

Species of Greatest Conservation Need

Wildlife species not threatened with extinction, or not managed as game animals, are generally not given sufficient consideration in land-use decisions in the context of large geographic regions or in relation to their actual habitats. Simply creating a consistent spatial framework for storing, retrieving, manipulating, analyzing, and updating the totality of our knowledge about the status of each animal species is a necessary and basic element for preventing the further degradation of biological resources (Covert and Simonson 2007).

With the exception of invasive species, all native and naturalized wildlife species in Ohio were considered to be Ohio Species of Greatest Conservation Need for this State Wildlife Action Plan revision. Rather than use subjective criteria to truncate the SGCN list, we allowed all species to remain on the list, but in order of conservation status, using criteria described by Millsap et al. (1990) and modified to fit Ohio – with the exception of avian species (see below). By calculating and then prioritizing conservation status for all native/naturalized species, we create a historical benchmark which will be useful in the future should the status of low priority species change. Low priority species on an all-inclusive list may have been left off of a truncated SGCN list. We felt it was best to document and record the status of all species using the same ranking criteria to establish a benchmark quantitative score for future comparison.

Ohio's 891 SGCN include all species from taxa groups for which we have enough information to calculate conservation status scores and ranks. Included are mammals, birds, reptiles, amphibians, butterflies and skippers, dragonflies and damselflies, fish, mussels, and crayfish (Table 1S). Invertebrates are represented by thousands of terrestrial and aquatic species for which varying degrees of data exist, and statutory authority varies. For these reasons, we were only able to calculate conservation ranks for dragonflies, damselflies, butterflies, skippers, and crayfish.

All of these species groups contain listed (endangered, threatened, etc.) species, and several also contain species that are hunted or fished for. While funding is and has been historically available for "game" species, the fact that habitat issues are the primary conservation threat in Ohio - and habitat affects all species - it is impossible to separate out "game" species. Consequently these species are included because they have conservation needs that Ohio's SWAP may help address. Their low conservation status rank and existence of dedicated funding however, make it highly unlikely that state wildlife grant funds would ever be spent directly on these species. The majority of species on the following SGCN lists are species that have little or no dedicated funding. These species have conservation needs that are not funded through the Endangered Species Act or with hunting/fishing license dollars. This Plan and the funds from the State Wildlife Grants program will provide the backbone for their conservation.

Table 1S. Ohio's SGCN by Taxa Group and Associated Number of Listed Species.

Taxonomic Group	Number of Species	Endangered	Threatened	Species of Concern	Special Interest	Extirpated	Extinct
Mammals	56	3	1	20	1	10	0
Birds	195	11	5	14	33	6	2
Reptiles	44	5	4	11	0	0	0
Amphibians	39	5	1	1	0	0	0
Fishes	164	20	13	9	0	8	2
Mussels	79	24	4	8	0	11	6
Crayfishes	21	0	2	3	0	0	0
Dragonflies/Damselflies	163	16	6	1	0	0	0
Butterflies/Skippers	130	8	1	2	1	1	0
Total	891	92	53	69	35	36	10

Information regarding the distribution and abundance of terrestrial and aquatic wildlife species was assembled through a number of channels, beginning with the SGCN list from our 2005 CWCS. Data from surveys conducted since the completion of the 2005 CWCS have also been included. Surveys are routinely conducted by the Division of Wildlife, and that information has been combined with a vast amount of data collected by the USFWS, USGS, USEPA, Ohio EPA, ODNR divisions (Parks, Natural Areas, Soil and Water, Forestry), universities, non-governmental conservation organizations, and private consultants.

Teams of internal and external species experts were assembled for amphibian, avian, butterfly & skipper, crayfish, dragonfly & damselfly, fish, mammal, mussel, and reptile taxa groups. Team members from outside of the Division of Wildlife included individuals from the Midwest Biodiversity Institute, Ohio Chapter of the Nature Conservancy, Ohio EPA, Ohio Biological Survey, Inc., The Ohio State University Department of Evolution, Ecology and Organismal Biology, other ODNR divisions, and numerous individuals recognized as species experts.

These teams used the best information available, and the scoring system described below to develop draft conservation status ranks for each species in these groups. These draft SGCN lists were then made available for review to additional species experts, stakeholders, conservationists, and members of the public at the 2014 and 2015 Ohio Wildlife Diversity Conference (~ 950 participants/event), the 2013 and 2014 Ohio Wildlife Diversity Leadership Conference (~ 50 participants/event), and 2014 Wildlife District Open Houses (5 sites around the state). In addition, the draft SGCN lists were posted on the Division's website for review and comment by the public. After combining all available data and considering input from all reviewers, the lists of SGCN were finalized for the 9 taxa groups listed above.

Conservation Status ranks for species within the nine taxa groups are contained in tables 2M - 10B along with rankings for each species, notes describing species listing (if applicable), habitat association, rangewide occurrence, statewide occurrence, and Ohio population trend are also contained in the tables. The species lists, and ranks within lists within each SGCN table are considered working drafts, and as such are open for future discussion and modification.

Conservation Status Criteria

All native and naturalized wildlife species in Ohio (mammals, reptiles, amphibians, butterflies, skippers, dragonflies, damselflies, fish, mussels, crayfish) with the exception of avians were scored using the Florida FWC Species Ranking developed by Millsap et al. (1990), with slight modifications to fit Ohio (described below).

To determine individual species scores using the FWC Species Ranking system, species experts were brought together to work through the scoring criteria as a team. Historical and current distribution and abundance data and extensive knowledge from species experts were used to determine scores for each criterion. Where differences of opinion occurred, discussion ensued, and consensus was reached. When consensus could not be reached, scores were averaged for each criterion across scorers (this was occasionally the case for fish and mussels). Scoring "meetings" were facilitated by Division of Wildlife SWAP Advisory Team members.

Modifications to FWC Species Ranking system

Aside from substituting "Ohio" for "Florida" throughout the document, two minor modifications were made to allow the FWC system to be used for scoring Ohio species.

(1) *Biological Variables* - #3 Range Size – size categories were adjusted to fit the state of Ohio in terms of land area.

(2) *Supplemental Variables* - #5 Harvest of the Taxon – for clarification purposes, the word "collected" was added to "harvested" so that each scoring choice read "harvested/collected". Most native wildlife species in Ohio are not harvested, but many are collected.

Avian Species Scoring

As mentioned above, avian species were the one taxa group that was not scored using the Florida system. Instead, a weighted matrix was utilized to identify the native and naturalized Ohio breeding avian species for prioritizing future conservation efforts. The matrix included an assessment of the following:

- the status of the species: Endangered, Threatened, Species of Concern, Species of Special Interest, Extirpated (scoring point values were Endangered = 3, Threatened = 2, Species of Concern = 1)
- the species ability to be self-sustained within designated conservation opportunity areas (COA) (scoring point values were 1 point for each COA)
- species conservation status in the 2010 Ohio Bird Conservation Plan: Highest, High, or Moderate (scoring point values were highest = 3, high = 2, moderate = 1)
- no points were assigned to species identified as viable and broadly distributed in Ohio

Ohio's SGCN Taxa Groups – history and status of listed species

Given its past geologic and glacial history, Ohio contains a diversity of habitats that support an abundance of terrestrial and aquatic species. Three hundred and eighty terrestrial wildlife species are recognized as native and naturalized. In addition, Ohio supports a diverse and abundant aquatic species community represented in part by 174 species of fish, 83 species of mollusks, and 21 crayfish species. Aquatic species constitute the majority of Ohio's threatened and endangered species and also represent the majority of extinctions and extirpations. Fish and mollusks, the two species groups for which the most historical information exists, appear to have been impacted the most by changes to Ohio's landscape since settlement.

Taxa Group: Mammals

The species assemblage, abundance, and distribution of mammals have changed dramatically since Ohio was settled. This taxa group is extremely sensitive to natural and anthropogenic factors that affect its habitat and impact population levels. Mammals as a group require considerable space to sustain populations due to individual energy needs. In addition, low reproductive rates relative to other taxa groups make them more vulnerable to issues like habitat loss and overharvest, and slower to recover from the population reductions that result. Mammals have been subjected to habitat loss, degradation, and fragmentation since settlement. Their value to humans for meat and fur has been an issue for some species, and other species have been reduced or extirpated in the name of protection of people and livestock. The assemblage that remains in Ohio today is a reflection of all this taxa group has endured in the past, and its ability to adapt to the modern landscape.

Extirpated Mammals

At least 9 mammals have been extirpated from Ohio. Mountain lions and gray wolves were eliminated from Ohio shortly after European settlement by over-trapping, habitat loss, and eradication due to an effort to protect people, livestock, and game species. Elk and bison were killed for their meat and hides. The marten and Canada lynx were probably never common in Ohio, and both species are currently confined to northern U.S. coniferous forests. All of these species were extirpated by the 1850s. The unique habitat and space required by them for survival and reproduction are no longer present in Ohio; thus, reintroduction is not a feasible option. The marsh rice rat, a semiaquatic North American rodent found primarily in the eastern and southern United States, has not been reported in Ohio since historic times. Their Ohio occurrence is known only from bones found in Native American archaeological sites. Reintroduction of this species is also not being considered.

The porcupine, which was extirpated by 1900, was once common in northeastern and northwestern Ohio. Although porcupines occasionally enter the state on their own, there are no plans to reintroduce this species because of possible conflicts with humans. However, recently a number of spatially concentrated sightings in Jefferson County suggest the possible establishment of a small breeding population. Fishers, one of the few natural predators of porcupines, are widespread throughout the northern forests of North America, and were once widespread in the Midwest, but similar to other extirpated predators, over-trapping and habitat loss eliminated them from Ohio by the mid-1800s. An isolated population exists in the Appalachians of West Virginia, and they were reintroduced to Pennsylvania in 1994 by the Pennsylvania Game Commission. Currently, they are abundant in parts of Pennsylvania - some within a

1-2 county radius of Ohio's eastern border, and occasional sightings of fishers occur in eastern Ohio and are becoming more frequent - although the presence of a breeding population is doubtful at this point. Nonetheless, the success of Pennsylvania's fishers and the self-repatriation of fishers in other parts of their range, suggest they may re-establish small breeding populations in Ohio in the future. Monitoring of porcupine and fisher sightings, and initiation of surveys in areas of possible re-establishment are warranted.

Endangered Mammals

The black bear, bobcat, Indiana myotis, Allegheny woodrat, and snowshoe hare currently comprise the endangered mammals of Ohio. Black bears and bobcats were extirpated by 1850, but have returned to Ohio from adjacent states as Ohio's forest land recovered. Both species are provided full protection under the law as their populations become established and grow. Current bobcat range in Ohio encompasses much of the southeastern portion of the state, and bobcat sightings have risen steadily over the past decade. However, based on verified sightings, bobcats are highly clustered in Ohio, with 70% of the population occurring within only 23% of their current range. Genetic analyses of road killed bobcats and other incidental kills (e.g., incidentally trapped individuals), revealed 2 genetically distinct populations: an eastern population centered around Noble County, and a more sparse and dispersed southern population. Genetic analyses also determined the eastern population is being maintained primarily through breeding, whereas the southern population is maintained through immigration from surrounding states, as well as Ohio's eastern population, and is considered a sink (i.e., a population unable to sustain itself without immigration). Because of the spatially-constrained population structure and the dependence of the southern population on immigration, the bobcat's future remains uncertain until additional areas within their range are exploited and the 2 populations merge. Continued monitoring of bobcat distribution is imperative, as are additional genetic analyses to confirm the mixing of populations and the stability of bobcats in the southern portion of their range, as the 2 populations continue to grow and expand.

In contrast to bobcats, black bear sightings have remained relatively consistent over the past decade. More importantly, the number of sightings of sows with cubs has remained low and fairly consistent, indicating a small but stable breeding population. Young female black bears tend to settle into home ranges adjacent to their mother, whereas young males tend to travel considerable distances before settling into a new home range. Because the peak of sightings (June and July) corresponds with the peak of breeding and dispersal, most of the sightings likely represent dispersing males. This is supported by the fact that all bears killed (most due to vehicle-related mortality) or trapped by ODOH employees (for relocation due to repeated bear-human conflicts) in Ohio to date (n = 20) have been males. For the past 3 years, extensive surveys utilizing techniques proven effective to survey black bears in nearby states (i.e., hair snares, camera traps) have failed to detect black bears in Ohio. This includes surveys located in the immediate vicinity of recent verified sightings, with survey stations at twice the minimum recommended density. These data suggest the possibility that a small and stable to slowly growing bear population exists in Ohio. Further monitoring of verified sightings, particularly those of females with cubs is warranted. Additional field surveys will be warranted when verified observations indicate a potential increase in bear population numbers that will make field surveys effective.

