance plants and animals	problematic native species	medium
C	Introduction and spread of diseases (plants and animals)	invasive non-native/alien species problematic native species	high medium
D	Colonial waterbirds and other avian communities are impacted by vegetation changes and nest site competition resulting from roosting/nesting cormorants	problematic native species	medium
IX	**pollution**		low
A	Urban effluent	household sewage & urban wastewater industrial & military effluents garbage & solid waste air-borne pollutants	low low low negligible

B	Agriculture effluent	agricultural & forestry effluents	negligible
X	**geological events**		low
---	none	---	---
XI	**climate change and severe weather**		low
A	Climate change could effect plant species composition, which in turn could affect wildlife species	habitat shifting & alteration droughts temperature extremes storms & flooding	low negligible low low
B	Lake levels impacts on shoreline species due to climate change	habitat shifting & alteration storms & flooding	low low

Table 26. CONSERVATION ACTIONS FOR LAKE ERIE ISLANDS HABITAT.
The following actions will help abate or have the potential to help abate threats to Lake Erie Islands habitat. Action categories/classification from Salafsky et al. (2008), and action priority rank calculations from Georgia DNR (2005).

ID	actions	2nd level action classification(s)	action priority rank	threat(s) addressed*
I	**LAND/WATER PROTECTION**		med	
1	Protect island habitat through strategic acquisitions, easements, and partnerships	resource & habitat protection	med	I, II, III, IV, V, VI
2	Use State Wildlife Grant funds for potential acquisitions	resource & habitat protection	med	I, II, III, IV, V, VI
3	Establish permanent buffer areas around island habitats to ensure their long-term viability	resource & habitat protection	med	I, II, III, IV, VI
4	Conserve and connect island habitats through acquisition, conservation easements, land donations, and other innovative strategies together with conservation-minded NGO partners and federal, state, and local governments	resource & habitat protection	med	I, II, III, IV, VI
5	Develop new and build on existing relationships with Land Trusts purchasing lands and conservation easements	resource & habitat protection	med	I, II, III, IV, VI
6	Add 100 acres of protected lands on the Lake Erie islands through conservation easement or purchase by 2016	site/area protection	med	I, II, III, IV, VI, VII-C,E
7	Site new recreational facilities such as golf courses and ball fields on already disturbed land	resource & habitat protection	med	VI-B
II	**LAND/WATER MANAGEMENT**		med	
1	Prevent introduction and control the spread of harmful species through legislation, regulation, policy, management practices, education, and partnerships	invasive/ problematic species control	high	VIII

2	Implement strategies identified in the Wildlife Stewardship Tactical Plan to avoid, minimize or eliminate the adverse impacts of non-native and/or problematic species in island habitats	invasive/ problematic species control	high	VIII
3	Establish an early-detection rapid-response system for dealing with invasive and nuisance species	invasive/ problematic species control	high	VIII-A,B,C
4	Implement strategies identified in the Wildlife Stewardship Tactical Plan to avoid, minimize or eradicate diseases in wildlife associated with island habitats	invasive/ problematic species control	high	VIII-C
5	Identify, investigate, and conduct research on the causes of habitat loss or impairment and develop strategies to minimize further habitat loss	habitat & natural process restoration	med	I, II, III, IV, VI, VII-C
6	Develop a list and prioritize research needs associated with habitat loss or impairment	habitat & natural process restoration	med	I, II, III, IV, VI, VII-C
7	Identify and implement strategies to minimize the effects of residential development adjacent to existing protected/preserved habitats	habitat & natural process restoration	med	I, IV, VI, VII-C
8	Design and implement surveys to determine the status and distribution of wildlife species associated with island habitats - evaluate the success of habitat restoration, enhancement, and management measures being implemented	habitat & natural process restoration	med	VII-F,G
9	Continue to research habitat requirements for the suite of wildlife associated with Lake Erie Island habitats	habitat & natural process restoration	med	VII-F,G
10	Assemble and/or develop GIS-based data layers and associated tables of known island habitats, including publicly-owned or conservation-minded NGO managed lands, and make it available for public-land managers and conservation-minded NGOs	habitat & natural process restoration	med	VII-F
11	Develop a comprehensive baseline inventory of historic versus current distribution and abundance of island habitats	habitat & natural process restoration	med	VII-F
12	Identify, design, and conduct appropriate habitat-based projects to evaluate the quality, quantity, connectivity, and distribution of “undeveloped/natural” Lake Erie Island habitat	habitat & natural process restoration	med	VII-F
13	Develop a management plan for colonial waterbirds on the Lake Erie islands	habitat & natural process restoration	med	VIII-B,D
14	Determine the effectiveness of habitat manipulation on Lake Erie islands to enhance colonial waterbird habitat	habitat & natural process restoration	med	VIII-B,D
15	Collect and evaluate data from legitimate citizen scientist-based monitoring surveys such as the Ohio Breeding Bird Survey	habitat & natural process restoration	med	VII-D,G
16	Identify ecosystem or population-level threats through research, surveillance, monitoring, and inventory	habitat & natural process restoration	med	I, II, III, IV, V, VI, VII-G, VIII, IX, XI
17	Develop compatible recreational activities criteria that can be used to evaluate impacts to habitat/species from recreational activities	habitat & natural process restoration	med	VI

18	Identify, protect, restore, and enhance 100 acres of island habitats that will support viable populations of the wildlife species dependent upon these habitats on public and private lands by 2025	site/area management	low	I, II, III, IV, V, VI, VII-B,C, VIII, IX
III	**SPECIES MANAGEMENT**		med	
1	Develop species-specific conservation plans as needs are identified to clearly define the actions the Division will/or will not implement concerning the state-listed species	species management	high	VII-G
2	Identify, design, and conduct appropriate species-specific surveys, inventories, or monitoring projects to determine species distribution and abundance	species management	high	VII-G
3	Biannually meet with appropriate department personnel to ensure compliance with the Lake Erie Watersnake Management Plan for island properties owned or managed by ODNR	species management	high	V
4	Continue Lake Erie watersnake population surveys through 2016 as designed in the post-delisting monitoring protocol	species management	high	V
5	Continue to implement the cormorant management plan through 2020 and revise its content as needed	species management	high	VIII-D
6	Identify the causes for the decline of the black-crowned night heron populations and develop a recovery plan by 2020	species recovery	low	VII-G
7	Reintroduce and restore Lake Erie Island species where appropriate	species reintroduction	low	I, II, VII-C
8	By 2016, develop and implement recovery/conservation plans for the state-listed species dependent upon island habitats starting with the Blanding's turtle	species recovery	low	VII-G
IV	**EDUCATION AND AWARENESS**		high	
1	Promote the value of island habitat/species conservation by developing and distributing new publications, educational materials, website information, and digital presentations	awareness & communications	high	I, II, III, IV, V, VI, VII-C,E
2	Provide technical assistance to private landowners who wish to protect, restore and/or enhance island habitats	awareness & communications	high	VII-E
3	Provide guidance to landowners for eradication/control of invasive and nuisance species	awareness & communications	high	VII-E, VIII
4	Continue to provide technical assistance to Lake Erie island shoreline residents and businesses to ensure open rock cribs are used in the construction of new or refurbished docks	awareness & communications	high	VI-B, VII-C
5	Provide technical guidance on coastal development plans as relates to fish and wildlife interests	awareness & communications	high	I, IV, VI, VII-C
6	Provide technical assistance to public land managers and NGOs to ensure island habitats under their management continue to be protected, restored and/or enhanced	awareness & communications	high	VII-D,E
7	Maintain a corps of Division of Wildlife-trained partners and volunteers to assist, lead, and promote special programs	training	high	V, VI, VII-D

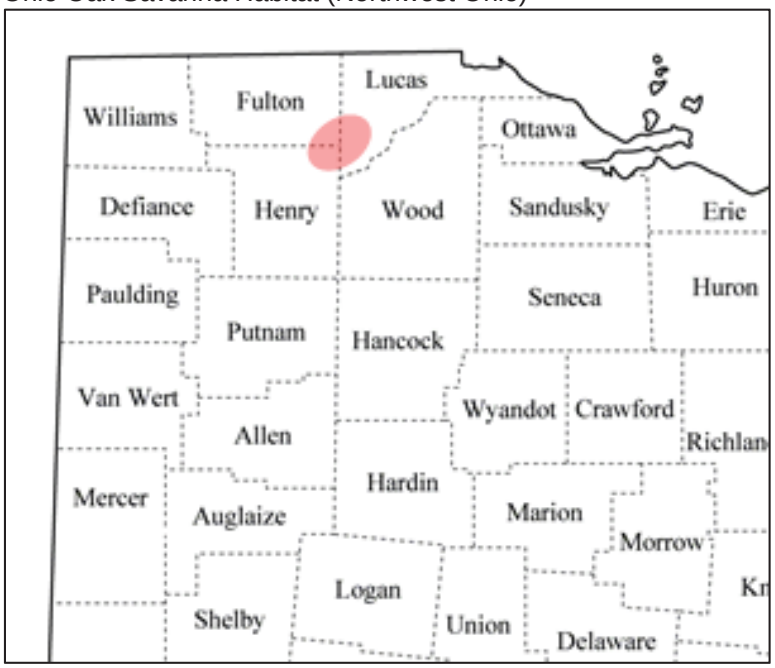
8	Utilize the Ohio Wildlife Legacy Stamp as a tool to illustrate the value of Ohioans in wildlife conservation and to convey the connection between wildlife, people, and habitat	awareness & communications	high	V, VI, VII-E
9	Educate the public about the negative effects of exotic and nuisance animals – encourage responsible disposal of unwanted animals	awareness & communications	high	VIII-A,B,C
V	**LAW AND POLICY**		med	
1	Balance the needs of fish and wildlife with the needs of people by mitigating incompatible ecosystem uses	policies & regulations	med	I, II, III, IV, V, VI
2	Participate in the policy-making process at Federal level to influence conservation programs	policies & regulations	med	I, II, III, IV
3	Encourage the preservation of habitat connectivity in all land use planning	policies & regulations private sector standards & codes	med high	I, IV
4	Create incentives (laws, policies) to prevent loss and/or minimize impacts to island habitats due to development	policies & regulations	med	I, II, IV
5	Support legislation promoting eco-friendly energy development and use	legislation policies & regulations	med med	III
6	Develop regulations to deter introduction of invasive/nuisance species	legislation policies & regulations	med med	VIII-A,B,C
7	Develop and implement a risk-assessment system in the approval process for importing or moving live animals and plants	legislation policies & regulations	med med	VIII-A,B,C
VI	**LIVELIHOOD, ECONOMIC AND OTHER INCENTIVES**		low	
1	Support incentives that encourage landowners to maintain/preserve existing island habitat on their properties	market forces conservation payments non-monetary values	low low low	I, VII-E

2	Support the creation of incentives for the protection and restoration of island habitat	linked enterprises & livelihood alternatives substitution market forces conservation payments non-monetary values	low low low low low	I, II, III, IV, VII-E
3	Support creation of incentives to incorporate wildlife habitat into recreational facilities such as parks and golf courses	market forces conservation payments non-monetary values	low low low	VI-B
4	Develop incentives for private landowners to eradicate/control invasive plant species	conservation payments non-monetary values	low low	VII-E, VIII-A,B,C
VII	**EXTERNAL CAPACITY BUILDING**		low	
1	Actively promote and engage in partnerships to conserve and enhance island habitats and the species dependent upon them	alliance & partnership development	low	I, II, V-A, VII-D
2	Support legitimate citizen scientist-based monitoring efforts of wildlife species and habitats	institutional & civil society development	low	VII-D
3	Develop new and strengthen existing partnerships with the Lake Erie Island Chapter of the Black Swamp Conservancy and Land Trust organizations working on the Lake Erie islands	alliance & partnership development	low	VII-D
4	Create a multiagency invasive species prevention and control group that would be responsible for all invasive species issues	alliance & partnership development	low	VIII
5	Through interagency coordination, work to assure that wildlife interests are taken into consideration in road, bridge, causeway, and utilities design, construction, and maintenance	alliance & partnership development	low	IV

*refers to the Lake Erie Islands Habitat Conservation Threats in Table 25

6.9 Oak Savanna Habitat

Ohio Oak Savanna Habitat (Northwest Ohio)



6.9.1 Status

The oak savanna was once one of the most common vegetation types in the Midwest. However, since the middle of the 19th century declines due primarily to settlement and loss of the normal fire regime have led this habitat to be listed as globally imperiled. Oak savannas are one of the rarest plant communities today. Most remaining oak savannas, including those in Ohio, are small and fragmented.

6.9.2 Description

Ohio's Oak Savannas lay a region in the northwestern portion of the state, along a sandy belt of soil known as the Oak Openings (Figure 19). This area is 22 miles long, 6 miles wide, and encompasses 130 to 140 square miles in parts of Henry, Fulton, and Lucas counties. These oak savannas are upland, dry areas dominated by drought-resistant prairie plants such as little bluestem, lupine, and widely-spaced oak trees with a park-like appearance. This community is often interspersed with areas of poor drainage that support wetlands.

In 1859, Lucas County Commissioners led the effort to develop an extensive network of drainage ditches throughout the county to drain the wet prairies and make the land available to agriculture. The water table was lowered and the oak savannas and wet prairies were converted to pastures and farms. Draining the wet areas of the Oak Openings enabled farms and homes to exist in areas that were formerly wetlands. Over the years, numerous farms in the area were abandoned for the more fertile soils found in the nearby Black Swamp region. During the 1930s, farmed-out areas were planted in pines to keep sand from blowing across roads and against houses.

The Oak Openings Region Green Ribbon Initiative consists of a number of local partners intent on conserving habitat by creating a biological/recreational corridor of preserved lands. This initiative has identified 6,000 acres of high-quality green space running through the area. Within this green space, approximately 1,000 acres of oak savanna habitat is actively maintained by the ODNR and The Nature Conservancy. Remnant oak savannas, wet prairies, and sand dunes are also scattered throughout an

additional 8,300 acres owned by the Division of Forestry and the Toledo Metroparks. Remnant oak savanna plant communities still exist on many residential properties throughout the region.

Periodic fires which once sustained the oak savanna plant community by retarding succession, now only occur in intensively managed areas. Invasive plant species also change the composition and structure of the plant community, making restoration more difficult. In addition, the use of chemical controls (e.g., demilin, and Bt) for the eradication of the gypsy moth is known to impact non-target lepidopteran species. This could be very problematic for lepidopterans with distributions limited to the Oak Openings.

It is difficult to quantify the minimum habitat necessary to sustain viable populations of the oak savanna wildlife. Efforts should be made to enhance, restore, and connect fragmented oak savanna habitat in the largest block of protected lands possible. Habitat should be maintained in a mosaic of open prairie grass areas with native lupines and nectaring plants (95%) interspersed with widely scattered oaks (3%) and small wetlands (2%).

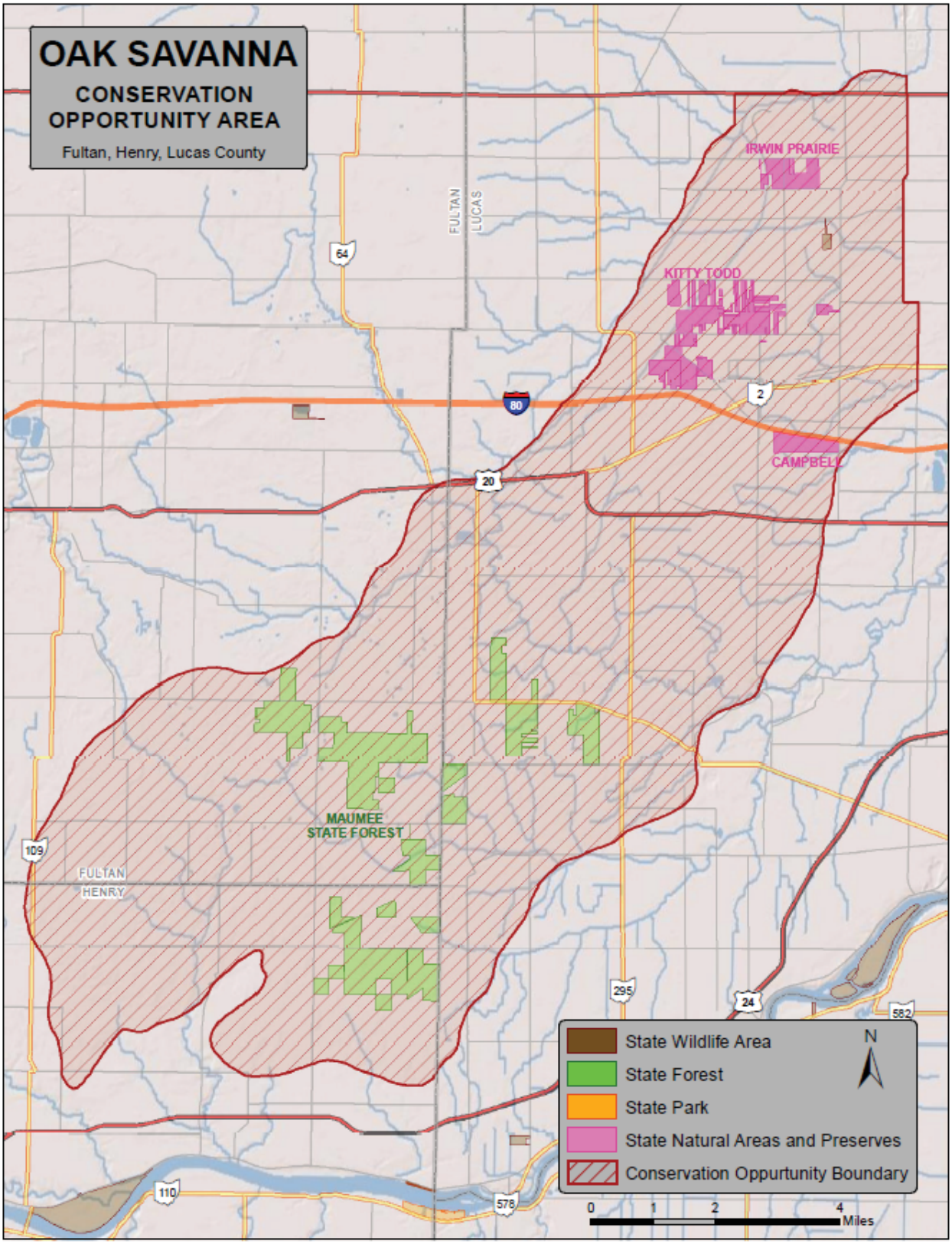


Figure 19. Oak Savanna Conservation Opportunity Area.

6.9.3 Associated Species of Greatest Conservation Need

Oak savannas provide a variety of habitats for many species of wildlife. Oak trees provide habitat as well as food for birds, rodents, deer, turkey, and a host other species. The diversity of ground vegetation (grasses, forbs) also supports numerous wildlife species that utilize this habitat for food and cover.

A self-sustaining population of the Karner blue butterfly has been successfully reintroduced in this habitat in the Oak Openings region. Efforts continue to expand the Karner's distribution to suitable habitat within its historic range. Habitat specificity for the Eastern Persius dusky wing butterfly and the frosted elfin butterfly is being researched. The distribution and abundance of the blue-spotted salamander also need to be determined so that sound management practices can be implemented to conserve a viable population within the Oak Savanna area.

The following species have been identified as Oak Savanna species of greatest conservation need (conservation status rank in parentheses):

<u>Amphibians</u>
Blue-spotted Salamander (19) *Ambystoma laterale*

<u>Birds</u>
Lark Sparrow (38) *Chondestes grammacus*

<u>Terrestrial Invertebrates</u>
Persius Dusky Wing Butterfly (2) *Erynnis persius*
Dusted Skipper (17) *Atryonopsis hianna*
Frosted Elfin Butterfly (18) *Incisalia irus*
Edward's Hairstreak (33) *Satyrium edwardsii*
Indian Skipper (41) *Hesperia sassacus*
Karner Blue (n/r) *Lycaeides melissa samuelis*

<u>Mammals</u>
Thirteen-lined Ground Squirrel (16) *Spermophilus tridecemlineatus*
Badger (16) *Taxidea laxus*

<u>Reptiles</u>
Eastern Hognose Snake (6) *Heterodon platirhinos*

Table 27. CONSERVATION THREATS TO OAK SAVANNA HABITAT.
The following threats negatively impact or have the potential to negatively impact Oak Savanna habitat. Threat categories/classification from Salafsky et al. (2008), and threat impact rank calculations from Master et al. (2012).

ID	threats	2nd level threat classification(s)	threat impact rank
I	**residential and commercial development**		high
A	Habitat destruction, fragmentation, altered hydrology from commercial development	commercial & industrial areas	high
B	Habitat destruction, fragmentation, altered hydrology from urban/suburban development	housing & urban areas	high
C	The market value of undeveloped land in the Oak Openings Region is exceptionally high, making land acquisition for protection purposes problematic	commercial & industrial areas housing & urban areas	high high

II	**agriculture and aquaculture**		low
A	Loss of Oak Savanna habitat because of conversion to agriculture	annual & perennial non-timber crops wood & pulp plantations livestock farming & ranching	low medium low
B	Loss of oak savanna habitat due to increase in intensity of agricultural practices – conversion of imbedded oak savanna habitat	annual & perennial non-timber crops	low
III	**energy production and mining**		low
A	Mining, oil and gas extraction - can directly damage and destroy habitat, and indirectly have negative impacts by altering hydrology and causing chemical contamination	oil & gas drilling mining & quarrying	low medium
B	Wind turbines can negatively impact birds and bats that utilize Oak Savanna habitat	renewable energy	low
IV	**transportation and service corridors**		low
A	Roads and utilities can destroy and fragment Oak Savanna habitat, and alter hydrology	roads & railroads utility & service lines	medium low
V	**biological resource use**		low
---	none	---	---
VI	**human intrusions and disturbance**		low
A	Incompatible recreational activities	recreational activities	medium
B	Creation of recreational facilities can alter/destroy island habitat	recreational activities	medium
VII	**natural system modifications**		low
A	Periodic fires which once sustained the oak savanna plant community by retarding succession only occur in intensively managed areas	fire & fire supression	medium
B	The use of chemical controls for the control/eradication of the gypsy moth and mosquitoes is known to negatively impact non-target lepidopteran and amphibians	other ecosystem modifications	low
C	Habitat destruction, fragmentation, altered hydrology due to proximity to development	other ecosystem modifications	low
D	Our ability to manage Oak Savanna habitat is limited by available staff and funding	other ecosystem modifications	low
E	While remnant oak savanna plant communities still exist on many residential properties, larger, intact oak savanna habitat is limited and few areas are connected leaving isolated oak savanna habitat scattered throughout the region	other ecosystem modifications	low
F	Less than 2% of the complex of dunes and swales that supported the sedge meadows, tallgrass prairies, barrens, and oak savannas remain	other ecosystem modifications	low
G	Lack of oak savanna inventory data, and a database system to analyze that datalimits our ability to manage	other ecosystem modifications	low
H	Lack of oak savanna associated species data limits our ability to manage for current threats and limits our ability to develop plans for impending issues like climate change	other ecosystem modifications	low