The Indiana myotis was listed as endangered at the federal level in 1967 and at the state level in 1974 primarily due to large numbers of deaths caused by human disturbance during hibernation. As is the case with many bat species, Indiana myotis are extremely vulnerable to disturbance while they hibernate. Furthermore, because they hibernate in large numbers in only a few caves (the largest hibernation caves support from 20,000 to 50,000 bats) the loss of even one hibernaculum represents a huge loss for the species. More than 85% of the range-wide population of Indiana myotis occupies nine "Priority One" hibernacula (i.e., hibernacula with recorded populations of >30,000 bats since 1960). Other threats include commercialization of caves, loss of summer habitat, pesticides and other contaminants, and most recently, White-Nose Syndrome (WNS). Ohio is home to a "Priority Two" hibernaculum (>500 but <30,000 bats) in Preble County (~9,000 Indiana myotis). Continued monitoring and protection of this hibernaculum is imperative. Evaluation of potential hibernacula (mines and caves) and sealing hibernacula with bat-friendly gates is also warranted. Description and delineation of summer habitat is needed. Protection of summer habitat and monitoring for WNS are also necessary to ensure the bat's protection in Ohio.

The Allegheny woodrat has always had a limited distribution in Ohio and has been listed as endangered since 1974. It has not been observed outside of Adams County for several years. The rapid decline of Allegheny woodrat populations throughout the northern portion of its range caused much concern about the species' future. The declines prompted researchers to examine possible causative factors. A primary factor is the parasite *Baylisascaris procyonis* (raccoon roundworm), a nematode that is fatal to woodrats. Increased habitat fragmentation may also be a factor. Fragmentation from roads and development causes loss of habitat, isolation, and increased exposure to parasitism, because these corridors also provide easy access for parasite hosts such as raccoons. Methods to protect remaining populations should be investigated (e.g., anthelmintic drugs), and intact forests that provide habitat for this species must be protected from further fragmentation and development.

Snowshoe hares were extirpated by the early 1900s. Restoration efforts began in January 2000, and between 2000 and 2007, about 700 hares from Michigan and Maine were released in Ashtabula and Geauga counties. The species appears to be persisting and reproducing. Additional research is needed to determine if this species can sustain itself without additional transplants.

Mammal Species of Concern

Twelve species are designated as species of concern. These include the pygmy shrew (*Sorex hoyi*), star-nosed mole, woodland jumping mouse, and southern red-backed vole. Pietkiewicz and Harder (pers. communication) conducted small mammal trapping throughout Ohio for 10 target species, including the species of concern. A total of 2,176 specimens, representing 19 of Ohio's 22 small mammal species were collected. Pygmy shrews accounted for only 4 captures, star-nosed moles 3 captures, woodland jumping mice 1 capture, and no southern red-backed voles were captured. Further research is needed to determine abundance and distribution, as well as factors limiting populations of these small mammals. Additional surveys will be required to determine if the southern red-backed vole continues to exist in Ohio or has been extirpated.

Little is known about the statewide distribution and population sizes of eastern small-footed bat and Rafinesque's big-eared bat, and surveys to determine their status are needed. Although the impact of WNS on bat populations is unknown, biologists are predicting significant declines due to this disease, especially to cave-dwelling bat species. Bat species that occur in Ohio and have been affected by WNS include: little brown bat, big brown bat, tri-colored bat, northern long-eared bat, eastern small-footed myotis, as well as the endangered Indiana myotis. For this reason, the little brown bat, big brown bat, tri-colored bat, and northern long-eared bat were designated species of concern. Data should be gathered to expand our knowledge concerning the distribution and abundance of these species in Ohio. Doing so will also increase WNS surveillance.

Two carnivores, the ermine and badger are listed as species of concern. It is unknown if reproducing populations of ermines exist in Ohio. Three observations of ermines have been recorded since the 1930s, including 1 each in Cuyahoga, Lake, and Ashtabula counties. However, ermine occur throughout Michigan and Pennsylvania. Further, they are easily mistaken for the larger long-tailed weasel. Consequently, ermine may occur in Ohio in the extreme northeastern or northwestern portions of the state. The badger occurs primarily in western Ohio and primarily utilizes combinations of small agricultural patches and linear habitat corridors, such as hedgerows, grassland buffers, and riparian areas. These small agricultural patches are relics that have remained after the vast agricultural transformation in Ohio. Management of suitable habitat is a key factor in conserving this species.

Table 2M. Ohio's Mammal Species of Greatest Conservation Need

The conservation status (rank) for each species represents input from professionals in mammal taxonomy, distribution, and abundance. This table represents the best professional knowledge available at this time, and as such is subject to modification as additional data is obtained.

Conservation Status Rank*	Common Name	Scientific Name	Species Listing		Habitat Association	Rangewide Occurrence	Statewide Occurrence	Ohio Population Trend
			Fed	State				
1	Eastern Small-footed Bat	<i>Myotis subulatus leibii</i>		SC	B, D	B	D	U
2	Northern Long-eared Bat	<i>Myotis septentrionalis</i>		SC	B, D, Q, I	A	A	D
3	Rafinesque's Big-eared Bat	<i>Corynorhinus rafinesquii</i>		SC	B, D	B	E	U
4	Silver-haired Bat	<i>Lasionycteris noctivagans</i>		SC	B	A	A	U
5	Evening Bat	<i>Nycticeius humeralis</i>		SI	B	B	A	U
6	Red Bat	<i>Lasiurus borealis</i>		SC	B	A	A	U
7	Indiana Bat	<i>Myotis sodalis</i>	E	E	B, D, H, I	A	A	D
7	Tri-colored bat	<i>Perimyotis subflavus</i>		SC	B, D	A	A	D
9	Hoary Bat	<i>Lasiurus cinereus</i>		SC	B	A	A	U
9	Southern Flying Squirrel	<i>Glaucomys volans</i>			B	A	A	U
11	Pygmy Shrew	<i>Sorex hoyi</i>		SC	A	A	B	U
12	Least Shrew	<i>Cryptotis parva</i>			A	A	A	U
13	Southern Red-backed Vole	<i>Myodes gapperi</i>		EX	G	B	n/a	n/a
14	Little Brown Bat	<i>Myotis lucifugus</i>		SC	B, D, H, I, Q	A	A	D
14	Big Brown Bat	<i>Eptesicus fuscus</i>		SC	B, D, I, Q	A	A	D
16	Ermine	<i>Mustela erminea</i>		SC	C, G	B	B	U
16	Thirteen-lined Ground Squirrel	<i>Spermophilus tridecemlineatus</i>			B	B	A	U
16	Badger	<i>Taxidea taxus</i>		SC	A	B	B	U
19	Pine Vole	<i>Microtus pinetorum</i>		SC	B	A	B	U
19	Smoky Shrew	<i>Sorex fumeus</i>		SC	B	A	B	U
19	Eastern Harvest Mouse	<i>Reithrodontomys humulis</i>		T	A	A	A	U
22	Hairy-tailed Mole	<i>Parascalops breweri</i>			B	B	B	U

22	Woodland Jumping Mouse	<i>Napaeozapus insignis</i>	SC	G	B	B	U
24	Allegheny Woodrat	<i>Neotoma magister</i>	E	B, D	B	D	U
25	Star-nosed Mole	<i>Condylura cristata</i>	SC	C	A	B	U
25	Eastern Chipmunk	<i>Tamias striatus</i>		B	A	A	U
25	Bobcat	<i>Felis rufus</i>		B	A	B	I
28	Meadow Jumping Mouse	<i>Zapus hudsonius</i>		Q	A	A	U
28	Black Bear	<i>Ursus americanus</i>	E	B	A	B	I
30	Long-tailed Weasel	<i>Mustela frenata</i>		B	A	A	U
30	Red Squirrel	<i>Tamiasciurus hudsonicus</i>		B	A	A	U
32	Southern Bog Lemming	<i>Synaptomys cooperi</i>	SC	A, C	A	A	U
33	Masked Shrew	<i>Sorex cinereus</i>		B	A	A	U
34	Eastern Mole	<i>Scalopus aquaticus</i>		A	A	A	U
35	Least Weasel	<i>Mustela nivalis</i>		Q	A	A	U
36	Deer Mouse	<i>Peromyscus maniculatus</i>	SC	A	A	A	U
36	White-footed Mouse	<i>Peromyscus leucopus</i>		B	A	A	U
36	Prairie Vole	<i>Microtus ochrogaster</i>	SC	A	A	A	U
36	Short-tailed Shrew	<i>Blarina brevicauda</i>		A	A	A	U
36	Gray Fox	<i>Urocyon cinereoargenteus</i>		B	A	A	D
41	Woodchuck	<i>Marmota monax</i>		Q	A	A	S
42	Gray Squirrel	<i>Sciurus carolinensis</i>		B	A	A	I
42	River Otter	<i>Lutra Canadensis</i>		C, H	A	A	I
44	Meadow Vole	<i>Microtus pennsylvanicus</i>		A	A	A	U
45	Fox Squirrel	<i>Sciurus niger</i>		B	A	A	I
45	Mink	<i>Mustela vison</i>		C, H	A	A	S
45	Striped Skunk	<i>Mephitis mephitis</i>		Q	A	A	S
45	Beaver	<i>Castor Canadensis</i>		C, H	A	A	I
49	Muskrat	<i>Ondatra zibethicus</i>		C	A	A	S
49	Coyote	<i>Canis latrans</i>		Q	A	A	I

49	Virginia Opossum	<i>Didelphis virginiana</i>		Q	A	A	S
49	Raccoon	<i>Procyon lotor</i>		Q	A	A	I
53	Red Fox	<i>Vulpes vulpes</i>		B	A	A	D
54	White-tailed Deer	<i>Odocoileus virginianus</i>		B	A	A	S
55	Eastern Cottontail	<i>Sylvilagus floridanus</i>		Q	A	A	S
56	Snowshoe Hare	<i>Lepus americanus</i>	SC	G	B	D	D

* Rank derived from Conservation Status Score calculated using Millsap et al. (1990) modified for Ohio

Habitat Association Key

A = grassland
 B = forest
 C = wetlands
 D = caves & mines
 E = oak savannahs
 F = Lake Erie islands
 G = boreal communities
 H = riparian corridors
 I = artificial/man-made environments
 J = Lake Erie
 K = Lake Erie Tributaries
 L = Ohio River
 M = Ohio River Tributaries
 N = headwater and small inland streams
 O = man-made lakes and ponds
 P = natural lakes
 Q = generalist

Statewide Occurrence Key

A = broadly distributed (>30 counties)
 B = common (11-29 counties)
 C = uncommon (6-10 counties)
 D = rare (<5 counties)
 E = unknown

Rangewide Occurrence Key

A = extensive range (multiple states/Canada) – which includes Ohio
 B = periphery of range is in Ohio
 C = disjunct from main portion of its range; occurs in Ohio
 D = center of range in/near Ohio
 E = very limited range with most of its rangewide population occurring in Ohio

Ohio Population Trend Key

D = decreasing
 I = increasing
 S = stable
 U = unknown

Species Listing Key

E = endangered
 T = threatened
 SC = species of concern
 SI = species of interest
 EX = extirpated

Taxa Group: Birds

A total of 421 avian species have been recorded in the state. Of the 421 species recorded, 40 of those have only been seen once. About 300 species occur in Ohio annually, and of these, about 180 species breed in Ohio every year. There are 22 avian species which occasionally breed in the state but their densities are relatively low. Their numbers in Ohio are dependent upon the success of their rangewide population. Two avian species, the passenger pigeon and Carolina parakeet, are extinct.

Extirpated Birds

The Swallow-tailed kite, greater prairie chicken, ivory-billed woodpecker, and Bachman's sparrow are currently extirpated from Ohio. Based on radiocarbon dating of materials from a Scioto County site, the ivory-billed woodpecker is believed to have disappeared from Ohio during the 15th or 16th century. Swallow-tailed kites nested in Ohio during the first half of the 19th century, but habitat destruction and human persecution eliminated this species. Swallow-tailed kites breed in mature, wetland forests and most of the remaining birds live in the southeastern U.S, primarily Florida. The greater prairie chicken was extirpated from the state by 1880 because of market hunting and the conversion of woodlands and prairie habitat to cropland. Greater prairie chickens require very large tracts of prairie grassland habitat. The last documented sighting of Bachman's sparrow was from Scioto County in 1978. There is no clear reason for their disappearance from Ohio or other adjacent states. They prefer pine woodlands and are a conservation concern in all states where they still exist. Ivory-billed woodpeckers, Greater prairie chickens, and Bachman's sparrows are all red list species on the National Audubon Society's Watchlist (i.e., declining rapidly and/or have very small populations or limited ranges and face major conservation threats). The swallow-tailed kite is a yellow list species (i.e., either declining or rare with national conservation concern). Because of their low population numbers and lack of required habitats in Ohio, reintroduction of these species is not biologically feasible at this time.