VIII	**invasive and other problematic species and genes**		medium
A	Introduction and/or spread of invasive plants and animals	invasive non-native/alien species	high
B	Introduction and/or spread of nuisance plants and animals	problematic native species	low
C	Introduction and spread of diseases (plants and animals)	invasive non-native/alien species problematic native species	high low
IX	**pollution**		low
A	Urban effluent	household sewage & urban wastewater industrial & military effluents garbage & solid waste air-borne pollutants	low low low negligible
B	Agriculture effluent	agricultural & forestry effluents	low
X	**geological events**		negligible
---	none	---	---
XI	**climate change and severe weather**		medium
A	Climate change could effect plant species composition, which in turn could affect wildlife species	habitat shifting & alteration droughts temperature extremes storms & flooding	medium high medium low

Table 28. CONSERVATION ACTIONS FOR OAK SAVANNA HABITAT.
The following actions will help abate or have the potential to help abate threats to Oak Savanna habitat. Action categories/classification from Salafsky et al. (2008), and action priority rank calculations from Georgia DNR (2005).

ID	actions	2nd level action classification(s)	action priority rank	threat(s) addressed*
I	**LAND/WATER PROTECTION**		med	
1	Add 250 acres of protected lands within the Oak Openings region through purchase or conservation easement by 2020	site/area protection	high	I, II, III, IV, VI-C,E
2	Protect oak savanna habitat through strategic acquisitions, easements, and partnerships – with special emphasis on the Oak Openings region	resource & habitat protection	low	I, II, III, IV, V, VI
3	Use State Wildlife Grant funds for potential acquisitions	resource & habitat protection	low	I, II, III, IV, V, VI

4	Establish permanent buffer areas around oak savanna habitats to ensure their long-term viability	resource & habitat protection	low	I, II, III, IV, VI
5	Conserve and connect oak savanna habitats through acquisition, conservation easements, land donations, and other innovative strategies together with conservation-minded NGO partners and federal, state, and local governments	resource & habitat protection	low	I, II, III, IV, VI
6	Develop new and build on existing relationships with Land Trusts purchasing lands and conservation easements	resource & habitat protection	low	I, II, III, IV, VI
7	Site new recreational facilities such as golf courses and ball fields on already disturbed land	resource & habitat protection	low	VI-B
II	**LAND/WATER MANAGEMENT**		med	
1	Identify, investigate, and conduct research on the causes of habitat loss or impairment and develop strategies to minimize further habitat loss	habitat & natural process restoration	med	I, II, III, IV, VI, VII-C
2	Develop a list and prioritize research needs associated with habitat loss or impairment	habitat & natural process restoration	med	I, II, III, IV, VI, VII-C
3	Design and implement surveys to determine the status and distribution of wildlife species associated with oak savanna habitats - evaluate the success of habitat restoration, enhancement, and management measures being implemented	habitat & natural process restoration	med	VII-G,H
4	Continue to research habitat requirements for the suite of wildlife associated with oak savanna habitats	habitat & natural process restoration	med	VII-G,H
5	Conduct research on the elements and complexity of the symbiotic relationship among wildlife species associated with oak savannas	habitat & natural process restoration	med	VII-H
6	Assemble and/or develop GIS-based data layers and associated tables of oak savanna habitats, including publicly-owned or conservation-minded NGO managed lands, and make it available for public-land managers and conservation-minded NGOs	habitat & natural process restoration	med	VII-G
7	Develop a comprehensive baseline inventory of historic versus current distribution and abundance of oak savanna habitats	habitat & natural process restoration	med	VII-G
8	Identify, design, and conduct appropriate habitat-based projects to evaluate the quality, quantity, connectivity, and distribution of “undeveloped/natural” oak savanna habitat	habitat & natural process restoration	med	VII-G
9	Collect and evaluate data from legitimate citizen scientist-based monitoring surveys, such as the Ohio Lepidopterist Society’s Long-term Butterfly Monitoring Program, the Breeding Bird Survey, and the Frog and Toad Call Survey, through 2020	habitat & natural process restoration	med	VII-D,H
10	Prevent introduction and control the spread of harmful species through legislation, regulation, policy, management practices, education, and partnerships	invasive/ problematic species control	med	VIII

11	Implement strategies identified in the Wildlife Stewardship Tactical Plan to avoid, minimize or eliminate the adverse impacts of non-native and/or problematic species in oak savanna habitats	invasive/ problematic species control	med	VIII
12	Establish an early-detection rapid-response system for dealing with invasive and nuisance species	invasive/ problematic species control	med	VIII
13	Implement strategies identified in the Wildlife Stewardship Tactical Plan to avoid, minimize or eradicate diseases in wildlife associated with island habitats	invasive/ problematic species control	med	VIII-C
14	Identify ecosystem or population-level threats through research, surveillance, monitoring, and inventory	habitat & natural process restoration	med	I, II, III, IV, V, VI, VII-H, VIII, IX, XI
15	Develop compatible recreational activities criteria that can be used to evaluate impacts to habitat/species from recreational activities	habitat & natural process restoration	med	VI
16	Identify, protect, restore, and enhance 100 acres of oak savanna habitat that will support viable populations of the wildlife species dependent upon this habitat on public and private lands by 2020	site/area management	low	I, II, III, IV, V, VI, VII-B,C, VIII, IX
17	Identify and implement strategies to minimize the effects of residential development adjacent to existing protected/preserved unique habitats by 2020 beginning in the Oak Openings region	site/area management	low	I, IV, VI, VII-C
18	Identify and prioritize corridors to connect fragmented parcels of unique habitat to allow for wildlife movement between areas beginning in the Oak Savanna Conservation Opportunity Area	site/area management	low	I, II, VII-E,G
19	Contact local government agencies within the Oak Openings Region to encourage them to stop spraying insecticides that adversely impact the lepidopteran and amphibians associated with oak savanna habitat	site/area management	low	VII-B
III	**SPECIES MANAGEMENT**		med	
1	Reintroduce and restore oak savanna species where appropriate	species reintroduction	med	I, II, VII-C
2	Develop species-specific conservation plans as needs are identified to clearly define the actions the Division will/or will not implement concerning the state-listed species	species management	med	VII-H
3	By 2016, develop and implement recovery/conservation plans for the state-listed species dependent upon oak savanna habitats starting with the blue-spotted salamander and endangered butterflies	species recovery	med	VII-H
4	Continue reintroduction and monitoring efforts for the Karner blue butterfly until viable, self-sustaining populations have been restored or through 2020	species reintroduction	med	VII-H
5	Identify, design, and conduct appropriate species-specific surveys, inventories, or monitoring projects to determine species distribution and abundance	species management	med	VII-G,H
6	Develop a feral hog management plan designed to minimize introductions and control expansion	species management	med	VIII-B

IV	**EDUCATION AND AWARENESS**		low	
1	Promote the value of oak savanna habitat/species conservation by developing and distributing new publications, educational materials, website information, and digital presentations	awareness & communications	low	I, II, III, IV, V, VI, VII-C
2	Provide technical assistance to private landowners who wish to protect, restore and/or enhance oak savanna habitats	awareness & communications	low	VII-E
3	Provide guidance to landowners for eradication/control of invasive and nuisance species	awareness & communications	low	VII-E, VIII
4	Provide technical assistance to public land managers and NGOs to ensure island habitats under their management continue to be protected, restored and/or enhanced	awareness & communications	low	VII-D,E
5	Continue to educate and inform the public and other agency personnel on the importance and necessity for prescribed burning as a safe and effective tool for oak savanna habitat management	awareness & communications	low	VII-A,E
6	Provide technical assistance to public and private landowners concerning the use of prescribed burning as a safe and effective management tool	awareness & communications	low	VII-A,E
7	Support efforts to identify, develop, and distribute appropriate informational and educational materials concerning the value of prescribed burning as a safe and effective tool for oak savanna habitat management to local residents, grassroots conservation groups, and local government agencies	awareness & communications	low	VII-A,D,E
8	Maintain a corps of Division of Wildlife-trained partners and volunteers to assist, lead, and promote special programs	training	low	V, VI, VII-D
9	Utilize the Ohio Wildlife Legacy Stamp as a tool to illustrate the value of Ohioans in wildlife conservation and to convey the connection between wildlife, people, and habitat	awareness & communications	low	V, VI, VII-E
10	Educate the public about the negative effects of exotic and nuisance animals – encourage responsible disposal of unwanted animals	awareness & communications	low	VIII
V	**LAW AND POLICY**		low	
1	Balance the needs of fish and wildlife with the needs of people by mitigating incompatible ecosystem uses	policies & regulations	low	I, II, III, IV, V, VI
2	Participate in the policy-making process at Federal level to influence conservation programs	policies & regulations	low	VII-E,F
3	Encourage the preservation of habitat connectivity in all land use planning	policies & regulations private sector standards & codes	low med	I, IV
4	Create incentives (laws, policies) to prevent loss and/or minimize impacts to oak savanna habitat due to development	policies & regulations	low	I, II, IV
5	Support legislation promoting eco-friendly energy development and use	legislation policies & regulations	low low	III

6	Develop regulations to deter introduction of invasive/nuisance species	legislation policies & regulations	low low	VIII
7	Develop and implement a risk-assessment system in the approval process for importing or moving live animals and plants	legislation policies & regulations	low low	VIII
VI	**LIVELIHOOD, ECONOMIC AND OTHER INCENTIVES**		low	
1	Support incentives that encourage landowners to maintain/preserve existing oak savanna habitat on their properties	market forces conservation payments non-monetary values	low low low	I, VII-E
2	Support the creation of incentives for the protection and restoration of oak savanna habitat	linked enterprises & livelihood alternatives substitution market forces conservation payments non-monetary values	low low low low low	I, II, III, IV, VII-E
3	Support creation of incentives to incorporate wildlife habitat into recreational facilities such as parks and golf courses	market forces conservation payments non-monetary values	low low low	VI-B
4	Develop incentives for private landowners to eradicate/control invasive plant species	conservation payments non-monetary values	low low	VII-E, VIII
5	Engage in research to understand social and economic influences on landowner decisions to participate in habitat programs, and use information to influence where and how programs are marketed	conservation payments non-monetary values	low low	VII-E
VII	**EXTERNAL CAPACITY BUILDING**		med	
1	Actively promote and engage in partnerships to conserve and enhance oak savanna habitats and the species dependent upon them	alliance & partnership development	med	I, II, VII-D
2	Support legitimate citizen scientist-based monitoring efforts of wildlife species and habitats	institutional & civil society development	med	VII-D,G,H