Endangered Birds

Recovery efforts are in place for the common tern, sandhill crane, and trumpeter swan. Ohio released 154 trumpeter swans from 1996-2003 as part of a restoration effort. Since 2006, over 20 trumpeter swan nests have been observed each year and 44-73 cygnets have been produced annually. Reintroduction has been completed but trumpeter swans should be monitored annually to assess their recovery and re-evaluate their status. Common terns have been monitored annually since 1993 for reproductive effort and population size. Efforts were made to establish secure artificial nest structures and to deter predators during the nesting season. Numbers of nests have ranged from 65-350 and young fledged have ranged from 3-345 over the last 16 years. Recovery efforts should continue for common terns with the goal of delisting. Sandhill cranes were last recorded nesting in Ohio in 1926 until a nest was confirmed in Wayne County in 1987. Since then cranes have been monitored annually to determine abundance and distribution in the state. Successful nest sites have varied from 1-23 since 1997. Sandhills have been located in 10 counties with an increasingly large non-breeding flock staying at Funk Bottoms Wildlife Area in Wayne County. Continued monitoring is necessary to assess their population status. In addition, more information is needed about the migratory ecology of Ohio sandhill cranes in order to determine if harvest in the southern states will be detrimental to Ohio's flock.

The breeding range of the yellow-bellied sapsucker, a forest-dependent endangered bird, is at its southern edge in Ohio. Nesting pairs of this species are found only in cool, humid microclimates of hemlock forests at scattered locations throughout eastern Ohio. Lark sparrows are at the extreme eastern limit of their range in Ohio and are unlikely to ever occur in viable numbers (>200 breeding pairs). Because Ohio is on the extreme edge of these birds' ranges, it is unlikely that management efforts would result in significant increases in their populations within the state. Therefore, with the exception of efforts to protect occupied areas, minimal management efforts will be directed for these species.

The American bittern, king rail, and black tern declined in Ohio with the loss of wetlands. They now breed in very limited numbers in Ohio, mostly on the shores of western Lake Erie. American bitterns, king rails, and black terns are listed in the "High" and "Highest" categories of Birds of Conservation Concern with the U.S. Fish and Wildlife Service (USFWS) in Bird Conservation Regions (BCR) 13 and 22. King rails have declined significantly in Ohio and over their entire breeding range. The USFWS developed a King Rail Conservation Plan that calls for 250 hectares (617 acres) of additional breeding habitat in Ohio to help

increase the Midwestern population of king rails to 524 individuals. All 3 of these species are considered focal species for monitoring efforts and should be given conservation priority according to the Upper Mississippi Valley/Great Lakes (UMVGL) Waterbird Conservation Plan. Unless the amount of quality wetland habitat is increased considerably, these species will probably not return to viable population levels. Currently habitat that does exist for these species should be protected and improved whenever possible.

West Sister Island in Lake Erie contains the largest colonies of snowy egrets (10-15 pairs) and cattle egrets (8-12 pairs) in the Great Lakes. Although these species nest in low numbers in Ohio, habitat destruction by double-crested cormorants may decrease their numbers further. Control strategies that reduce the impact of cormorants on island vegetation need to be continued.

Northern harriers are associated with large grasslands, wet meadows, wet prairies, pastures, hayfields, and reclaimed surface-mined lands. Their numbers declined with the loss of grassland and wetland habitats, and through persecution. Harriers were rare in the 1950s through the 1980s with a slight increase in the 1990s, although few nests were reported in Ohio. The Breeding Bird Atlas I (1982-1987) reported 28 possible nests, 3 probable, and 4 confirmed nests. The Breeding Bird Atlas II (2006-2011) lists 71 possible nests, 9 probable, and 7 confirmed nests. Northern harriers have declined throughout their range from habitat loss. Management and restoration of large grasslands in Ohio would benefit this species. Continued monitoring is necessary to assess population status.

Surveys for the Loggerhead shrike at former breeding locations and surface-mined lands owned by the Division of Wildlife produced no observations of the species in 2002-2003. The Ohio Breeding Bird Atlas II found 1 confirmed nest of loggerhead shrikes in southwestern Ohio and 4 possible breeding locations in northern counties. They have declined across their range; the USFWS lists the Loggerhead shrike as a Bird of Conservation Concern in BCRs 22 and 28. Declines are believed to be because of habitat loss and possibly poor over-winter survival in the southeastern U.S.

Rapid declines of remnant populations of Bewick's wrens occurred from the mid-1950s to the mid-1960s. They were extremely rare by the 1990s. The 1982-1987 Breeding Bird Atlas verified 3 breeding pairs during this time, and summarized that Ohio probably had a maximum of 5 breeding pairs annually across the state. Only 1 possible nest was located during the Breeding Bird Atlas II in northern Ohio. Declines are believed to be from interspecific competition with house wrens and habitat loss. The USFWS lists Bewick's wrens as species of Conservation Concern in BCRs 13 and 28. Bewick's wrens are now believed to be extirpated from Ohio.

The golden-winged warbler, once locally common in the Oak Openings region, has been likely extirpated from the state. No nests were recorded in the 1980s and only 1 nest was recorded in the 1990s. The Breeding Bird Atlas II (2006-2011) has recorded 3 possible and 2 probable nests but no nests that were confirmed. Golden-winged warblers are a red list species on the American Bird Conservancy and National Audubon Society's Watchlist (i.e., declining rapidly and/or have very small populations or limited ranges and face major conservation threats). Declines have been caused by habitat loss, competition and hybridization with the blue-winged warbler, and nest site parasitism by brown-headed cowbirds.

The piping plover is a federally endangered species. Habitat loss from development, high water levels, vegetation encroachment, disease, and human disturbance are threats to this species. Piping plovers usually require about 30m of open sandy beach for nesting. Areas of Erie and Lake Counties have been designated as Critical Habitat under the Endangered Species Act. "Critical Habitat" identifies areas important to the recovery of a listed species. The piping plover population has been increasing slightly in the Great Lakes region from 51-63 pairs, 2002-2008, and its distribution has expanded from Michigan to Wisconsin and Ontario, Canada. In 2009 a nest was found in Illinois along the Lake Michigan shoreline. No piping plovers currently nest in Ohio, however, birds are regularly observed during migration. Areas in Ohio designated as Critical Habitat receive considerable recreational use and are near residential development. Options should be considered for protection of these areas so that if populations continue to expand there are available nesting sites along Ohio's Lake Erie coastline.

The Kirtland's warbler is a federally endangered species that migrates over Ohio to its breeding areas in Michigan. Kirtland's warblers are rarely seen in Ohio. Although there are undocumented sightings almost annually, only about 16 records have been confirmed since 1980.

Threatened Birds

The upland sandpiper is a grassland bird that was very numerous after the forests of pre-settlement Ohio were replaced by open fields. However, the conversion of grassland to crops and market hunting severely reduced their population. Upland sandpipers require a variety of grassland heights for nesting, brood rearing and foraging. The Breeding Bird Atlas I found 5 possible, 8 probable, and 10 confirmed nests from 1982-1987. The Breeding Bird Atlas II so far has documented 1 possible nest, 13 probable nests, and 1 confirmed upland sandpiper nest, 2006-2010. The USFWS lists the upland sandpiper as a species of Conservation Concern in BCRs 13, 22 and 28.

Black-crowned night herons are considered a focal species for monitoring efforts and should be given high priority according to the UMVGL Waterbird Conservation Plan for monitoring in the Great Lakes. The plan calls for increasing populations in BCRs 13 and 22 by managing and protecting high-quality breeding habitats. Succession and damage by double-crested cormorants are currently reducing the vegetation necessary for black-crowned night herons to successfully nest on West Sister Island in Lake Erie. Control strategies need to be evaluated that will reduce the impact of succession and cormorants on island vegetation. Protection of nesting sites for Black-crowned night herons on West Sister Island is imperative for the viability of this species in Ohio.

Yellow-crowned night herons were not observed in Ohio until 1928. Their northward expansion increased to several small breeding colonies in the 1950s but halted and began to decline in the late 1960s. The number of yellow-crowned herons nesting in Ohio is believed to be less than 20 pairs. The first Breeding Bird Atlas recorded 5 possible, 1 probable, and 1 confirmed nest from 1982-87. Breeding Bird Atlas II has recorded 4 possible, 1 probable, and 2 confirmed nests so far. Yellow-crowned night herons prefer wooded wetlands, upland woods near rivers and streams, islands, and coastal areas for nesting. The low numbers of this species since its expansion into Ohio suggests that it is on the edge of its range and will probably not become a viable breeding population in the state.

Before Ohio lost 90% of its wetlands, least bitterns were quite common in Ohio. The most dramatic declines were from the 1930s through 1965 when many marshes were drained. Least bitterns still nest in small numbers in the Western Lake Erie marshes and in very local, scattered inland marshes. They are listed as a species of Conservation Concern by the USFWS in BCRs 13 and 22. Least bitterns are considered a focal species and a high priority for monitoring efforts and should be given conservation priority according to the UMVGL Waterbird Conservation Plan.

Once a more common summer resident in the 1830s, only small numbers of dark-eyed juncos breed in northeastern Ohio's hemlock ravines and mature beech-maple forests. They are mainly winter visitors throughout the state. The USFWS region-wide population is declining slightly but is not considered a species of Conservation Concern. Current breeding sites should be protected but no special management considerations are needed at this time.

The first confirmed nests of hermit thrushes in Ohio occurred during the late 1920s and early 1930s at Pymatuning Bog in Ashtabula County. Many years went by with few reports of additional nests until a few small populations began to nest in the 1980s. The population continued to expand, and the Breeding Bird Atlas I (1982-1987) found 3 possible, 1 probable, and 1 confirmed nest. The Breeding Bird Atlas II has recorded 1 observed breeding hermit thrush, 9 possible nests, 20 probable, and 8 confirmed nests. The hermit thrush uses a variety of forest types and forest edges, but mostly hemlock ravines for nesting in Ohio. Opportunities to provide more habitat for the hermit thrush should be taken when possible.

Least flycatchers nest in northeastern Ohio and are expanding in a south-westerly direction across the state. Their numbers are still low, especially in the northwest and southern counties. The Breeding Bird Atlas I listed 35 possible nests, 37 probable, and 5 confirmed nests. Breeding Bird Atlas II has recorded 1

observed nesting least flycatcher, 21 possible nests, 61 probable, and 7 confirmed nests. Least flycatchers prefer secondary woodlands, riparian corridors, and open woods for breeding.

Recovery programs are currently ongoing for bald eagles, peregrine falcons, ospreys, and barn owls. All of these species have been down-listed from Ohio endangered to threatened status because of these recovery efforts. Peregrine falcons and bald eagles were also delisted from the Federal Threatened and Endangered Species list, in 1999 and 2007, respectively. Bald eagles are no longer listed species in Ohio. Federal recovery plans mandate the monitoring of bald eagles and peregrine falcons for a minimum of 5 years after delisting. The bald eagle monitoring plan calls for monitoring nests for 20 years, in 5-year increments starting in 2009. Similarly, the peregrine falcon monitoring plan will monitor selected territories for 5 sampling periods at 3-year intervals through 2015.

A successful osprey hacking program began in 1996 and was discontinued in 2003 when the goal of 20 breeding pairs of ospreys had been reached. Ospreys have increased from a low of 2 nests in 1997 to 82 nests in 2010. Ospreys were down-listed from state endangered to threatened in 2006, and are now unlisted in Ohio. A percentage of nests are monitored each year to continue to evaluate the status of this recovering species. Similarly, over 200 barn owl nest boxes were erected in good quality grassland habitat from 1986-2005. Nesting barn owls increased from a low of 11 nests in 1995 to 83 in 2006. Barn owls were also down-listed from state endangered to threatened in 2006. Nest boxes in areas of known barn owl activity, and areas delineated by a barn owl habitat model developed in 2008, are monitored annually to continue to assess the status of this species. A Barn Owl Conservation Plan was completed in 2006 to document the species status, restoration progress and research priorities.

Bird Species of Concern

Henslow's sparrows (BCRs 13, 22, 28), cerulean warblers (BCRs 13, 22, 28), prothonotary warblers (BCR 22), and sedge wrens (BCR 28) are listed by the USFWS as species of Conservation Concern in several Ohio BCRs. Henslow's sparrows, cerulean warblers and prothonotary warblers are also focal species in the UMVGL Landbird Conservation Plan. The plan lists them as a high priority for monitoring efforts and should be given conservation priority. The National Audubon Society and the American Bird Conservancy's Watch List classifies Henslow's sparrows as red (i.e., declining rapidly and/or have very small populations or limited ranges and face major conservation threats) and cerulean warblers and prothonotary warblers as yellow (i.e., species that are either declining or rare, typically species of national conservation concern). These species should be given priority for monitoring and research to assess their status and to develop habitat plans to protect or restore critical habitats essential to their recovery when possible.

Populations of the northern bobwhite quail were decimated after severe winters in 1977 and 1978. Statewide survey indices have shown some population recovery in southwestern Ohio, but quail numbers have never reached pre-1977 levels. The North American Breeding Bird Survey (BBS) index for bobwhites in Ohio has declined by 6.3% per year since 1966 and by 9.4% annually since 1996. The Breeding Bird Atlas I listed 100 possible, 180 probable, and 122 confirmed nests. Breeding Bird Atlas II has recorded 97 possible, 265 probable, and 17 confirmed nests. The Northern Bobwhite Conservation Initiative (NBCI) plan states that the northern bobwhite may approach extirpation in some states by the end of the decade. The NBCI plan lists population and management goals for BCRs 22, 24, and 28 in Ohio. Monitoring and restoration of bobwhite quail and their habitat should continue, especially in the southwestern portion of the state.