3	Develop new and strengthen existing partnerships with Land Trust organizations working in the Oak Openings region	alliance & partnership development	med	VII-D
4	Create a multiagency invasive species prevention and control group that would be responsible for all invasive species issues	alliance & partnership development	med	VIII
5	Support partner organizations utilizing prescribed burning and other techniques to restore and enhance oak savannas	alliance & partnership development	med	VII-A,D
6	Become an active participant in the Green Ribbon Initiative in the Oak Openings region	alliance & partnership development	med	VII-D
7	Through interagency coordination, work to assure that wildlife interests are taken into consideration in road, bridge, causeway, and utilities design, construction, and maintenance	alliance & partnership development	med	IV
8	Beginning in the Toledo area, identify local planners and initiate dialogue promoting the value of oak savanna habitat conservation in local planning and zoning decisions	alliance & partnership development	med	I, II, III, IV

*refers to the Oak Savanna Habitat Conservation Threats in Table 27

6.10 Boreal Community Habitat

Ohio Boreal Community Habitat

6.10.1 Status

The extensive boreal forest which extends from Alaska through Canada and into the northeast United States was never a dominant habitat type in Ohio. What boreal community did occur in Ohio was restricted to the northeast part of the state. Extensive logging that occurred from the time of settlement through the early part of the 20th century reduced the amount of boreal habitat in Ohio. Boreal habitat

remaining today faces additional threats from the population density and accompanying development in this part of the state.

6.10.2 Description

Boreal communities are peatlands (e.g., hemlock-hardwood swamps and other boggy swamps, bogs, and fens) generally thought of as areas which occur in northern regions of the United States and Canada. However, both boreal flora and fauna occur in the snowbelt region of extreme Northeastern Ohio. The Boreal Community Area (Figure 20) includes portions of Ashtabula County, the eastern 1/3 of Geauga County, and the northern 1/3 of Trumbull County where the average annual snowfall exceeds 60 inches.

Boreal communities once covered thousands of acres in the snowbelt region, but since European settlement, these lands have been drained or flooded. Many existing boreal communities are degraded by human impacts and invasive species. Hemlock swamps are very rare in Ohio, occurring only in the snowbelt region. Bogs and fens are not limited to this region, however numerous boreal species only occur or have been reported to occur in this region's bogs and fens. Some of the region's best examples of boreal communities (e.g., the Pymatuning Bog in Eastern Andover Township, Ashtabula County) existed into the 1930s but were drained and burned for conversion to agricultural fields, pastures, and other land uses. Based on field surveys conducted through 2009, roughly a few dozen examples of boreal communities still exist in the region. These remaining boreal communities are threatened by an increasing abundance of invasive species and incompatible land uses.

Approximately 43% of the state's human population resides in northeastern Ohio. Losses of boreal habitat can be attributed primarily to agriculture, but also to recreation, water level changes, mining, and development. Many boreal areas have been destroyed, fragmented, and isolated as a result of commercial, industrial, and residential development. As a result of wetland regulations, active non-profit conservation organizations, and state agencies – a number of boreal communities have been protected, and opportunities exist to conserve additional areas. All remaining quality boreal communities should be protected and managed for the wildlife dependent upon them.

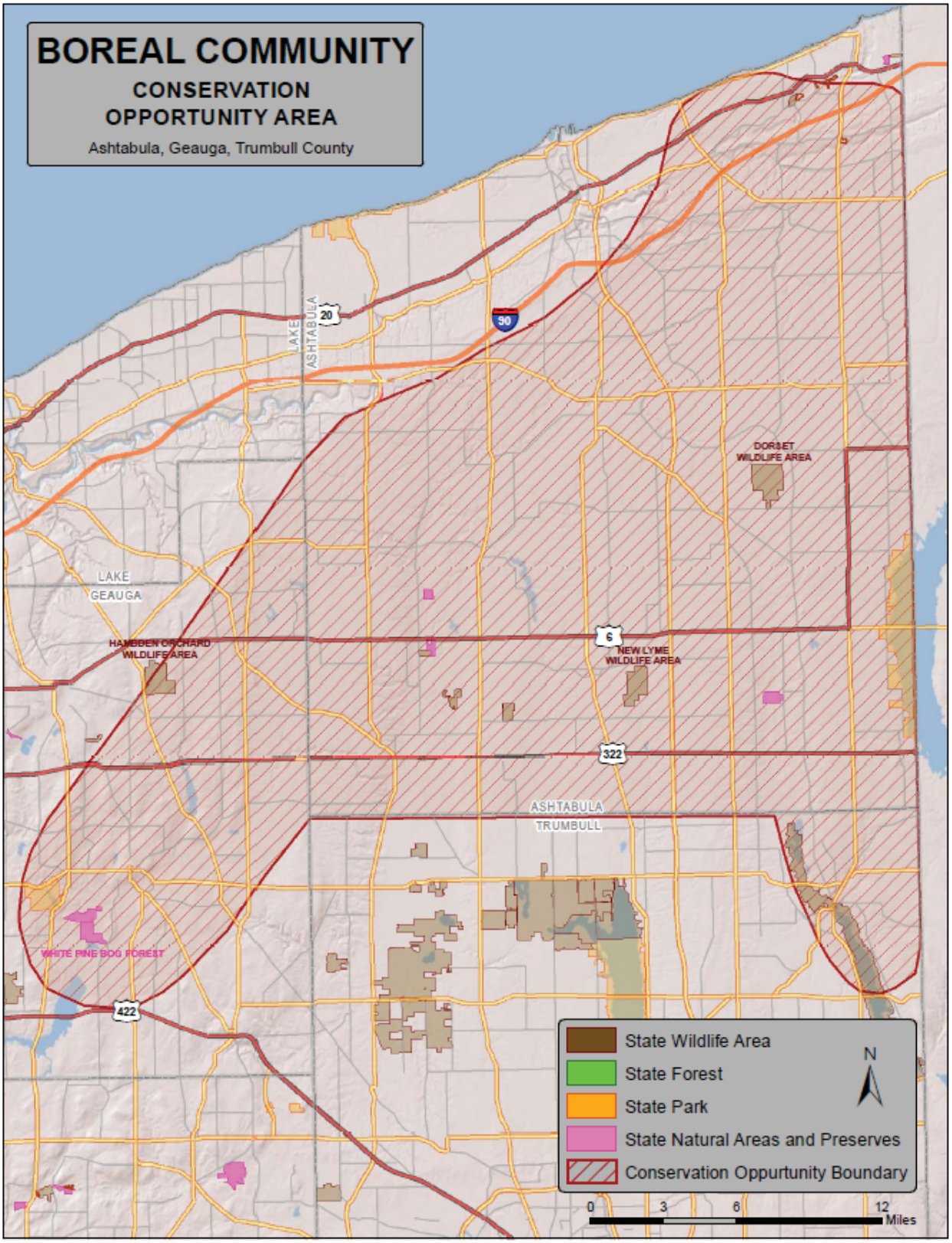


Figure 20. Boreal Community Conservation Opportunity Area.

6.10.3 Associated Species of Greatest Conservation Need

Four boreal-dependent wildlife species have been extirpated (fisher, lynx, porcupine, and snowshoe hare). The fisher and lynx probably were never common in Ohio and it is not likely that restoration efforts for either of these species would be successful. The porcupine, which was extirpated by 1900, was once common in extreme northeastern and northwestern Ohio. Since 2005, public observations of porcupines have increased in northeastern and eastern Ohio. A survey to determine the status of porcupines in the state would be appropriate. Snowshoe hares were extirpated from Ohio by 1940 but have been reintroduced starting in 2000 in eastern Geauga County. Repatriation of the snowshoe hare began in January 2000. This species is capable of breeding within a very limited range in Ohio, which is at the southern fringe of a large contiguous range with an abundant population. During 2000-2007, more than 740 hares were translocated from Michigan and Maine to northeastern Geauga and southwestern Ashtabula counties. This was a collaborative effort with the OSU School of Natural Resources. Data collected via annual track-count transects (2000-2013) suggested that repatriation efforts were unsuccessful. We presume that many of the more suitable forest tracts have matured beyond the ideal successional stage for hare populations in Ohio. The Ohio Division of Wildlife has no current plans to revive translocation efforts and habitat conditions in Ohio are such that feasible management actions are unlikely to result in significant population increases. Designated as state-listed Species of Concern, little is known about the current distribution and abundance of the ermine, southern red-backed vole, and woodland jumping mouse. Surveys need to be initiated to assess their status and distribution.

The following species have been identified as Boreal Community species of greatest conservation need (conservation status rank in parentheses):

<u>Amphibians</u>
Four-toed Salamander (11) *Hemidactylium scutatum*

<u>Mammals</u>
Southern Red-backed Vole (13) *Myodes gapperi*
Ermine (16) *Mustela ermine*
Woodland Jumping Mouse (22) *Napaeozapus insignis*

<u>Reptiles</u>
Spotted Turtle (4) *Clemmys guttata*

<u>Terrestrial Invertebrates</u>
Mitchell's Satyr (1) *Neonympha mitchellii*

Table 29. CONSERVATION THREATS TO BOREAL COMMUNITY HABITAT.
The following threats negatively impact or have the potential to negatively impact Boreal Community habitat. Threat categories/classification from Salafsky et al. (2008), and threat impact rank calculations from Master et al. (2012).

ID	threats	2nd level threat classification(s)	threat impact rank
I	**residential and commercial development**		medium
A	Habitat destruction, fragmentation, altered hydrology from commercial development	commercial & industrial areas	low
B	Habitat destruction, fragmentation, altered hydrology from urban/suburban development	housing & urban areas	high
C	The market value of undeveloped land in the Boreal Community region is exceptionally high, making land acquisition for protection purposes problematic	commercial & industrial areas housing & urban areas	low high
II	**agriculture and aquaculture**		low
A	Loss of Boreal habitat because of conversion to	annual & perennial	low

	agriculture	non-timber crops	
		wood & pulp plantations	low
		livestock farming & ranching	low

B	Loss of Boreal habitat due to increase in intensity of agricultural practices – conversion of imbedded boreal habitat	annual & perennial non-timber crops	low
III	**energy production and mining**		low
A	Mining, oil and gas extraction - can directly damage and destroy habitat, and indirectly have negative impacts by altering hydrology and causing chemical contamination	oil & gas drilling mining & quarrying	medium low
IV	**transportation and service corridors**		medium
A	Roads and utilities can destroy and fragment Boreal habitat, and alter hydrology	roads & railroads utility & service lines	medium medium
V	**biological resource use**		low
A	Logging and timber harvest can destroy/damage habitat	logging & wood harvesting	low
VI	**human intrusions and disturbance**		low
A	Incompatible recreational activities	recreational activities	low
B	Creation of recreational facilities can alter/destroy island habitat	recreational activities	low
VII	**natural system modifications**		low
A	The use of chemical controls for the control/eradication of the gypsy moth and mosquitoes is known to negatively impact non-target lepidopteran and amphibians	other ecosystem modifications	low
B	Habitat destruction, fragmentation, altered hydrology due to proximity to development	other ecosystem modifications	low
C	Our ability to manage boreal habitat is limited by available staff and funding	other ecosystem modifications	low
D	Lack of boreal habitat inventory data, and a database system to analyze that data limits our ability to manage	other ecosystem modifications	low
E	Lack of boreal habitat associated species data limits our ability to manage for current threats and limits our ability to develop plans for impending issues like climate change	other ecosystem modifications	low
VIII	**invasive and other problematic species and genes**		high
A	Introduction and/or spread of invasive plants and animals	invasive non-native/alien species	very high
B	Introduction and/or spread of nuisance plants and animals	problematic native species	high
C	Introduction and spread of diseases (plants and animals)	invasive non-native/alien species problematic native species	very high high

IX	**pollution**		low
A	Urban effluent	household sewage & urban wastewater industrial & military effluents garbage & solid waste air-borne pollutants	low low low medium
B	Agriculture effluent	agricultural & forestry effluents	low
X	**geological events**		low
---	none	---	---
XI	**climate change and severe weather**		medium
A	Climate change could effect plant species composition, which in turn could affect wildlife species	habitat shifting & alteration droughts temperature extremes storms & flooding	high low low low

Table 30. CONSERVATION ACTIONS FOR BOREAL COMMUNITY HABITAT.
The following actions will help abate or have the potential to help abate threats to Boreal Community habitat. Action categories/classification from Salafsky et al. (2008), and action priority rank calculations from Georgia DNR (2005).

ID	actions	2nd level action classification(s)	action priority rank	threat(s) addressed*
I	**LAND/WATER PROTECTION**		high	
1	Protect boreal community habitat through strategic acquisitions, easements, and partnerships	resource & habitat protection	high	I, II, III, IV, V, VI
2	Use State Wildlife Grant funds for potential acquisitions	resource & habitat protection	high	I, II, III, IV, V, VI
3	Establish permanent buffer areas around boreal community habitats to ensure their long-term viability	resource & habitat protection	high	I, II, III, IV, VI
4	Conserve and connect boreal habitats through acquisition, conservation easements, land donations, and other innovative strategies together with conservation-minded NGO partners and federal, state, and local governments	resource & habitat protection	high	I, II, III, IV, VI
5	Develop new and build on existing relationships with Land Trusts purchasing lands and conservation easements	resource & habitat protection	high	I, II, III, IV, VI
6	Add 100 acres of protected lands within the boreal community region through purchase or conservation easement by 2025	site/area protection	high	I, II, III, IV, VI, VII-B

7	Site new recreational facilities such as golf courses and ball fields on already disturbed land	resource & habitat protection	high	VI-B
II	**LAND/WATER MANAGEMENT**		high	
1	Identify, investigate, and conduct research on the causes of habitat loss or impairment and develop strategies to minimize further habitat loss	habitat & natural process restoration	high	I, II, III, IV, VI, VII-B
2	Develop a list and prioritize research needs associated with habitat loss or impairment	habitat & natural process restoration	high	I, II, III, IV, VI, VII-B
3	Identify and implement strategies to minimize the effects of residential development adjacent to existing protected/preserved unique habitats	habitat & natural process restoration	high	I, IV, VI, VII-B
4	Design and implement surveys to determine the status and distribution of wildlife species associated with boreal community habitats - evaluate the success of habitat restoration, enhancement, and management measures being implemented	habitat & natural process restoration	high	VII-D,E
5	Continue to research habitat requirements for the suite of wildlife associated with boreal habitats	habitat & natural process restoration	high	VII-D,E
6	Conduct research on the distribution and abundance of wildlife species associated with boreal communities	habitat & natural process restoration	high	VII-D,E
7	Assemble and/or develop GIS-based data layers and associated tables of boreal community habitats, including publicly-owned or conservation-minded NGO managed lands, and make it available for public-land managers and conservation-minded NGOs	habitat & natural process restoration	high	VII-D
8	Develop a comprehensive baseline inventory of historic versus current distribution and abundance of boreal community habitats	habitat & natural process restoration	high	VII-D
9	Identify, design, and conduct appropriate habitat-based projects to evaluate the quality, quantity, connectivity, and distribution of “undeveloped/natural” boreal community habitat	habitat & natural process restoration	high	VII-D
10	Identify and prioritize corridors to connect fragmented parcels of boreal habitat to allow for wildlife movement between areas	habitat & natural process restoration	high	I, II, VII-B,D
11	Collect and evaluate data from legitimate citizen scientist-based monitoring surveys such as the Ohio Breeding Bird Survey	habitat & natural process restoration	high	VII-C,D,E
12	Prevent introduction and control the spread of harmful species through legislation, regulation, policy, management practices, education, and partnerships	invasive/ problematic species control	high	VIII
13	Implement strategies identified in the Wildlife Stewardship Tactical Plan to avoid, minimize or eliminate the adverse impacts of non-native and/or problematic species in boreal community habitats	invasive/ problematic species control	high	VIII
14	Establish an early-detection rapid-response system for dealing with invasive and nuisance species	invasive/ problematic species control	high	VIII

15	Implement strategies identified in the Wildlife Stewardship Tactical Plan to avoid, minimize or eradicate diseases in wildlife associated with boreal community habitats	invasive/ problematic species control	high	VIII-C
16	Identify ecosystem or population-level threats through research, surveillance, monitoring, and inventory	habitat & natural process restoration	high	I, II, III, IV, V, VI, VII-E, VIII, IX, XI
17	Develop compatible recreational activities criteria that can be used to evaluate impacts to habitat/species from recreational activities	habitat & natural process restoration	high	VI
18	Identify, protect, restore, and enhance 100 acres of boreal habitat that will support viable populations of the wildlife species dependent upon this habitat on public and private lands by 2016	site/area management	med	I, II, III, IV, VI, VII-A,B, VIII, IX
III	**SPECIES MANAGEMENT**		high	
1	Develop species-specific conservation plans as needs are identified to clearly define the actions the Division will/or will not implement concerning the state-listed species	species management	high	VII-E
2	Initiate surveys to determine the current distribution and abundance of the ermine, southern red-backed vole, and woodland jumping mouse	species management	high	VII-E
3	Identify, design, and conduct appropriate species-specific surveys, inventories, or monitoring projects to determine species distribution and abundance	species management	high	VII-E
4	Develop a feral hog management plan designed to minimize introductions and control expansion	species management	high	VIII-B
5	Reintroduce and restore boreal community species where appropriate	species reintroduction	low	I, II, VII-C
6	Continue reintroduction and monitoring efforts for the snowshoe hare until viable, self-sustaining populations have been restored or through 2020	species reintroduction	low	VII-E
IV	**EDUCATION AND AWARENESS**		med	
1	Maintain a corps of Division of Wildlife-trained partners and volunteers to assist, lead, and promote special programs	training	med	VII-B
2	Promote the value of oak savanna habitat/species conservation by developing and distributing new publications, educational materials, website information, and digital presentations	awareness & communications	low	I, II, III, IV, V, VI, VII-B
3	Provide technical assistance to private landowners who wish to protect, restore and/or enhance boreal habitats	awareness & communications	low	I, II
4	Provide guidance to landowners for eradication/control of invasive and nuisance species	awareness & communications	low	VIII
5	Provide technical assistance to public land managers and NGOs to ensure boreal habitats under their management continue to be protected, restored and/or enhanced	awareness & communications	low	VII-B
6	Utilize the Ohio Wildlife Legacy Stamp as a tool to illustrate the value of Ohioans in wildlife conservation and to convey the connection between wildlife, people, and habitat	awareness & communications	low	VI, VII-B

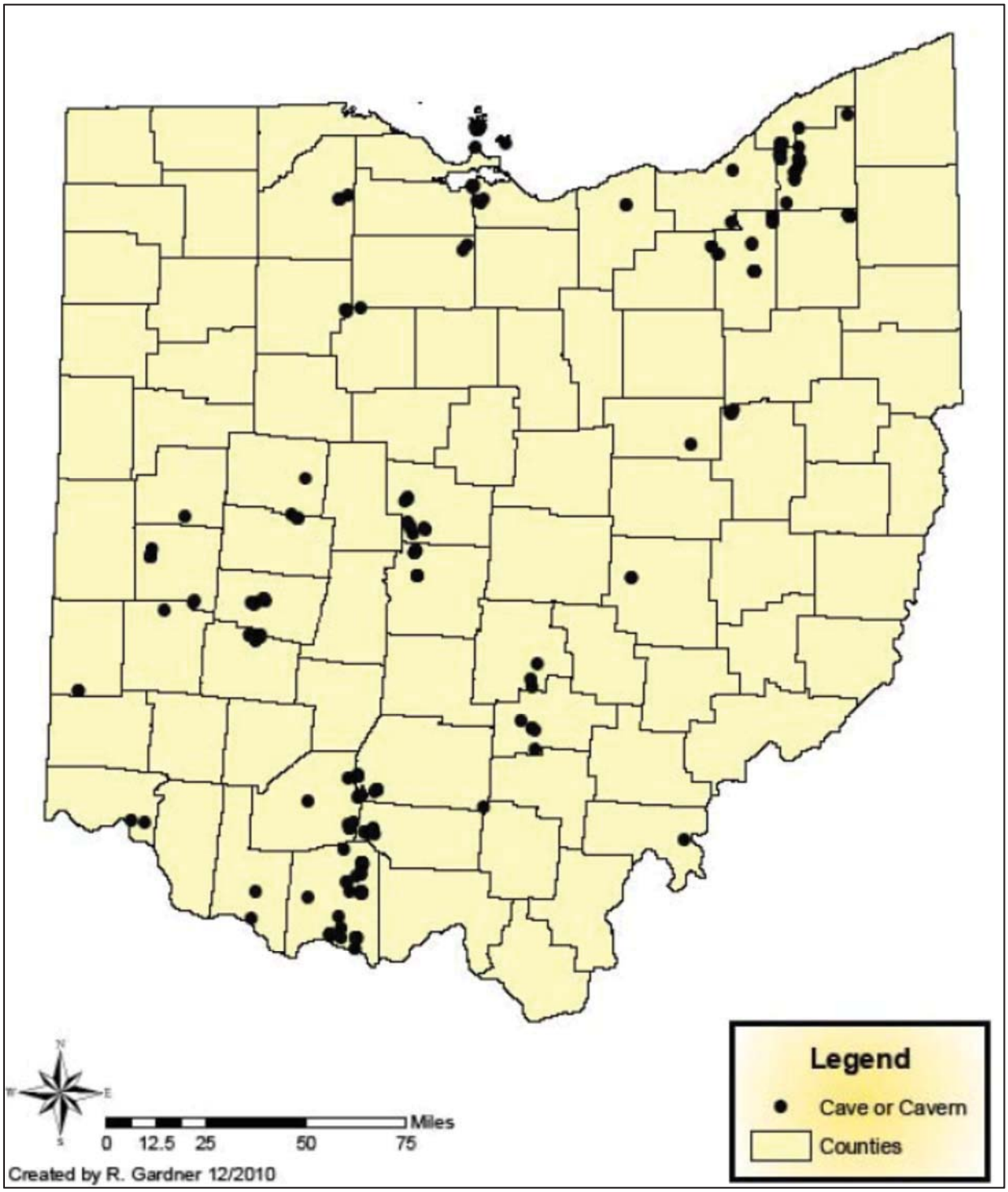
7	Educate the public about the negative effects of exotic and nuisance animals – encourage responsible disposal of unwanted animals	awareness & communications	low	VIII
V	**LAW AND POLICY**		med	
1	Balance the needs of fish and wildlife with the needs of people by mitigating incompatible ecosystem uses	policies & regulations	med	I, II, III, IV, V, VI
2	Participate in the policy-making process at Federal level to influence conservation programs	policies & regulations	med	I, II, III, IV
3	Encourage the preservation of habitat connectivity in all land use planning	policies & regulations private sector standards & codes	med med	I, IV
4	Create incentives (laws, policies) to prevent loss and/or minimize impacts to boreal habitat due to development	policies & regulations	med	I, II, III, IV
5	Support legislation promoting eco-friendly energy development and use	legislation policies & regulations	low med	III
6	Develop regulations to deter introduction of invasive/nuisance species	legislation policies & regulations	low med	VIII
7	Develop and implement a risk-assessment system in the approval process for importing or moving live animals and plants	legislation policies & regulations	low med	VIII
VI	**LIVELIHOOD, ECONOMIC AND OTHER INCENTIVES**		med	
1	Support the creation of incentives for the protection and restoration of boreal community habitat	linked enterprises & livelihood alternatives substitution market forces conservation payments non-monetary values	high low low high low	I, II, III, IV
2	Develop incentives for private landowners to eradicate/control invasive plant species	conservation payments non-monetary values	high low	VIII