Other species listed under this category should be monitored to assess their population status, and/or develop methods to learn more about their populations in Ohio.

Table 3B. Ohio's Avian Species of Greatest Conservation Need

The conservation status (rank) for each species represents input from professionals in mammal taxonomy, distribution, and abundance. This table represents the best professional knowledge available at this time, and as such is subject to modification as additional data is obtained.

Conservation Status Rank*	Common Name	Scientific Name	Species Listing		Habitat Association	Rangewide Occurrence	Statewide Occurrence	Ohio Population Trend
			Fed	State				
1	Cerulean Warbler	<i>Setophaga cerulea</i>		SC	B	A	B	D
1	Henslow's Sparrow	<i>Ammodramus henslowii</i>		SC	A	A	A	S
3	Northern Bobwhite	<i>Colinus virginianus</i>		SC	A	A	B	D
3	Sedge Wren	<i>Cistothorus platensis</i>		SC	A, C	A	B	S
5	Northern Harrier	<i>Circus cyaneus</i>		E	A, C	A	B	S
5	King Rail	<i>Rallus elegans</i>		E	C	A	C	U
5	Virginia Rail	<i>Rallus limicola</i>		SC	C	A	B	S
5	Sora Rail	<i>Porzana carolina</i>		SC	C	A	B	S
5	Marsh Wren	<i>Cistothorus palustris</i>		SC	C	A	B	S
10	American Bittern	<i>Botaurus lentiginosus</i>		E	C	A	C	S
10	Upland Sandpiper	<i>Bartramia longicauda</i>		E	A	A	B	D
10	Common Tern	<i>Sterna hirundo</i>		E	C	A	D	S
10	Black Tern	<i>Chlidonias niger</i>		E	C, F	A	D	U
10	American Black Duck	<i>Anas rubripes</i>		SI	C	A	B	U
10	Least Bittern	<i>Ixobrychus exilis</i>		T	C	A	B	S
10	Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>		T	C, F	A	C	S
10	Blue-winged Warbler	<i>Vermivora cyanoptera</i>			B	A	A	D
10	Worm-eating Warbler	<i>Helmitheros vermivorum</i>			B	A	B	S
10	Great Egret	<i>Ardea alba</i>		SC	C, F, H	A	A	S
10	Sharp-shinned Hawk	<i>Accipiter striatus</i>		SC	B	A	A	S
10	Common Gallinule	<i>Gallinula galeata</i>			C	A	B	D
10	Prothonotary Warbler	<i>Protonotaria citrea</i>		SC	C	A	A	U
10	Bobolink	<i>Dolichonyx oryzivorus</i>		SC	A	A	A	D

24	Snowy Egret	<i>Egretta thula</i>	E	C, F	A	D	U
24	Loggerhead Shrike	<i>Lanius ludovicianus</i>	E	A	A	D	S
24	American Woodcock	<i>Scolopax minor</i>		B	A	A	S
24	Wood Thrush	<i>Hylocichla mustelina</i>		B	A	A	S
24	Trumpeter Swan	<i>Cygnus buccinator</i>	T	C	B	B	I
24	Blue-winged Teal	<i>Anas discors</i>		A, C	A	B	S
24	Peregrine Falcon	<i>Falco peregrinus</i>	T	I	A	B	I
24	Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>		B	A	A	S
24	Barn Owl	<i>Tyto alba</i>	T	A	A	B	I
24	Eastern Whip-poor-will	<i>Antrostomus vociferus</i>		B	A	B	D
24	Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>		B	A	A	D
24	Prairie Warbler	<i>Setophaga discolor</i>		A, B	A	B	D
36	Lark Sparrow	<i>Chondestes grammacus</i>	E	A, E	B	B	U
36	Acadian Flycatcher	<i>Empidonax vireescens</i>		B	A	A	S
36	Wood Duck	<i>Aix sponsa</i>		B, H	A	A	S
36	Great Blue Heron	<i>Ardea herodias</i>		C, F, H	A	A	S
36	Wilson's Phalarope	<i>Phalaropus tricolor</i>	SI	A, C	B	D	U
36	Yellow-billed Cuckoo	<i>Coccyzus americanus</i>		B, H	A	A	D
36	Short-eared Owl	<i>Asio flammeus</i>	SI	A, C	B	D	U
36	Great Crested Flycatcher	<i>Myiarchus crinitus</i>		B	A	A	S
36	Bell's Vireo	<i>Vireo bellii</i>	SI	B	B	C	U
36	Yellow-throated Vireo	<i>Vireo flavifrons</i>		B	A	A	S
36	Blue-gray Gnatcatcher	<i>Polioptila caerulea</i>		B	A	A	S
36	Veery	<i>Catharus fuscescens</i>		B	A	B	S
36	Black-and-white Warbler	<i>Mniotilta varia</i>		B	A	A	S
36	American Redstart	<i>Setophaga ruticilla</i>		B	A	A	S
36	Vesper Sparrow	<i>Poocetes gramineus</i>		A	A	A	S
36	Eastern Meadowlark	<i>Sturnella magna</i>		A	A	A	D

52	Little Blue Heron	<i>Egretta caerulea</i>		C, F, H	B	D	U
52	Sandhill Crane	<i>Grus canadensis</i>	E	A, C	A	B	I
52	Canvasback	<i>Aythya valisineria</i>		C, J	B	D	U
52	Northern Shoveler	<i>Anas clypeata</i>	SI	A, C	B	C	U
52	Northern Pintail	<i>Anas acuta</i>	SI	A, C	B	R	U
52	Green-winged Teal	<i>Anas crecca</i>	SI	A, C	B	C	U
52	Hooded Merganser	<i>Lophodytes cucullatus</i>		C, H	A	A	U
52	Ring-necked Pheasant	<i>Phasianus colchicus</i>		A	A	A	D
52	Pied-billed Grebe	<i>Podilymbus podiceps</i>		C	A	B	S
52	Yellow-crowned Night-Heron	<i>Nyctanassa violacea</i>	SI	C, H	B	D	U
52	Black Vulture	<i>Coragyps atratus</i>	SC	B, D	B	B	I
52	Bald Eagle	<i>Haliaeetus leucocephalus</i>		B, C, H	A	A	S
52	Red-shouldered Hawk	<i>Buteo lineatus</i>		B	A	A	I
52	Broad-winged Hawk	<i>Buteo platypterus</i>		B	A	A	S
52	American Coot	<i>Fulica americana</i>		C	B	B	S
52	Spotted Sandpiper	<i>Actitis macularius</i>		C, H	A	A	S
52	Wilson's Snipe	<i>Gallinago delicata</i>	SI	C	B	C	U
52	Herring Gull	<i>Larus argentatus</i>		C, F	B	B	S
52	Northern Saw-whet Owl	<i>Aegolius acadicus</i>	SI	B	B	D	U
52	Chuck-will's-widow	<i>Antrostomus carolinensis</i>	SI	B	B	C	S
52	Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	SC	B	A	C	I
52	Pileated Woodpecker	<i>Dryocopus pileatus</i>		B	A	A	I
52	Blue-headed Vireo	<i>Vireo solitarius</i>		B	A	B	I
52	Purple Martin	<i>Progne subis</i>		A	A	A	I
52	Golden-crowned Kinglet	<i>Regulus satrapa</i>	SI	B	B	D	U
52	Hermit Thrush	<i>Catharus guttatus</i>	SI	B	A	B	I
52	Chestnut-sided Warbler	<i>Setophaga pensylvanica</i>		B, E	A	B	S
52	Black-throated Green Warbler	<i>Setophaga virens</i>		B	A	B	S

52	Blackburnian Warbler	<i>Setophaga fusca</i>	SI	B	A	C	S
52	Yellow-throated Warbler	<i>Setophaga dominica</i>		B	A	A	I
52	Pine Warbler	<i>Setophaga pinus</i>		B, H	A	B	S
52	Northern Parula	<i>Setophaga americana</i>		B, H	A	A	I
52	Louisiana Waterthrush	<i>Parkesia motacilla</i>		H	A	A	S
52	Hooded Warbler	<i>Setophaga citrina</i>		B	A	A	S
52	Canada Warbler	<i>Cardellina canadensis</i>	SI	B	A	C	S
52	Summer Tanager	<i>Piranga rubra</i>		B	A	A	S
52	Eastern Towhee	<i>Pipilo erythrophthalmus</i>		B	A	A	S
52	Savannah Sparrow	<i>Passerculus sandwichensis</i>		A	A	A	D
52	Grasshopper Sparrow	<i>Ammodramus savannarum</i>		A	A	A	D
52	Swamp Sparrow	<i>Melospiza georgiana</i>		C	B	A	S
52	Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>		B	B	A	I
52	Blue Grosbeak	<i>Passerina caerulea</i>		B	B	A	I
52	Dickcissel	<i>Spiza americana</i>		A	B	A	S
52	Western Meadowlark	<i>Sturnella neglecta</i>	SI	A	B	D	S
52	Rusty Blackbird	<i>Euphagus carolinus</i>		B, C	B	D	U
52	Mallard	<i>Anas platyrhynchos</i>		A, C	A	A	S
52	Ruffed Grouse	<i>Bonasa umbellus</i>		B	B	B	D
52	Killdeer	<i>Charadrius vociferus</i>		A	A	A	I
52	Eastern Screech-Owl	<i>Megascops asio</i>		B	A	A	D
52	Common Nighthawk	<i>Chordeiles minor</i>		Q	A	A	D
52	Chimney Swift	<i>Chaetura pelagica</i>		I	A	A	S
52	Belted Kingfisher	<i>Megasceryle alcyon</i>		C, H	A	A	S
52	Northern Flicker	<i>Colaptes auratus</i>		B	A	A	D
52	Eastern Wood-Pewee	<i>Contopus virens</i>		B	A	A	S
52	Willow Flycatcher	<i>Empidonax traillii</i>		B, C	A	A	S
52	Brown Thrasher	<i>Toxostoma rufum</i>		B	A	A	S

52	Yellow-breasted Chat	<i>Icteria virens</i>		B	A	A	D
52	Scarlet Tanager	<i>Piranga olivacea</i>		B	A	A	S
52	Indigo Bunting	<i>Passerina cyanea</i>		B	A	A	S
52	Orchard Oriole	<i>Icterus spurius</i>		B	A	A	I
112	Canada Goose	<i>Branta canadensis</i>		A, C, H	A	A	I
112	Wild Turkey	<i>Meleagris gallopavo</i>		B	A	A	S
112	Turkey Vulture	<i>Cathartes aura</i>		B, D	A	A	I
112	Cooper's Hawk	<i>Accipiter cooperii</i>		B	A	A	S
112	Red-tailed Hawk	<i>Buteo jamaicensis</i>		A	A	A	I
112	American Kestrel	<i>Falco sparverius</i>		A	A	A	D
112	Ring-billed Gull	<i>Larus delawarensis</i>		C, F	A	B	I
112	Mourning Dove	<i>Zenaida macroura</i>		A, B	A	A	S
112	Great Horned Owl	<i>Bubo virginianus</i>		B	A	A	S
112	Barred Owl	<i>Strix varia</i>		B	A	A	S
112	Ruby-throated Hummingbird	<i>Archilochus colubris</i>		Q	A	A	S
112	Red-bellied Woodpecker	<i>Melanerpes carolinus</i>		B	A	A	I
112	Downy Woodpecker	<i>Picoides pubescens</i>		B	A	A	S
112	Hairy Woodpecker	<i>Picoides villosus</i>		B	A	A	S
112	Eastern Phoebe	<i>Sayornis phoebe</i>		B	A	A	S
112	Eastern Kingbird	<i>Tyrannus tyrannus</i>		A	A	A	S
112	White-eyed Vireo	<i>Vireo griseus</i>		B	A	A	S
112	Warbling Vireo	<i>Vireo gilvus</i>		B	A	A	S
112	Red-eyed Vireo	<i>Vireo olivaceus</i>		B	A	A	I
112	Blue Jay	<i>Cyanocitta cristata</i>		Q	A	A	S
112	American Crow	<i>Corvus brachyrhynchos</i>		Q	A	A	S
112	Horned Lark	<i>Eremophila alpestris</i>		A	A	A	S
112	Tree Swallow	<i>Tachycineta bicolor</i>		Q	A	A	I
112	Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>		H	A	A	S

112	Bank Swallow	<i>Riparia riparia</i>		H	A	A	S
112	Cliff Swallow	<i>Petrochelidon pyrrhonota</i>		Q	A	A	I
112	Barn Swallow	<i>Hirundo rustica</i>		Q	A	A	I
112	Carolina Chickadee	<i>Poecile carolinensis</i>		B	A	A	I
112	Black-capped Chickadee	<i>Poecile atricapillus</i>		B	A	A	S
112	Tufted Titmouse	<i>Baeolophus bicolor</i>		B	A	A	D
112	White-breasted Nuthatch	<i>Sitta carolinensis</i>		B	A	A	I
112	Carolina Wren	<i>Thryothorus ludovicianus</i>		B	A	A	S
112	House Wren	<i>Troglodytes aedon</i>		Q	A	A	S
112	Eastern Bluebird	<i>Sialia sialis</i>		A	A	A	S
112	American Robin	<i>Turdus migratorius</i>		B	A	A	S
112	Gray Catbird	<i>Dumetella carolinensis</i>		B	A	A	I
112	Northern Mockingbird	<i>Mimus polyglottos</i>		B	A	A	S
112	Cedar Waxwing	<i>Bombycilla cedrorum</i>		B	A	A	S
112	Yellow Warbler	<i>Setophaga petechia</i>		B, C	A	A	D
112	Ovenbird	<i>Seiurus aurocapilla</i>		B	A	A	S
112	Kentucky Warbler	<i>Geothlypis formosa</i>		B	A	A	S
112	Common Yellowthroat	<i>Geothlypis trichas</i>		A, C	A	A	S
112	Chipping Sparrow	<i>Spizella passerina</i>		Q	A	A	I
112	Field Sparrow	<i>Spizella pusilla</i>		A	A	A	S
112	Song Sparrow	<i>Melospiza melodia</i>		Q	A	A	S
112	Northern Cardinal	<i>Cardinalis cardinalis</i>		Q	A	A	S
112	Red-winged Blackbird	<i>Agelaius phoeniceus</i>		A, C	A	A	D
112	Common Grackle	<i>Quiscalus quiscula</i>		Q	A	A	S
112	Brown-headed Cowbird	<i>Molothrus ater</i>		A	A	A	S
112	Baltimore Oriole	<i>Icterus galbula</i>		B	A	A	S
112	House Finch	<i>Haemorhous mexicanus</i>		Q	A	A	D
112	American Goldfinch	<i>Spinus tristis</i>		A	A	A	S

112	Common Moorhen	<i>Gallinula chloropus</i>	SC	C	C	B	U
112	Gadwall	<i>Anas strepera</i>	SI	C, F	C	D	U
112	American Wigeon	<i>Anas americana</i>		C	C	D	U
112	Redhead	<i>Aythya americana</i>	SI	C	C	D	U
112	Common Merganser	<i>Mergus merganser</i>		J, K, L, M, O	B	D	U
112	Ruddy Duck	<i>Oxyura jamaicensis</i>	SI	C	C	C	U
112	Double-crested Cormorant	<i>Phalacrocorax auritus</i>		F,O,P	A	A	I
112	Cattle Egret	<i>Bubulcus ibis</i>	E	A, C, F	B	D	U
112	Green Heron	<i>Butorides virescens</i>		C, H	A	A	S
112	Osprey	<i>Pandion haliaetus</i>		H,O,P	A	B	I
112	Mississippi Kite	<i>Ictinia mississippiensis</i>		B, E	C	D	U
112	Merlin	<i>Falco columbarius</i>		A	C	D	U
112	Purple Gallinule	<i>Porphyrio martinicus</i>		C	C	D	U
112	Black-necked Stilt	<i>Himantopus mexicanus</i>		C	C	D	U
112	Eurasian Collared-Dove	<i>Streptopelia decaocto</i>		Q	B	B	I
112	Long-eared Owl	<i>Asio otus</i>	SI	B	A	D	U
112	Alder Flycatcher	<i>Empidonax alnorum</i>		B, C	A	B	S
112	Least Flycatcher	<i>Empidonax minimus</i>	SI	B	A	B	D
112	Red-breasted Nuthatch	<i>Sitta canadensis</i>	SI	B	A	B	S
112	Brown Creeper	<i>Certhia americana</i>	SI	B	A	B	S
112	Winter Wren	<i>Troglodytes hiemalis</i>	SI	B, G	A	C	I
112	Nashville Warbler	<i>Oreothlypis ruficapilla</i>		B	A	D	U
112	Magnolia Warbler	<i>Setophaga magnolia</i>	SI	B	A	C	S
112	Black-throated Blue Warbler	<i>Setophaga caerulescens</i>	SI	B, G	A	C	S
112	Northern Waterthrush	<i>Parkesia noveboracensis</i>	SI	B, G	A	C	U
112	Mourning Warbler	<i>Geothlypis philadelphia</i>	SI	B, E	A	D	U
112	Clay-colored Sparrow	<i>Spizella pallida</i>		A	B	C	U
112	Dark-eyed Junco	<i>Junco hyemalis</i>	SI	B, G	B	C	U

112	Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>	SI	C	B	D	U
112	Purple Finch	<i>Haemorhous purpureus</i>	SI	B	B	B	S
112	Pine Siskin	<i>Spinus pinus</i>	SI	B	C	B	U
112	Common Raven	<i>Corvus corax</i>	SI	B	B	D	I

* Rank derived from Conservation Status Score calculated using weighted matrix described in the Avian Species Scoring section

Habitat Association Key

- A = grassland
- B = forest
- C = wetlands
- D = caves & mines
- E = oak savannahs
- F = Lake Erie islands
- G = boreal communities
- H = riparian corridors
- I = artificial/man-made environments
- J = Lake Erie
- K = Lake Erie Tributaries
- L = Ohio River
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Statewide Occurrence Key

- A = broadly distributed (>30 counties)
- B = common (11-29 counties)
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Rangewide Occurrence Key

- A = extensive range (multiple states/Canada) – which includes Ohio
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- D = center of range in/near Ohio
- E = very limited range with most of its rangewide population occurring in Ohio

Ohio Population Trend Key

- D = decreasing
- I = increasing
- S = stable
- U = unknown

Species Listing Key

- E = endangered
- T = threatened
- SC = species of concern
- SI = species of interest
- EX = extirpated

Taxa Group: Reptiles

This taxa group consists of snakes, turtles, lizards, and skinks. Habitat alteration, limited mobility, and human persecution have shaped the abundance and distribution of Ohio's reptiles. Much remains to be learned about this species group. Their generally secretive nature makes them prime candidates for habitat loss as well as direct mortality from human activities. Until more distribution information on both the macro and micro-scale is obtained, it will be difficult to protect habitat for some species. Improving public perception of certain species (snakes for example) will help to alleviate human persecution issues. Overall, basic life history and ecology information for reptiles lags behind that of other taxa groups, and limits our ability to conserve many of these species.

Endangered Reptiles

There are 5 endangered reptiles. All have suffered habitat destruction, degradation, and fragmentation, as well as intentional killing and over-collecting. In addition, all have very limited statewide distributions.

Recovery efforts are currently underway for the Eastern massasauga, timber rattlesnake, and the plains garter snake. The Eastern massasauga's habitats are marshes and fens. Natural succession of woody vegetation is a leading cause of recent habitat deterioration throughout its range. Intensive management to retard woody vegetation growth is necessary to maintain suitable habitat conditions. Timber rattlesnakes are a woodland species. The Division's management plan for this species is to protect existing populations as opposed to increasing their occupied range. Public sightings and annual surveys are important sources of information concerning their distribution and relative abundance. Educational programs aimed at segments of the public most likely to encounter rattlesnakes are exceptionally valuable tools in conserving populations of these 2 venomous snakes. The reasons for the decline of the plains garter snake are not fully understood and needs to be determined. Typical grassland management practices (i.e., mowing and burning) may have contributed and have now been modified within the plains garter snake's habitat. The use of captive breeding to augment their declining population is ongoing.

U.S. Fish and Wildlife Service Recovery Plans have been completed for the copperbelly watersnake and Lake Erie watersnake. The principle limiting factor for copperbelly watersnakes is the availability of wetland/upland complexes of sufficient size (hundreds of acres are needed to maintain a population). Additional factors include human persecution, inadequate habitat management, and road-related mortality. The copperbelly watersnake is known only to persist in Ohio in Williams County. The CRP State Acres for Wildlife Enhancement (SAFE) program in Ohio is aimed at creating conservation practices to address high priority objectives through targeted habitat restoration. Williams County is within a priority area, and the copperbelly watersnake is a target species. The primary recovery strategies for the Lake Erie watersnake are to sustain subpopulations (including a stable, persistent subpopulation of snakes on each of the four largest islands), reducing deliberate and accidental human-induced mortality through a vigorous outreach campaign, and maintaining enough essential habitat to support the subpopulations. U.S. Fish & Wildlife Service recovery criteria have been met, and the Lake Erie watersnake has been proposed for delisting at the federal level.

Threatened Reptiles

There are 3 threatened reptiles, all of which have been primarily impacted by habitat loss and alteration, although exploitation from the pet trade has also taken a toll. The Kirtland's snake occupies moist, open meadow or wet prairie habitats. Their occupied Ohio range appears to be declining, but because of their secretive nature and habitat preference, confirmed sightings are infrequent. The ecology and behavior of Kirtland's snake are also poorly understood and warrant further research. The presence of crayfish burrows seems to be an important factor because they are the presumed hibernation, aestivation, and refuge sites. They appear to rely heavily on earthworms as prey. Suitable habitat may also remain unoccupied due to chemical contamination. The spotted turtle is associated with fens. Spotted turtles frequently use a multitude of wetland areas, and shift between them often. Uplands are used extensively, and provide important habitats for nesting, aestivating, and as travel corridors between wetlands. Blanding's turtle is essentially imperiled rangewide in the U.S., and it has been given state conservation status in 14 of the 15 states in which it occurs. Both diet and reproduction are essential elements for the species recovery, however both are tied to the quality and availability of habitat. Current research in Ohio, failed to document recruitment of Blanding's turtles. Management plans for the Kirtland's snake, spotted

turtle, and Blanding's turtle should be focused on maintaining and increasing required habitat components in the landscape.

Reptile Species of Concern

There are 11 reptiles designated as species of concern. Habitat destruction and fragmentation has impacted the eastern box turtle. This isolates individuals from mates and/or food, increases road crossings, and subsequently increases mortality. The commercial pet trade also has had a tremendous impact on eastern box turtles. Their slow reproductive rate increases recovery time for this species. The eastern black kingsnake is limited in Ohio to Adams, Scioto, Jackson, and Lawrence counties, and even in this area it is relatively uncommon. It shows a marked preference for the Scioto and Ohio River bottomlands. The apparent decline in populations across the range is somewhat surprising given their broad diet and habitat capacity. Understanding basic ecological requirements and behavior of eastern kingsnakes is paramount to successful conservation and management in Ohio.

The eastern garter snake in its melanistic form (completely black) is found along the Western Basin of Lake Erie and on the Lake Erie islands, where up to 50% of individuals may be melanistic with the exception of some white on the chin. The preferred habitat for the short-headed garter snake has largely disappeared as old farms have been developed or abandoned and reforested in some areas. A population of short-headed garter snakes in Youngstown (Mahoning County) exists, although it is uncertain whether these snakes were introduced or native. The northern rough greensnake, lives in the extreme southern quarter of the state and is comparatively uncommon throughout its range. It may be reduced in some areas where insecticides are applied. The eastern fox snake occurs along the southwestern shores of Lake Erie, west of Sandusky. Unfortunately, their coppery head often causes them to be killed, mistaken for copperheads.

The queensnake is found in small rivers and streams with rocky shores and bottoms. Rarity is largely due to loss of habitat, and water pollution and sedimentation affect both habitat quality and food availability. This species is known to communally hibernate in old bridge abutments, fractured dams, and in some deep rip-rap, and is vulnerable when actions are taken to repair or remove these structures. Freshly molted crayfish provide more than 90% of the queensnake's diet. Information on other aspects of its natural history is lacking. Results of a recent study suggested an overall decline in the queensnake, but indicated a stable population of northern water snakes at a Sandusky Bay location.

The smooth earthsnake occurs only in the southern quarter of the state, especially in the forested area of Shawnee and Pike state forests. It is extremely secretive and little is known concerning its biology. The smooth greensnake is also comparatively uncommon throughout its range, and has likely been reduced by habitat destruction and widespread use of insecticides. The little brown skink is limited to the extreme southern part of the state where it prefers open areas in or adjacent to woodlands. It is of conservation concern only on the northern edge of its range in southern Ohio.

The Ouachita map turtle appears to have a very limited distribution in Ohio, being found only in the Scioto River and associated oxbows. Status and distribution are poorly understood because of identification problems and confusion in the literature. Research is needed to document the distribution and abundance of this species, and to fill in gaps in our knowledge concerning their natural history.

Table 4R. Ohio's Reptile Species of Greatest Conservation Need

The conservation status (rank) for each species represents input from professionals in mammal taxonomy, distribution, and abundance. This table represents the best professional knowledge available at this time, and as such is subject to modification as additional data is obtained.