3	Support incentives that encourage landowners to maintain/preserve existing boreal habitat on their properties	market forces conservation payments non-monetary values	low high low	I
4	Support creation of incentives to incorporate wildlife habitat into recreational facilities such as parks and golf courses	market forces conservation payments non-monetary values	low high low	VI-B
VII	**EXTERNAL CAPACITY BUILDING**		high	
1	Actively promote and engage in partnerships to conserve and enhance boreal community habitats and the species dependent upon them	alliance & partnership development	high	I, II, VII-C
2	Create a multiagency invasive species prevention and control group that would be responsible for all invasive species issues	alliance & partnership development	high	VIII
3	Work with partners in northeast Ohio to restore and/or enhance hydrologic regime of boreal communities	alliance & partnership development	high	VII-C
4	Through interagency coordination, work to assure that wildlife interests are taken into consideration in road, bridge, causeway, and utilities design, construction, and maintenance	alliance & partnership development	high	IV
5	Support legitimate citizen scientist-based monitoring efforts of wildlife species and habitats	institutional & civil society development	med	VII-C
6	Develop new and strengthen existing partnerships with Land Trust organizations working in Boreal Communities	institutional & civil society development	med	VII-C

*refers to the Boreal Community Habitat Conservation Threats in Table 29

6.11 Caves & Mines Habitat

Ohio Cave locations



6.11.1 Status

In 2007 the ODNR Division of Natural Areas, in partnership with Wittenberg University, initiated a multi-year survey of Ohio's cave resources. In total, the cave survey identified 400 caves – 211 in carbonate bedrock and 189 in non-carbonate bedrock. Caves that have formed in limestone and dolomite bedrock are located in western Ohio. Non-carbonate caves, including rock shelters and recesses, are the common cave type in eastern Ohio. Although Ohio's caves may be few in number and relatively small compared to other states, they are fragile ecosystems that have important geological (unique rock formations), biological (important habitats), and archaeological values (native American culture).

6.11.2 Description

Approximately 300 caves span Ohio in a 40-mile-wide track of land aligned north-south from the Lake Erie islands to Adams County. A 3-year survey of the plant and animal species associated with Ohio caves was initiated in 2007 by the Division of Natural Areas and Preserves and gathered considerable data. In addition to naturally formed caves, there are 4,000+ recorded inactive underground mines resulting from mineral extraction. Of the 4,000+ recorded mines, less than 20% are believed to have external entrances which are still open. Both natural caves and man-made mines provide critical habitat for wildlife. The features common to most caves include total darkness, relative permanence (in contrast to more ephemeral environments like a forest), and relatively constant environmental conditions (temperature, humidity, air flow). Two equally important features are caves' long history of isolation and their individuality.

To secure populations of most of the cave-dependent wildlife, it is estimated that a minimum of 25% of all caves or quality mines should be protected. This can be accomplished by installing bat-friendly gates in all high quality mine entries and conserving natural buffer zones (a minimum of 200 acres) around cave or mine entries known to support hibernating bats.

Human disturbance including but not limited to recreational vehicle use, caving, commercialization, and vandalism pose a serious threat to unique habitat-dependent wildlife. Sealing and improper gating reduces or eliminates the availability of mines to wildlife. Properly designed and installed gating can provide secure environments for cave-dependent wildlife, while eliminating human disturbance. Opportunities may exist to provide quality hibernacula for Indiana bats by enhancing internal features of man-made mines to simulate the humidity, airflow, and micro-habitat required by these bats. The feasibility of enhancing these mine features needs to be researched. Additional surveys and research are needed to adequately assess the population status of cave dwelling bat species. The impacts of White-nose Syndrome must be assessed and monitored. All Ohio bats are insectivores and are known to feed over a variety of habitats including riparian corridors, forests, grasslands, and agricultural fields. In addition to protecting caves and mines, adjacent lands must be conserved to ensure adequate amounts of quality foraging habitat exist near cave entrances.

6.11.3 Associated Species of Greatest Conservation Need

The 2007 Division of Natural Areas survey placed special emphasis on the identification of all living organisms found within each cave. Typical cave fauna discovered include types of planaria, spiders, isopods, beetles, pseudoscorpions, and bats. In total, 261 species of invertebrates and invertebrates were found to utilize Ohio's caves. Twenty of these species are considered obligate cavernicoles – meaning they are entirely dependent upon the cave environment.

The following species have been identified as Caves and Mines species of greatest conservation need (conservation status rank in parentheses):

<u>Amphibians</u>

Cave Salamander (15)	*Eurycea lucifuga*

<u>Terrestrial Invertebrates</u>

Ohio Cave Beetle (n/r)	*Pseudanophthalmus ohioensis*

Mammals

Eastern Small-footed Bat (1)	*Myotis subulatus leibii*
Northern Long-eared Bat (2)	*Myotis septentrionalis*
Rafinesque's Big-eared Bat (3)	*Corynorhinus rafinesquii*
Indiana Bat (7)	*Myotis sodalis*
Tri-colored Bat (7)	*Perimyotis subflavus*
Little Brown Bat (14)	*Myotis lucifugus*
Big Brown Bat (14)	*Eptesicus fuscus*
Allegheny Woodrat (24)	*Neotoma magister*

Table 31. CONSERVATION THREATS TO CAVES AND MINES HABITAT.
The following threats negatively impact or have the potential to negatively impact Caves and Mines habitat. Threat categories/classification from Salafsky et al. (2008), and threat impact rank calculations from Master et al. (2012).

ID	threats	2nd level threat classification(s)	threat impact rank
I	**residential and commercial development**		medium
---	none	---	---
II	**agriculture and aquaculture**		negligible
---	none	---	---
III	**energy production and mining**		medium
A	Mining, oil and gas extraction - can directly damage and destroy habitat, and indirectly have negative impacts by altering hydrology and causing chemical contamination	oil & gas drilling mining & quarrying	low high
IV	**transportation and service corridors**		low
---	none	---	---
V	**biological resource use**		low
---	none	---	---
VI	**human intrusions and disturbance**		medium
A	Incompatible recreational activities	recreational activities	medium
B	The spread of pathogens from cave to cave by humans could seriously impact cave-dependent wildlife	recreational activities work & other activities	medium low
C	Disturbance of bat hibernacula	recreational activities work & other activities	medium low
VII	**natural system modifications**		medium
A	Sealing and improper gating mine entrances eliminates or reduces the availability of underground mines to wildlife	other ecosystem modifications	medium
B	Disturbance of foraging habitat near cave entrances can compromise bats' ability to store adequate fat reserves prior to entering a hibernaculum, and to find food upon spring emergence	other ecosystem modifications	medium
C	Our ability to manage cave and mine habitat is limited by available staff and funding	other ecosystem modifications	medium
D	Lack of cave and mine inventory data, and a database to analyze that data limits our ability to manage	other ecosystem modifications	medium
E	Lack of cave and mine associated species data limits our ability to manage for current threats and limits our ability to develop plans for impending issues like climate change	other ecosystem modifications	medium

VIII	**invasive and other problematic species and genes**		medium
A	Introduction and/or spread of invasive plants and animals	invasive non-native/alien species	high
B	Introduction and/or spread of nuisance plants and animals	problematic native species	medium
C	Introduction and spread of diseases (especially white-nose syndrome)	invasive non-native/alien species problematic native species	high medium
IX	**pollution**		low
A	Most caves have not been mapped and their connectivity to the surface remains unclear. As a result the potential for cave degradation from non-point source pollution is unknown but likely to occur	household sewage & urban wastewater industrial & military effluents agricultural & forestry effluents	negligible high low
X	**geological events**		low
---	none	---	---
XI	**climate change and severe weather**		negligible
---	none	---	---

Table 32. CONSERVATION ACTIONS FOR CAVES AND MINES HABITAT.
The following actions will help abate or have the potential to help abate threats to Caves and Mines habitat. Action categories/classification from Salafsky et al. (2008), and action priority rank calculations from Georgia DNR (2005).