Conservation Status Rank*	Common Name	Scientific Name	Species Listing		Habitat Association	Rangewide Occurrence	Statewide Occurrence	Ohio Population Trend
			Fed	State				
1	Shortheaded Garter Snake	<i>Thamnophis brachystoma</i>		SC	B	B	C	I
2	Eastern Smooth Earth Snake	<i>Virginia valeriae valeriae</i>		SC	B	B	B	D
3	Rough Green Snake	<i>Opheodrys aestivus</i>		SC	B, H, K, M, N	B	D	D
4	Spotted Turtle	<i>Clemmys guttata</i>		T	C, G	A	C	D
5	Kirtland's Snake	<i>Clonophis kirtlandii</i>		T	A, C	D	B	D
6	Eastern Hognose Snake	<i>Heterodon platirhinos</i>		SC	B, E, H	A	A	D
7	Midland Smooth Softshell	<i>Apalone mutica mutica</i>			H, K, M, N	A	A	D
8	Butler's Garter Snake	<i>Thamnophis butleri</i>			A	B	C	D
8	Black Racer	<i>Coluber constrictor constrictor</i>			A, B	A	A	D
8	Blue Racer	<i>Coluber constrictor flaviventrus</i>			A	A	A	D
8	Smooth Green Snake	<i>Liochlorophis vernalis</i>		E	A	A	C	D
12	Broadhead Skink	<i>Eumeces laticeps</i>			B	B	C	D
13	Eastern Box Turtle	<i>Terrapene carolina carolina</i>		SC	B	A	B	D
13	Eastern Ribbon Snake	<i>Thamnophis sauritus sauritus</i>			A, C	A	A	D
13	Northern Ribbon Snake	<i>Thamnophis sauritus septentrionalis</i>			A, C	B	B	D
13	Black Kingsnake	<i>Lampropeltis getula nigra</i>		SC	B	B	D	D
17	Northern Copperhead	<i>Agkistrodon contortrix mokasen</i>			B	B	A	S
18	Timber Rattlesnake	<i>Crotalus horridus horridus</i>		E	B	B	C	D
19	Common Map Turtle	<i>Graptemys geographica</i>			C, H, K, M, N	B	C	S
19	Ouachita Map Turtle	<i>Graptemys ouachitensis</i>		SC	H, K, M, N	B	D	D
19	Queen Snake	<i>Regina septemvittata</i>		SC	H, K, M, N	A	A	D
22	Blanding's Turtle	<i>Emydoidea blandingii</i>		T	C	B	C	D

22	Copperbelly Water Snake	<i>Nerodia erythrogaster neglecta</i>	E	E	B, C	A	D	D
24	Northern Ringneck Snake	<i>Diadophis punctatus edwardsii</i>			B	A	A	D
25	Eastern Worm Snake	<i>Carphophis amoenus amoenus</i>			B	A	A	D
25	Midwest Worm Snake	<i>Carphophis amoenus helenae</i>			B	A	A	D
27	Eastern Massasauga	<i>Sistrurus catenatus catenatus</i>		E	C	A	B	D
28	Eastern Milk Snake	<i>Lampropeltis triangulum triangulum</i>			B	A	A	S
29	Northern Redbelly Snake	<i>Storeria occipitomaculata occipitomaculata</i>			B	A	A	S
30	Little Brown Skink	<i>Scincella lateralis</i>		SC	B	B	D	D
31	Red-eared Slider	<i>Trachemys scripta elegans</i>			H, K, M, N	A	A	D
31	Black Rat Snake	<i>Elaphe obsoleta obsoleta</i>			B	A	A	D
33	Eastern Fox Snake	<i>Pantherophis vulpinus</i>		SC	C	B	D	I
34	Common Musk Turtle	<i>Sternotherus odoratus</i>			C, H, K, M, N	A	B	D
34	Five-lined Skink	<i>Eumeces fasciatus</i>			B	A	A	S
36	Eastern Spiny Softshell	<i>Apalone spinifera spinifera</i>			H, K, M, N	A	A	D
37	Common Snapping Turtle	<i>Chelydra serpentina serpentina</i>			Q	A	A	D
37	Northern Fence Lizard	<i>Sceloporus undulatus hyacinthinus</i>			B	A	A	S
39	Eastern Garter Snake	<i>Thamnophis sirtalis sirtalis</i>		SC	Q	A	A	D
40	Midland Painted Turtle	<i>Chrysemys picta marginata</i>			C, H, K, M, N	A	A	I
40	Northern Water Snake	<i>Nerodia sipedon sipedon</i>			C, H, K, M, N	A	A	D
40	Lake Erie Water Snake	<i>Nerodia sipedon insularum</i>		T	F	E	D	S
43	Northern Brown Snake	<i>Storeria dekayi dekayi</i>			B, C	A	A	S
44	Eastern Plains Garter Snake	<i>Thamnophis radix radix</i>		E	A	B	D	D

* Rank derived from Conservation Status Score calculated using Millsap et al. (1990) modified for Ohio

Habitat Association Key

A = grassland
B = forest
C = wetlands
D = caves & mines
E = oak savannahs
F = Lake Erie islands
G = boreal communities
H = riparian corridors
I = artificial/man-made environments
J = Lake Erie
K = Lake Erie Tributaries
L = Ohio River
M = Ohio River Tributaries
N = headwater and small inland streams
O = man-made lakes and ponds
P = natural lakes
Q = generalist

Statewide Occurrence Key

A = broadly distributed (>30 counties)
B = common (11-29 counties)
C = uncommon (6-10 counties)
D = rare (<5 counties)
E = unknown

Rangewide Occurrence Key

A = extensive range (multiple states/Canada) – which includes Ohio
B = periphery of range is in Ohio
C = disjunct from main portion of its range; occurs in Ohio
D = center of range in/near Ohio
E = very limited range with most of its rangewide population occurring in Ohio

Ohio Population Trend Key

D = decreasing
I = increasing
S = stable
U = unknown

Species Listing Key

E = endangered
T = threatened
SC = species of concern
SI = species of interest
EX = extirpated

Taxa Group: Amphibians

Ohio's amphibian taxa group includes 25 species and subspecies of salamanders and 14 species of frogs and toads. The majority of amphibians spend part of their life in aquatic habitats and part of it in terrestrial habitats. This characteristic amplifies the potential impacts of habitat destruction/degradation. Protecting multiple habitat types becomes necessary for species that require different habitats during different portions of their life cycle. That, combined with their generally secretive nature makes this taxa group very vulnerable to the activities of humans on the landscape. Like reptiles, basic life history and ecology information lags behind some of the other taxa groups. Consequently, there is much work to be done to make conservation of amphibians in Ohio as effective as it can be.

Endangered Amphibians

Eastern hellbenders, blue-spotted salamanders, green salamanders, cave salamanders and the Eastern spadefoot are endangered in Ohio because of habitat loss and small populations in few, isolated locations. Eastern hellbenders, the largest amphibian in the state, are found in swift flowing streams in southeast Ohio. Ohio represents the extreme southern edge of the blue-spotted salamander's range, which is found in a few locations in the Oak Openings Region southwest of Toledo, and in Williams County. The green salamander is only known from 3 counties along the Ohio River. The cave salamander is found in limestone areas of 3 southern Ohio counties. Only 30 specimens are known from this state. There are 5 distinct populations of the eastern spadefoot, found in sandy soils associated with river valleys of 7 southern Ohio counties. Protection of the few remaining breeding locations of all 5 of these species will be critical in maintaining existing populations in Ohio.

Threatened Amphibians

The mud salamander has been found in 9 south-central Ohio counties. Ohio represents the northern edge of the mud salamander's range and only 20 voucher specimens exist for this species. Little is known about its life history or current statewide distribution. A survey of historical locations and other areas with suitable habitat should be initiated to better delineate the salamanders occupied range.

Amphibian Species of Concern

The four-toed salamander is the smallest Ohio salamander. It requires mature forests with bogs to complete their life cycle. Specimens have been found in 34 counties, however, its current range and population size needs to be assessed. The Eastern cricket frog is found throughout the western two-thirds of Ohio. Populations have been declining in other Midwestern states. The Ohio Frog and Toad Survey indicates that the Eastern cricket frog is still abundant in southwest Ohio but not in the remainder of its previous range. Surveys should continue to assess the distribution and population status of this species.

Research is also needed to assess the effects of forest management practices on survival and reproduction of all state-listed amphibians.

Table 5A. Ohio's Amphibian Species of Greatest Conservation Need

The conservation status (rank) for each species represents input from professionals in mammal taxonomy, distribution, and abundance. This table represents the best professional knowledge available at this time, and as such is subject to modification as additional data is obtained.

Conservation Status Rank*	Common Name	Scientific Name	Species Listing		Habitat Association	Rangewide Occurrence	Statewide Occurrence	Ohio Population Trend
			Fed	State				
1	Northern Spring Salamander	<i>Gyrinophilus porphyriticus porphyriticus</i>			B	B	B	D
2	Streamside Salamander	<i>Ambystoma barbouri</i>			B, H	A	B	D
3	Kentucky Spring Salamander	<i>Gyrinophilus porphyriticus duryi</i>			B	B	D	D
4	Smallmouth Salamander	<i>Ambystoma texanum</i>			B	A	A	D
5	Mud Salamander	<i>Pseudotriton montanus</i>		T	C	B	D	D
6	Green Salamander	<i>Aneides aeneus</i>		E	B	A	D	S
7	Jefferson Salamander	<i>Ambystoma jeffersonianum</i>			B, C	A	A	D
7	Northern Red Salamander	<i>Pseudotriton ruber ruber</i>			B, H	A	B	S
9	Eastern Tiger Salamander	<i>Ambystoma tigrinum tigrinum</i>			B, C	A	B	D
10	Marbled Salamander	<i>Ambystoma opacum</i>			A, B	A	B	D
11	Four-toed Salamander	<i>Hemidactylium scutatum</i>		SC	B, C, G	A	C	D
12	N. Ravine Salamander	<i>Plethodon richmondi</i>			B	A	B	S
13	Longtailed Salamander	<i>Eurycea longicauda longicauda</i>			B, H	A	A	S
14	Mudpuppy	<i>Necturus maculosus maculosus</i>			K, M, N, O	A	A	D
15	Cave Salamander	<i>Eurycea lucifuga</i>		E	D	B	D	D
15	Eastern Spadefoot	<i>Scaphiopus holbrookii</i>		E	B, C	A	D	D
17	Northern Dusky Salamander	<i>Desmognathus fuscus fuscus</i>			B, H	A	A	S
18	Mountain Chorus Frog	<i>Pseudacris brachyphona</i>			A	A	B	D
19	Blue-spotted Salamander	<i>Ambystoma laterale</i>		E	E	B	C	D
20	Red-spotted Newt	<i>Notophthalmus viridescens viridescens</i>			B, C	A	A	S
20	Western Chorus Frog	<i>Pseudacris triseriata triseriata</i>			A, B	A	B	D
22	Wood Frog	<i>Rana sylvatica</i>			B	A	A	D

23	Eastern Hellbender	<i>Cryptobranchus alleganiensis</i>	E	M	A	C	D
24	Cope's Gray Treefrog	<i>Hyla chrysoscelis</i>		B	A	B	S
24	Gray Treefrog	<i>Hyla versicolor</i>		A, B	A	A	S
24	Mountain Dusky Salamander	<i>Desmognathus ochrophaeus</i>		B	B	C	I
24	Pickereel Frog	<i>Rana palustris</i>		B, C	A	B	S
28	Northern Leopard Frog	<i>Rana pipiens</i>		A, C	A	A	D
28	Northern Slimy Salamander	<i>Plethodon glutinosus</i>		B, C	A	B	S
28	Spotted Salamander	<i>Ambystoma maculatum</i>		B, E, H	A	A	D
31	Fowler's Toad	<i>Bufo woodhousii fowleri</i>		H	A	A	D
32	N. Two-lined Salamander	<i>Eurycea bislineata</i>		B, C	A	B	I
32	S. Two-lined Salamander	<i>Eurycea cirrigera</i>		B, H	A	A	I
34	Northern Spring Peeper	<i>Pseudacris crucifer crucifer</i>		B, C	A	A	S
34	Redback Salamander	<i>Plethodon cinereus</i>		B, C	A	A	S
36	Blanchard's Cricket Frog	<i>Acris crepitans blanchardi</i>		C, H	A	B	D
37	American Toad	<i>Bufo americanus</i>		Q	A	A	S
38	Green Frog	<i>Rana clamitans melanota</i>		Q	A	A	I
39	Bullfrog	<i>Rana catesbeiana</i>		Q	A	A	I

* Rank derived from Conservation Status Score calculated using Millsap et al. (1990) modified for Ohio

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Taxa Group: Fish

Two fish species that once occurred in Ohio are listed as extinct. The last reported collections for the extinct harelip sucker are from the Blanchard and Auglaize rivers in 1893, and the last blue pike was collected from Lake Erie in the late 1960s. Eight fish species are listed as extirpated, with most of them having been absent for many years, including the diamond darter (last seen in Ohio in 1899), pugnose shiner (1931), longhead darter (1939) and alligator gar (1946). Most extirpated species – including the blackchin shiner and blacknose shiner – are the victims of habitat loss, requiring conditions that no longer exist in much of Ohio. For other species like the Mississippi silvery minnow and spoonhead sculpin, Ohio likely represented the edge of their ranges. The extirpated diamond darter now occupies only a small stretch of the lower Elk River in West Virginia.