ID	actions	2nd level action classification(s)	action priority rank	threat(s) addressed*
I	**LAND/WATER PROTECTION**		high	
1	Protect cave and mine habitat through strategic acquisitions, easements, and partnerships	resource & habitat protection	high	III, VI, VII, VIII, IX
2	Use State Wildlife Grant funds for potential acquisitions	resource & habitat protection	high	III, VI, VII, VIII, IX
3	Establish permanent buffer areas around cave and mine habitats to ensure their long-term viability	resource & habitat protection	high	III, VI, VII, VIII, IX
4	Develop new and build on existing relationships with Land Trusts purchasing lands and conservation easements	resource & habitat protection	high	III, VI, VII, VIII, IX
II	**LAND/WATER MANAGEMENT**		high	
1	Identify, investigate, and conduct research on the causes of habitat loss or impairment and develop strategies to minimize further habitat loss	habitat & natural process restoration	high	III, VI, VII-B
2	Develop a list and prioritize research needs associated with habitat loss or impairment	habitat & natural process restoration	high	III, VI, VII-B

3	Identify and implement strategies to minimize the effects of residential development adjacent to existing protected/preserved habitats	habitat & natural process restoration	high	VI, VII-B
4	Design and implement surveys to determine the status and distribution of wildlife species associated with mine and cave habitats - evaluate the success of habitat restoration, enhancement, and management measures being implemented	habitat & natural process restoration	high	VII-D,E
5	Continue to research habitat requirements for the suite of wildlife associated with cave and mine habitats	habitat & natural process restoration	high	VII-D,E
6	Conduct research on the distribution and abundance of wildlife species associated with cave and mine habitats	habitat & natural process restoration	high	VII-D,E
7	Develop and implement recovery/conservation plans for the state-listed species dependent upon cave and mine habitats	habitat & natural process restoration	high	VII-E
8	Assemble and/or develop GIS-based data layers and associated tables of cave and mine habitats, including publicly-owned or conservation-minded NGO managed lands, and make it available for public-land managers and conservation-minded NGOs	habitat & natural process restoration	high	VII-D
9	Develop a comprehensive baseline inventory of historic versus current distribution and abundance of cave and mine habitats	habitat & natural process restoration	high	VII-D
10	Continue locating and protecting, with bat-friendly gates, mines and caves serving as hibernation sites for Indiana Myotis and other species	habitat & natural process restoration	high	VI
11	Support the mapping of caves, as feasible, to ensure their conservation and the long-term viability of cave-dependent wildlife	habitat & natural process restoration	high	VII-D
12	Evaluate the feasibility of creating suitable hibernacula zones for Indiana myotis by enhancing internal features of the Preble Mine in areas of the mine currently unoccupied by bats by 2016	site/area management	high	VI
13	Continue biannual surveys of all bat species in the Preble County underground mine to assess population size and evaluate health and condition	site/area management	high	VI
14	Prevent introduction and control the spread of harmful species through legislation, regulation, policy, management practices, education, and partnerships	invasive/ problematic species control	high	VIII
15	Implement strategies identified in the Wildlife Stewardship Tactical Plan to avoid, minimize or eliminate the adverse impacts of non-native and/or problematic species in cave and mine habitats	invasive/ problematic species control	high	VIII
16	Establish an early-detection rapid-response system for dealing with invasive and nuisance species	invasive/ problematic species control	high	VIII
17	Implement strategies identified in the Wildlife Stewardship Tactical Plan to avoid, minimize or eradicate diseases in wildlife associated with cave and mine habitats	invasive/ problematic species control	high	VI-B, VIII-C
18	Identify ecosystem or population-level threats through research, surveillance, monitoring, and inventory	habitat & natural process restoration	high	III, VI, VII, VII-E, VIII, IX

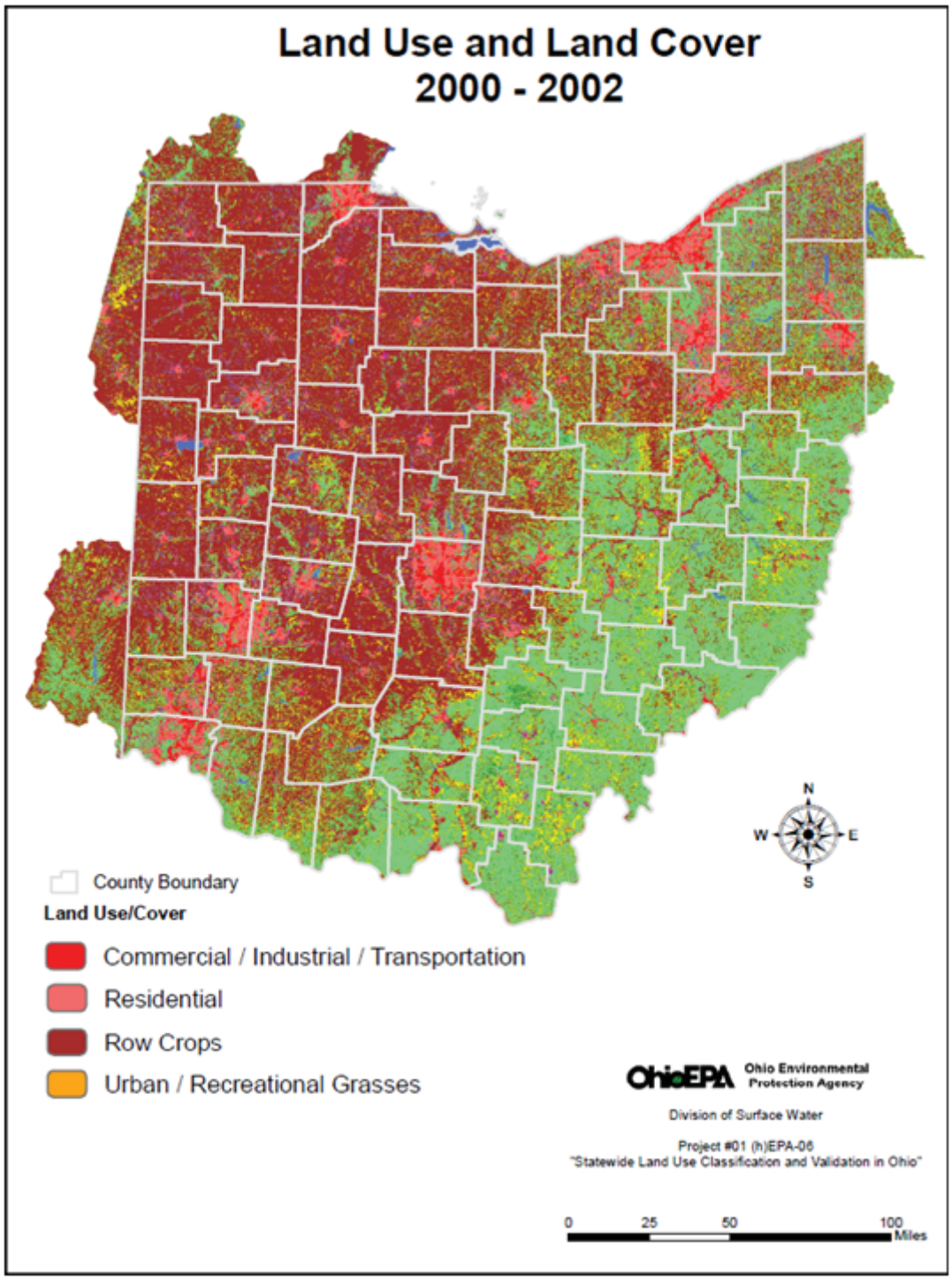
19	Develop compatible recreational activities criteria that can be used to evaluate impacts to habitat/species from recreational activities	habitat & natural process restoration	high	VI
III	**SPECIES MANAGEMENT**		med	
1	Develop species-specific conservation plans as needs are identified to clearly define the actions the Division will/or will not implement concerning the state-listed species	species management	low	VII-E
2	Annually revise and distribute the ODNR Indiana Bat Management Strategy	species management	low	VI, VII
3	Identify, design, and conduct appropriate species-specific surveys, inventories, or monitoring projects to determine species distribution and abundance	species management	low	VII-E
IV	**EDUCATION AND AWARENESS**		high	
1	Promote the value of cave and mine habitat/species conservation by developing and distributing new publications, educational materials, website information, and digital presentations	awareness & communications	high	VI, VII
2	Provide technical assistance to public land managers and NGOs to ensure cave and mine habitats under their management continue to be protected, restored and/or enhanced	awareness & communications	high	VII-C
3	Maintain a corps of Division of Wildlife-trained partners and volunteers to assist, lead, and promote special programs	training	high	VII-C
4	Utilize the Ohio Wildlife Legacy Stamp as a tool to illustrate the value of Ohioans in wildlife conservation and to convey the connection between wildlife, people, and habitat	awareness & communications	high	VI, VII
V	**LAW AND POLICY**		med	
1	Support legislation promoting eco-friendly energy development and use	legislation policies & regulations	high med	III, IX
2	Develop regulations to deter introduction of invasive/nuisance species	legislation policies & regulations	high med	VIII
3	Balance the needs of fish and wildlife with the needs of people by mitigating incompatible ecosystem uses	policies & regulations	med	III, VI, VII
4	Participate in the policy-making process at Federal level to influence conservation programs	policies & regulations	med	III, IX
5	Create incentives (laws, policies) to prevent loss and/or minimize impacts to cave and mine habitat due to development	policies & regulations	med	VII-B

VI	**LIVELIHOOD, ECONOMIC AND OTHER INCENTIVES**		med	
1	Support incentives that encourage landowners to maintain/preserve existing cave and mine habitat on their properties	market forces conservation payments non-monetary values	med high high	VII-C
VII	**EXTERNAL CAPACITY BUILDING**		high	
1	Actively promote and engage in partnerships to conserve and enhance cave and mine habitats and the species dependent upon them	alliance & partnership development	high	VII-C
2	Meet routinely with state and federal agency personnel to ensure bat-friendly gating is used when sealing entries to abandoned underground mines with known or potential use by bats	alliance & partnership development	high	VI, VII-A
3	Support legitimate citizen scientist-based monitoring efforts of wildlife species and habitats	institutional & civil society development	high	VII-C,D,E

*refers to the Caves and Mines Habitat Conservation Threats in Table 31

6.12 Artificial/man-made Environments

Ohio Artificial/man-made Environments



6.12.1 Status

Ohio's population growth is currently relatively static, and urban areas seem to reflect this in terms of growth. As far as developed areas are concerned, suburban areas show the most growth. Residential neighborhoods, condominium complexes, townhouses/apartments, and the like are responsible for the majority of recent development. The number of acres in agriculture has decreased by about 10%, and the number of farms has decreased by about 13% in the last 30 years (USDA 2012). During this time, the number of farms under 1000 acres have decreased, while farms over 1000 acres have increased.

6.12.2 Description

Artificial/man-made Environments are primarily divided between areas of human development of varying intensity (urban a suburban areas) and agriculture. In both cases, natural habitats have been replaced artificial environments, and the species that occupied these natural habitats have been replaced by a substantially reduced assemblage of tolerant/adaptable species. These environments create an ecosystem of their own with altered hydrology, climate, plant and animal communities, and a host of other development-induced characteristics.

Urban/suburban environments are a complex mixture of above ground structures (buildings, bridges, towers, power lines & supports) and altered surfaces (roads, parking lots, lawns). Some of the artificial environments in this category offer significant opportunities for wildlife conservation. With proper planning, wildlife habitat can be included in parks, golf courses, airport properties, cemeteries, and residential areas. Areas of intense development (cities) offer fewer opportunities, but still have structures that can mimic natural habitats that are utilized by certain wildlife species (ex., peregrine falcons nesting on tall buildings, bats roosting in bridge expansion joints).

Agricultural lands convert diverse natural communities into large areas of relative monoculture. Large acreages may be planted in row crops (primarily corn and soybeans) or other field crops such as wheat and hay, or may exist as pastures, orchards, or vineyards. Available wildlife habitat often varies by season. At the peak of the growing season, structural complexity in agricultural fields is at its maximum, and food and shelter are readily available for a number of wildlife species adapted to such conditions. After harvest and through the winter months, available habitat is at a minimum and large expanses of land may offer little to wildlife species in terms of food or shelter. Applications of fertilizers, herbicides, and pesticides can have far reaching effects to agricultural land ecosystems, and the natural ecosystems that surround them. Opportunities to include wildlife habitat on agricultural lands are numerous and varied.

A third but much smaller category of artificial environments are man-made structures placed into aquatic habitats. Structures such as docks, piers, bridge supports, breakwaters, marinas, and rip-rapped shorelines often increase structural complexity in aquatic systems. By increasing complexity, these structures can actually add habitat, and there can be community benefits resulting from these artificial habitats in aquatic systems. However, many of these structures replace significant amounts of natural habitat, cause habitat degradation and affect water quality during their construction, and can result in changes to natural water and animal movements (dams).