Endangered Fish

Twenty fish species are presently listed as endangered in Ohio. Cisco, once the most important commercially harvested species in Lake Erie are now a very rare species, though a small population still remains in the central and eastern basins. The popeye shiner was thought to have disappeared from Ohio prior to 1900 until a population was discovered in Scioto Brush Creek in southern Ohio in the mid 1980's. The shoal chub has not been found in Ohio waters since the early 1980's, the gilt darter since 1893, and the Scioto madtom since 1957 – these species may have become extirpated. Pirate perch had not been collected since 1942, and a reintroduction effort attempted in the 1990s does not appear to have been successful. Lake sturgeon (1971) and shovelnose sturgeon (1939) have been absent from Ohio for many years, but appear to be increasing in the Great Lakes and Ohio River drainage thanks to reintroduction programs.

As is the case with extinct and extirpated species, most of the endangered fish species are suffering from habitat loss/degradation and degraded water quality as development, dams, and agriculture have changed the landscape of Ohio. As expected, the majority of endangered fish are lesser tolerant species requiring clean, clear, often vegetated waters. Many of these now only occur in isolated locations around Ohio (e.g., goldeye, Iowa darter, northern madtom, popeye shiner, pugnose minnow, shortnose gar, spotted gar, spotted darter, western banded killifish). Ohio represents the extreme southern edge of the range of the longnose sucker.

Six of the seven species of lampreys that occur in Ohio are native, and three of those are listed as endangered (Ohio lamprey, northern brook lamprey, mountain brook lamprey). Lampreys require two or three distinctly different habitats that are connected by free flowing (free of dams) stretches of streams. Unfortunately the habitats necessary for lampreys to complete their life cycles have become degraded, and these species are now confined to a few locations around the state. Ohio lampreys are only found in the Ohio River and the lower portion of its tributary streams. Northern brook lampreys have been found in the Grand and St. Joseph Rivers in the Lake Erie drainage and several tributaries to the Scioto River in the Ohio River drainage. However, they have only been found in the upper Grand River in recent years. Mountain brook lampreys are only found in the Mahoning river drainage in Ohio. The only known existing populations are in Eagle Creek and the West Branch of the Mahoning River.

Threatened Fish

Thirteen species of fish are listed as threatened in Ohio, and nearly all are river/stream species whose ranges have decreased as the habitat and water quality that they require has decreased. The bigeye shiner is one of several minnow species that were once much more abundant in Ohio than they are today. This species was once well distributed in the historically small, meandering, clear prairie streams of western Ohio. Today these streams have mostly been converted to straight muddy drainage ditches that are uninhabitable to this and other sensitive species. Bigmouth shiners have a small distribution in Ohio, primarily in the Rocky and Black river drainages of Lake Erie.

The western tongue-tied minnow is only found in southwest Ohio in the Great Miami and Little Miami River systems. They were once rather well distributed in the upper portion of both of these river systems but today can only be found in the Mad River and tributaries of it in the Great Miami River system. The mountain madtom had been reduced to a few remnant populations but because of improvements in water quality they appear to be making a comeback. Populations now occur in parts of the Little Miami,

Muskingum, Walhonding, and Tuscarawas Rivers. Paddlefish are found in the Ohio River and up to the first dam on its larger tributaries. Historically they were much more common and could be found as far up the Ohio River as Pennsylvania. It is also probable that there was a small population in Lake Erie at one time. Today paddlefish are most common in the Ohio River from Portsmouth downstream to the Indiana state line. Blue suckers are not uncommon in fast, gravel-bottomed chutes of the lower Scioto River, from around Piketon downstream to the Ohio River. They are also present in the lower portions of the Great and Little Miami, Muskingum, and Hocking Rivers, and can be found in the Ohio River.

Historically the tippecanoe darter was found in the Walhonding River, the lower Muskingum River, and in the Olentangy River, Big Walnut Creek, Big Darby Creek, and Deer Creek of the Scioto River drainage. Since the early 1980's they have expanded their distribution in the Scioto River drainage. Unfortunately they appear to have been extirpated from the Muskingum River drainage with the exception of a small population in the lower end of the Muskingum River.

Channel darters appear to be a victim of invasive species in a significant portion of their range. Up until the invasion of the round goby, large schools of channel darters could be observed on the bars around the Lake Erie islands. It is now likely the Lake Erie population no longer exists. They are still found in the Ohio River and the lower portion of the Scioto, Muskingum and Hocking Rivers. There may also be a small remnant population in the lower Maumee and Sandusky Rivers in the Lake Erie drainage. Greater redhorse are now largely confined to limited portions of the Sandusky, Maumee, and Grand River systems where water quality and substrates are less impacted by local land use. The river darter has historically been found in some of the larger western Lake Erie tributaries, but there are no recent reports of them from the Lake Erie drainage. This species is now limited to the Ohio River and the lower portion of larger tributaries such as the Scioto, Hocking, and Muskingum Rivers. The American eel which spends most of its life in freshwater, but spawns in saltwater may be found at times in any stream in Ohio and in Lake Erie. Sightings of this catadromous species are rare however.

The brook trout is the only trout native to the inland waters of Ohio. In the mid 1800's it was found in the northeastern portion of the state in the Chagrin River and in a small creek in Ashtabula County. It was thought that the native populations had all died out until 1972 when they were found in two small streams in the Chagrin River watershed. A reintroduction program which began in 1997 has resulted in the establishment of 10 reproducing populations in northeast Ohio. Lake chubsuckers, because of the destruction of much of the permanent wetlands this species relies on, are one of the rarest sucker species found in Ohio. They are primarily found in glacially formed natural lakes often referred to as pothole or kettle lakes. Historically they were found in Nettle Lake of extreme NW Ohio, a group of small pothole lakes between Bellefontaine and Urbana Ohio, and in many small pothole lakes in NE Ohio. Today they are still present in those natural lakes that have clear water and an abundance of aquatic vegetation. Additionally, they can be found in a few larger wetlands like Killbuck marsh, and small populations may still be present in Nettle Lake, Indian Lake, and parts of the Portage Lakes.

Fish Species of Concern

Nine fish are listed as species of concern. Three species, (lake trout, lake whitefish, and burbot) are unique to Lake Erie, and are all on the southern edge of their range there. Lake trout and burbot have never been extremely abundant, but lake whitefish made a substantial contribution to the Lake Erie commercial harvest in the late 1800's and early 1900's. Today all three species are still present in some numbers, and restoration programs for lake trout are now underway. Historically, the muskellunge was abundant in the bays and tributaries of Lake Erie and in many streams in the Ohio River drainage. Numbers of these Ohio native muskellunge are greatly reduced today.

River redhorse and the eastern sand darter are found in rivers/streams of both the Lake Erie and Ohio River drainage in Ohio. Both species are considered intolerant, and have consequently undergone range reductions. Least darters are relatively well distributed in the western part of Ohio in small sluggish prairie streams that have clear water and significant aquatic vegetation. They are also found in natural lakes and permanent wetlands that also contain large amounts of aquatic vegetation and clear water. Historically this species was probably more widely distributed where appropriate habitat was present.

Longnose dace are found in rocky streams with extremely steep gradients and very swift currents. They can also be found in large lakes with rocky wave swept shorelines. In Ohio they are found in small streams in the Chagrin River watershed, a few other small eastern Lake Erie tributaries, eastern Lake Erie, and in several small streams draining into the upper Ohio River along the eastern edge of the state. Blue catfish are found in the Ohio River and the lower portion of its larger tributaries. They are most common in the Ohio River from Portsmouth downstream to Cincinnati. The Ohio River represents the northern edge of the range for this species.

Table 6F. Ohio's Fish Species of Greatest Conservation Need

The conservation status (rank) for each species represents input from professionals in mammal taxonomy, distribution, and abundance. This table represents the best professional knowledge available at this time, and as such is subject to modification as additional data is obtained.

Conservation Status Rank*	Common Name	Scientific Name	Species Listing		Habitat Association	Rangewide Occurrence	Statewide Occurrence	Ohio Population Trend
			Fed	State				
1	Scioto Madtom	<i>Noturus trautmani</i>	E	E	N	E	D	U
2	Diamond Darter	<i>Crystallaria cincotta</i>		EX	L, M	B	n/a	n/a
3	Popeye Shiner	<i>Notropis ariommus</i>		E	K	A	D	U
4	Longhead Darter	<i>Percina macrocephala</i>		EX	N	A	n/a	n/a
5	American Eel	<i>Anguilla rostrata</i>		T	K, L, M	A	C	U
6	Gilt Darter	<i>Percina evides</i>		E	L	A	D	U
7	Western Tonguetied Minnow	<i>Exoglossum laurae</i>		T	N	A	D	U
8	Spotted Darter	<i>Etheostoma maculatum</i>		E	N	A	D	S
9	Paddlefish	<i>Polyodon spathula</i>		T	L, M	A	B	I
10	Northern Madtom	<i>Noturus stigmosus</i>		E	N	A	D	D
11	Shoal Chub	<i>Macrhybopsis hyostoma</i>		E	L, M	B	D	D
12	Bigeye Shiner	<i>Notropis boops</i>		T	N	A	D	S
13	Ohio Lamprey	<i>Ichthyomyzon bdellium</i>		E	L, M, N	A	D	S
14	Spoonhead Sculpin	<i>Cottus ricei</i>		EX	J	B	n/a	n/a
15	Alligator Gar	<i>Lepisosteus spatula</i>		EX	L, M	B	n/a	n/a
16	Mountain Brook Lamprey	<i>Ichthyomyzon greeleyi</i>		E	N	A	D	S
17	Lake Sturgeon	<i>Acipenser fulvescens</i>		E	J, K, L, M	A	D	S
18	Blue Sucker	<i>Cycleptus elongatus</i>		T	L, M	A	D	S
19	Shovelnose Sturgeon	<i>Scaphirhynchus platyrhynchus</i>		E	L, M	A	C	S
20	Tippecanoe Darter	<i>Etheostoma tippecanoe</i>		T	M, N	A	D	S
21	Mountain Madtom	<i>Noturus eleutherus</i>		T	N	A	D	S
22	Blacknose Shiner	<i>Notropis heterolepis</i>		EX	J, K, N, P	A	n/a	n/a
23	Northern Brook Lamprey	<i>Ichthyomyzon fossor</i>		E	N	A	D	S

24	Mottled Sculpin	<i>Cottus bairdi</i>		J, N	A	B	S
25	Bluebreast Darter	<i>Etheostoma camurum</i>		L, M, N	A	C	I
26	Silver Lamprey	<i>Ichthyomyzon unicuspis</i>		J, K, N	A	C	S
27	Pugnose Minnow	<i>Opsopoeodus emiliae</i>	E	N	A	D	D
28	American Brook Lamprey	<i>Lampetra appendix</i>		N	A	B	I
29	Eastern Sand Darter	<i>Ammocrypta pellucida</i>	SC	J, K, L, M, N	A	C	S
30	Western Banded Killifish	<i>Fundulus diaphanus menona</i>	E	J, K, N, P	A	D	D
31	Redside Dace	<i>Clinostomus elongatus</i>		N	A	B	I
32	Gravel Chub	<i>Erimystax x-punctatus</i>		M, N	A	C	S
33	Least Darter	<i>Etheostoma microperca</i>	SC	N	A	C	I
33	Cisco	<i>Coregonus artedi</i>	E	J	B	C	D
35	Least Brook Lamprey	<i>Lampetra aepyptera</i>		N	A	B	I
36	Burbot	<i>Lota lota</i>	SC	J	A	C	S
36	Silver Chub	<i>Macrhybopsis storeriana</i>		J, K, L, M	A	B	I
38	Iowa Darter	<i>Etheostoma exile</i>	E	J, K, N, P	A	D	S
39	Goldeye	<i>Hiodon alosoides</i>	E	L, M	A	C	S
39	Rosyside Dace	<i>Clinostomus funduloides</i>		N	B	D	S
41	Streamline Chub	<i>Erimystax dissimilis</i>		M, N	A	D	S
42	Bigeye Chub	<i>Hybopsis amblops</i>		K, M, N	A	A	S
43	Central Mudminnow	<i>Umbra limi</i>		N	A	B	S
44	Channel Darter	<i>Percina copelandi</i>	T	J, K, L, M	A	C	S
45	Spotted Gar	<i>Lepisosteus oculatus</i>	E	J, K	A	C	D
46	Lake Chubsucker	<i>Erimyzon sucetta</i>	T	N, O	A	C	D
47	Longnose Sucker	<i>Catostomus catostomus</i>	E	J	B	D	D
48	Bigmouth Shiner	<i>Notropis dorsalis</i>	T	N	A	D	S
48	Black Redhorse	<i>Moxostoma duquesnei</i>		J, K, L, M, N	A	B	I
50	Mooneye	<i>Hiodon tergisus</i>		J, K, L, M	A	B	S
51	Pirate Perch	<i>Aphredoderus sayanus</i>	E	N, P	B	D	D