6.12.3 Associated Species of Greatest Conservation Need

In an evolutionary sense, artificial environments have not existed long enough to have developed their own suite of associated species. Over time however, a number of terrestrial and aquatic species have demonstrated the ability to adapt very well to these environments. While none of these species would be considered to call artificial environments "home", many are able to make use of different aspects that these artificial habitats offer, and some spend their entire life (and have for generations) living in these artificial environments. Species such as deer, coyote, raccoon, opossum, groundhog, cardinals, and robins have developed urban/suburban populations. These species are able to find the necessary food and cover to survive/reproduce, and are highly tolerant of human activity.

In agricultural areas, a number of wildlife species live in or adjacent to crop fields, and utilize crops as a primary food source. Agricultural fields create edge habitat, and some species that require a patchwork of habitat types and the edge-effect they create have flourished in agricultural areas. Ohio's countryside today supports more whitetail deer than did the same land before settlers arrived. Grain fields can be

important food stops for migrating birds and waterfowl. In general however, agricultural lands support a much less diverse species assemblage than the habitats they replaced, despite the fact that some well adapted species (deer) have prospered in these areas.

Species found in artificial environments are there because of their ability to adapt. Artificial environments are not "preferred habitat" for any wildlife species, and there are not species that are dependent upon artificial habitats for their survival. Opportunistic/adaptable species over time have simply taken advantage of an unoccupied niche that provides enough of life's necessities for them to survive. Consequently, we do not feel that a list of species of greatest conservation need is appropriate for artificial man-made environments.

Table 33. CONSERVATION THREATS TO ARTIFICIAL/MAN-MADE ENVIRONMENTS.
The following threats negatively impact or have the potential to negatively impact Artificial/man-made Environments. Threat categories/classification from Salafsky et al. (2008), and threat impact rank calculations from Master et al. (2012).

ID	threats	2nd level threat classification(s)	threat impact rank
I	**residential and commercial development**		very high
A	Loss of agricultural land to residential development	housing & urban areas	very high
B	Loss of agricultural land to commercial development	commercial & industrial areas	very high
II	**agriculture and aquaculture**		high
---	none	---	---
III	**energy production and mining**		high
A	Energy extraction, production, and mining can directly damage and destroy habitat, and indirectly have negative impacts by altering hydrology and causing chemical contamination	oil & gas drilling mining & quarrying renewable energy	high low medium
IV	**transportation and service corridors**		low
A	Roads and associated traffic in urban/suburban areas impact wildlife movement and cause mortality	roads & railroads	low
B	Power lines are a source of wildlife mortality	utility & service lines	low
V	**biological resource use**		low
---	none	---	---
VI	**human intrusions and disturbance**		low
A	Incompatible recreational activities	recreational activities	low
B	Human activities in urban/suburban areas	work & other activities	low
VII	**natural system modifications**		medium
A	Incompatible wildlife management strategies - managed to control/reduce wildlife species	other ecosystem modifications	medium
B	Agricultural lands are managed to focus on a particular crop, resulting in reduced habitat diversity	other ecosystem modifications	medium
C	Artificial environments cause altered hydrology, water quality, species composition/community structure	other ecosystem modifications	medium
D	Lack of artificial/man-made environment associated species data limits our ability to manage for current threats and limits our ability to develop plans for impending issues like climate change	other ecosystem modifications	medium
E	Our ability to manage artificial/man-made environments is limited by available staff and funding	other ecosystem modifications	medium

VIII	**invasive and other problematic species and genes**		medium
A	Introduction and/or spread of invasive plants and animals	invasive non-native/alien species	high
B	Introduction and/or spread of nuisance plants and animals	problematic native species	medium
C	Introduction and spread of diseases (plants and animals)	invasive non-native/alien species problematic native species	high medium
IX	**pollution**		low
A	Herbicides, pesticides, fertilizers, chemicals, solid waste, other toxic substances	household sewage & urban wastewater industrial & military effluents agricultural & forestry effluents garbage & solid waste air-borne pollutants	low low low low low
B	Light pollution in urban/suburban areas	excess energy	low
C	Noise pollution in urban/suburban areas	excess energy	low
X	**geological events**		negligible
---	none	---	---
XI	**climate change and severe weather**		high
A	Climate change could impact habitats, water quality, and species	habitat shifting & alteration droughts temperature extremes storms & flooding	high very high medium high

Table 34. CONSERVATION ACTIONS FOR ARTIFICIAL/MAN-MADE ENVIRONMENTS.
The following actions will help abate or have the potential to help abate threats to Artificial Man-made Environments. Action categories/classification from Salafsky et al. (2008), and action priority rank calculations from Georgia DNR (2005).

ID	actions	2nd level action classification(s)	action priority rank	threat(s) addressed*
I	**LAND/WATER PROTECTION**		high	
1	Use acquisitions, conservation easements, etc. to protect key habitats/species	resource & habitat protection	high	IV, VI, VII-C, IX
2	Use State Wildlife Grant funds for acquisitions to protect important habitats that are interspersed in artificial man-made environments	resource & habitat protection	high	IV, VI, VII-C, IX
3	Create parks, open spaces, greenways	site/area protection	high	IV, VII-C, IX

4	Develop new and build on existing relationships with Land Trusts purchasing lands and conservation easements	resource & habitat protection	high	IV, VI, VII-C, IX
II	**LAND/WATER MANAGEMENT**		med	
1	Prevent introduction and control the spread of harmful species through legislation, regulation, policy, management practices, education, and partnerships	invasive/ problematic species control	med	VIII
2	Implement strategies identified in the Wildlife Stewardship Tactical Plan to avoid, minimize or eliminate the adverse impacts of non-native and/or problematic species in Artificial/man-made Environments	invasive/ problematic species control	med	VIII
3	Establish an early-detection rapid-response system for dealing with invasive and nuisance species	invasive/ problematic species control	med	VIII
4	Implement strategies identified in the Wildlife Stewardship Tactical Plan to avoid, minimize or eradicate diseases in wildlife associated with artificial man-made environments	invasive/ problematic species control	med	VIII-C
5	Identify, investigate, and conduct research on the causes of habitat loss or impairment and develop strategies to minimize further habitat loss	habitat & natural process restoration	low	I, III, IV, VII-C
6	Develop a list and prioritize research needs associated with habitat loss or impairment	habitat & natural process restoration	low	I, III, IV, VII-C
7	Minimize effects of lighting, noise, activity on wildlife	habitat & natural process restoration	low	VI-B, IX-B,C
8	Design and implement surveys to determine the status and distribution of wildlife species associated with Artificial/man-made Environments - evaluate the success of habitat restoration, enhancement, and management measures being implemented	habitat & natural process restoration	low	VII-D
9	Continue to research habitat requirements for the suite of wildlife associated with Artificial/man-made Environments	habitat & natural process restoration	low	VII-D
10	Develop and implement recovery/conservation plans for the state-listed species that utilize Artificial/man-made Environments	habitat & natural process restoration	low	VII-D
11	Include wildlife/habitat in land use planning	habitat & natural process restoration	low	I, IV, VII-C, IX
12	Restore hydrology by removing obsolete water control structures	habitat & natural process restoration	low	VII-C
13	Identify ecosystem or population-level threats through research, surveillance, monitoring, and inventory	habitat & natural process restoration	low	I, III, IV, VI, VII, VIII, IX, XI
14	Develop compatible recreational activities criteria that can be used to evaluate impacts to habitat/species from recreational activities	habitat & natural process restoration	low	VI-A

III	**SPECIES MANAGEMENT**		med	
1	Develop species-specific conservation plans as needs are identified to clearly define the actions the Division will/or will not implement concerning the state-listed species	species management	med	VII-D
2	Identify, design, and conduct appropriate species-specific surveys, inventories, or monitoring projects to determine species distribution and abundance	species management	med	VII-D
IV	**EDUCATION AND AWARENESS**		high	
1	Educate landowners, homeowners, city maintenance personnel, etc. on the proper use of chemicals – pesticides, herbicides	awareness & communications	high	IX
2	Educate landowners, homeowners, maintenance personnel, etc. on identification and control of invasive and nuisance species	awareness & communications	high	VIII
3	Educate the public about the negative effects of exotic and nuisance animals – encourage responsible disposal of unwanted animals	awareness & communications	high	VIII
4	Educate planners, developers, homeowners, farmers, policy makers, etc. on ways to benefit wildlife/habitat	awareness & communications	high	I, III, IV, VI, VII, IX
5	Promote the value of habitat/species conservation by developing and distributing new publications, educational materials, website information, and digital presentations	awareness & communications	high	IV, VI, VII, VIII, IX
6	Utilize the Ohio Wildlife Legacy Stamp as a tool to illustrate the value of Ohioans in wildlife conservation and to convey the connection between wildlife, people, and habitat	awareness & communications	high	IV, VI, VII, VIII, IX
7	Maintain a corps of Division of Wildlife-trained partners and volunteers to assist, lead, and promote special programs	training	med	VII-E
V	**LAW AND POLICY**		high	
1	Balance the needs of fish and wildlife with the needs of people by mitigating incompatible ecosystem uses	policies & regulations	high	I, III, IV, VI, VII-B, C, IX
2	Participate in the policy-making process at Federal level to influence conservation programs	policies & regulations	high	I, III, IV, IX
3	Create incentives to prevent loss and/or minimize impacts to existing wildlife habitat	policies & regulations private sector standards & codes	high med	I, III, IV, VI, VII-B, C, IX
4	Develop regulations to deter introduction of invasive/nuisance species	legislation policies & regulations	high high	VIII
5	Develop and implement a risk-assessment system in the approval process for importing or moving live animals and plants	legislation policies & regulations	high high	VIII

VI	**LIVELIHOOD, ECONOMIC AND OTHER INCENTIVES**		med	
1	Provide economic incentives for wildlife friendly development in urban/suburban areas	market forces conservation payments non-monetary values	med med med	I, IV, VI, VII-C, IX
2	Develop incentives for landowners to eradicate/control invasive plant species	conservation payments non-monetary values	med med	VIII
3	Promote land use practices that minimize the need for hardened shorelines	market forces conservation payments non-monetary values	med med med	VII-C
4	Provide incentives for habitat restoration in agricultural areas	linked enterprises & livelihood alternatives market forces conservation payments non-monetary values	low med med med	VII-B, IX
VII	**EXTERNAL CAPACITY BUILDING**		high	
1	Create a coalition of outdoor enthusiast groups (garden clubs etc) to volunteer for green projects in urban/suburban areas	institutional & civil society development	high	VII-E
2	Create a coalition of farmers and rural landowners interested in wildlife/habitat - and facilitate projects for them	institutional & civil society development	high	VII-B
3	Create a multiagency invasive species prevention and control group that would be responsible for all invasive species issues	alliance & partnership development	high	VIII
4	Through interagency coordination, work to assure that wildlife interests are taken into consideration in road, bridge, causeway, and utilities design, construction, and maintenance	alliance & partnership development	high	IV

*refers to the Artificial Man-made Environments Habitat Conservation Threats in Table 33