52	Silver Redhorse	<i>Moxostoma anisurum</i>		K, L, M, N	A	B	I
53	Variegate Darter	<i>Etheostoma variatum</i>		M, N	A	B	S
54	Southern Redbelly Dace	<i>Phoxinus erythrogaster</i>		N	A	A	I
55	Greater Redhorse	<i>Moxostoma valenciennesi</i>	T	K, N	A	C	S
56	Black Buffalo	<i>Ictiobus niger</i>		L, M	A	B	S
57	Lake Whitefish	<i>Coregonus clupeaformis</i>	SC	J	A	C	D
58	Dusky Darter	<i>Percina sciera</i>		L, M, N	A	C	S
58	Creek Chubsucker	<i>Erimyzon claviformis</i>		N	A	B	S
60	Shortnose Gar	<i>Lepisosteus platostomus</i>	E	L, M	A	D	S
61	River Darter	<i>Percina shumardi</i>	T	J, K, L, M	A	D	S
62	Mississippi Silvery Minnow	<i>Hybognathus nuchalis</i>	EX	L, M	B	n/a	n/a
63	River Redhorse	<i>Moxostoma carinatum</i>	SC	L, M	A	C	S
63	Smallmouth Redhorse	<i>Moxostoma breviceps</i>		L, M, N	A	B	I
65	Grass Pickerel	<i>Esox americanus vermiculatus</i>		N	A	A	S
66	Brook Stickleback	<i>Culaea inconstans</i>		N	B	B	I
67	Hornyhead Chub	<i>Nocomis biguttatus</i>		N	A	A	I
68	Scarlet Shiner	<i>Lythrurus fasciolaris</i>		M, N	A	B	S
68	Slenderhead Darter	<i>Percina phoxocephala</i>		L, M, N	A	B	I
70	Channel Shiner	<i>Notropis volucellus wickliffi</i>		L, M	A	B	I
70	Brindled Madtom	<i>Noturus miurus</i>		J, K, M, N	A	A	I
72	Highfin Carpsucker	<i>Carpiodes velifer</i>		L, M, N	A	B	I
73	Blue Catfish	<i>Ictalurus furcatus</i>	SC	L, M, O	A	B	S
74	Longnose Dace	<i>Rhinichthys cataractae</i>	SC	J, K, N	A	C	S
74	Orangethroat Darter	<i>Etheostoma spectabile</i>		M, N	A	A	I
76	Spotted Sucker	<i>Minytrema melanops</i>		J, K, L, M, N, O	A	A	I
76	Bowfin	<i>Amia calva</i>		J, K, L, M	A	B	I
78	Stonecat Madtom	<i>Noturus flavus</i>		J, K, M, N	A	A	I
79	River Carpsucker	<i>Carpiodes carpio</i>		L, M	A	B	I

80	River Shiner	<i>Notropis blennioides</i>		L, M	A	B	I
80	Bigmouth Buffalo	<i>Ictiobus cyprinellus</i>		J, K, L, M, O	A	B	I
80	Tadpole Madtom	<i>Noturus gyrinus</i>		J, K, M, N	A	B	I
83	Ghost Shiner	<i>Notropis burchanani</i>		L, M, N	A	C	I
83	Silver Shiner	<i>Notropis photogenis</i>		K, M, N	A	A	I
83	Longnose Gar	<i>Lepisosteus osseus</i>		J, K, L, M, N, O	A	A	I
86	Blackstriped Topminnow	<i>Fundulus notatus</i>		N, O	A	B	I
87	Threadfin Shad	<i>Dorosoma petenense</i>		L, M	A	B	I
88	Smallmouth Buffalo	<i>Ictiobus bubalus</i>		L, M	A	B	I
89	Fantail Darter	<i>Etheostoma flabellare</i>		J, K, L, M, N	A	A	I
89	Golden Redhorse	<i>Moxostoma erythrurum</i>		J, K, L, M, N, O	A	A	I
91	Longear Sunfish	<i>Lepomis megalotis</i>		K, L, M, N	A	A	I
91	Steelcolor Shiner	<i>Cyprinella whipplei</i>		M, N	A	B	I
93	River Chub	<i>Nocomis micropogon</i>		L, N	A	A	I
94	Mimic Shiner	<i>Notropis volucellus</i>		J, K, M, N	A	A	S
95	Greenside Darter	<i>Etheostoma blennioides</i>		J, K, L, M, N	A	A	I
96	Skipjack Herring	<i>Alosa chrysochloris</i>		L, M	A	B	I
97	Bullhead Minnow	<i>Pimephales vigilax</i>		L, M, N	A	C	I
97	Spottail Shiner	<i>Notropis hudsonius</i>		J, K, L	A	B	S
99	Lake Trout	<i>Salvelinus namaycush</i>	SC	J	B	D	S
100	Banded Darter	<i>Etheostoma zonale</i>		L, M, N	A	A	I
100	Rainbow Darter	<i>Etheostoma caeruleum</i>		K, L, M, N	A	A	I
102	Trout Perch	<i>Percopsis omiscomaycus</i>		J, K, L, M, N	A	A	I
103	Common Shiner	<i>Luxilus cornutus</i>		N	A	B	I
103	Rosyface Shiner	<i>Notropis rubellus</i>		K, M, N	A	A	I
103	Blackside Darter	<i>Percina maculata</i>		K, L, M, N	A	A	I
106	Johnny Darter	<i>Etheostoma nigrum</i>		J, K, L, M, N	A	A	I
107	Redfin Shiner	<i>Lythrurus umbratilis</i>		K, M, N	A	B	I

107	Quillback Carpsucker	<i>Carpiodes cyprinus</i>		J, K, L, M, N, O	A	A	I
107	Brook Silverside	<i>Labidesthes sicculus</i>		J, L, N, O, P	A	A	I
107	Chain Pickerel	<i>Esox niger</i>		N, O	B	C	S
111	Chinook Salmon	<i>Oncorhynchus tshawytscha</i>		J, K	C	C	S
111	Coho Salmon	<i>Oncorhynchus kisutch</i>		J, K	C	C	S
111	Pink Salmon	<i>Oncorhynchus gorbuscha</i>		J, K	C	C	S
114	Spotfin Shiner	<i>Cyprinella spiloptera</i>		J, K, L, M, N	A	A	I
115	Shorthead Redhorse	<i>Moxostoma macrolepidotum</i>		J, K, L, M	A	B	S
116	Logperch Darter	<i>Percina caprodes</i>		J, K, L, M, N, O	A	A	I
117	Mosquitofish	<i>Gambusia affinis</i>		N, P	B	D	S
117	Silverjaw Minnow	<i>Notropis buccatus</i>		K, M, N	A	A	I
119	Northern Hogsucker	<i>Hypentelium nigricans</i>		J, K, L, M, N	A	A	I
120	Brown Bullhead	<i>Ameiurus nebulosus</i>		J, K, L, M, N, O	A	A	S
120	Yellow Bullhead	<i>Ameiurus natalis</i>		J, K, L, M, N, O	A	A	S
120	Central Stoneroller	<i>Campostoma anomalum</i>		K, L, M, N	A	A	I
123	Brook Trout	<i>Salvelinus fontinalis</i>	T	N	A	D	S
124	Sand Shiner	<i>Notropis stramineus</i>		J, K, L, M, N	A	A	I
124	Western Blacknose Dace	<i>Rhinichthys atratulus</i>		N	A	A	I
124	Northern Studfish	<i>Fundulus catenatus</i>		M, N	A	C	I
127	Emerald Shiner	<i>Notropis atherinoides</i>		J, K, L, M, N	A	A	I
127	Striped Shiner	<i>Luxilus chrysocephalus</i>		J, K, L, M, N	A	A	I
129	Golden Shiner	<i>Notemigonus crysoleucas</i>		J, K, L, M, N, O	A	A	I
130	Black Bullhead	<i>Ameiurus melas</i>		J, K, L, M, N, O	A	A	S
131	Pugnose Shiner	<i>Notropis anogenus</i>	EX	J, K	B10	n/a	n/a
132	Creek Chub	<i>Semotilus atromaculatus</i>		J, K, L, M, N	A	A	I
132	White Catfish	<i>Ictalurus catus</i>		L	C	D	S
132	Freshwater Drum	<i>Aplodinotus grunniens</i>		J, K, L, M	A	A	I
135	Rock Bass	<i>Ambloplites rupestris</i>		J, K, L, M, N, O, P	A	A	I

135	Bluntnose Minnow	<i>Pimephales notatus</i>		J, K, L, M, N	A	A	I
137	White Sucker	<i>Catostomus commersoni</i>		J, K, L, M, N, O	A	A	I
137	Suckermouth Minnow	<i>Phenacobius mirabilis</i>		K, M, N	A	A	I
139	Pumpkinseed Sunfish	<i>Lepomis gibbosus</i>		L, O	A	A	S
139	Fathead Minnow	<i>Pimephales promelas</i>		J, K, L, M, N, O	A	A	I
141	Flathead Catfish	<i>Pylodictis olivaris</i>		K, L, M, N, O	A	A	I
142	Warmouth	<i>Lepomis gulosus</i>		K, L, M, O, P	A	A	I
143	Sauger	<i>Sander canadense</i>		J, K, L, M	A	B	I
144	Spotted Bass	<i>Micropterus punctulatus</i>		L, M, O	A	B	I
145	Northern Pike	<i>Esox lucius</i>		J, L, K, N, O	B	C	U
146	Rainbow Smelt	<i>Osmerus mordax</i>		J	A	B	I
147	Green Sunfish	<i>Lepomis cyanellus</i>		J, K, L, M, N, O, P	A	A	I
148	Orangespotted Sunfish	<i>Lepomis humilis</i>		J, K, L, M, N, O, P	A	A	I
148	Blackchin Shiner	<i>Notropis heterodon</i>	EX	J, K	B	n/a	n/a
150	Rainbow Trout	<i>Oncorhynchus mykiss</i>		J, K, N	A	B	I
151	Smallmouth Bass	<i>Micropterus dolomieu</i>		J, K, L, M, N, O, P	A	A	I
152	Ohio Muskellunge	<i>Esox masquinongy ohioensis</i>	SC	L, M, N	E	B	U
153	Channel Catfish	<i>Ictalurus punctatus</i>		J, K, L, M, N, O	A	A	I
154	Walleye	<i>Sander vitreus</i>		J, K, L, O	A	A	D
155	White Bass	<i>Morone chrysops</i>		J, K, L, M, N, O	A	A	S
156	Striped Bass	<i>Morone saxatilis</i>		L	A	C	S
157	Gizzard Shad	<i>Dorosoma cepedianum</i>		J, K, L, M, N, O	A	A	I
158	Redear Sunfish	<i>Lepomis microlophus</i>		L, O	B	B	S
159	Bluegill Sunfish	<i>Lepomis macrochirus</i>		J, K, L, M, O, P	A	A	I
160	Largemouth Bass	<i>Micropterus salmoides</i>		J, K, L, M, O, P	A	A	I
161	Black Crappie	<i>Pomoxis nigromaculatus</i>		J, K, L, M, O, P	A	A	I
162	Yellow Perch	<i>Perca flavescens</i>		J, K, L, O	A	A	S
163	White Crappie	<i>Pomoxis annularis</i>		J, K, L, M, O, P	A	A	I

164	Brown Trout	<i>Salmo trutta</i>		J, K, N	A	B	I
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* Rank derived from Conservation Status Score calculated using Millsap et al. (1990) modified for Ohio

Habitat Association Key

- A = grassland
- B = forest
- C = wetlands
- D = caves & mines
- E = oak savannahs
- F = Lake Erie islands
- G = boreal communities
- H = riparian corridors
- I = artificial/man-made environments
- J = Lake Erie
- K = Lake Erie Tributaries
- L = Ohio River
- M = Ohio River Tributaries
- N = headwater and small inland streams
- O = man-made lakes and ponds
- P = natural lakes
- Q = generalist

Statewide Occurrence Key

- A = broadly distributed (>30 counties)
- B = common (11-29 counties)
- C = uncommon (6-10 counties)
- D = rare (<5 counties)
- E = unknown

Rangewide Occurrence Key

- A = extensive range (multiple states/Canada) – which includes Ohio
- B = periphery of range is in Ohio
- C = disjunct from main portion of its range; occurs in Ohio
- D = center of range in/near Ohio
- E = very limited range with most of its rangewide population occurring in Ohio

Ohio Population Trend Key

- D = decreasing
- I = increasing
- S = stable
- U = unknown

Species Listing Key

- E = endangered
- T = threatened
- SC = species of concern
- SI = species of interest
- EX = extirpated

Taxa Group: Mussels

In light of their historical decreasing abundance and distribution, mussels are generally considered to be the most imperiled group of organisms in North America. In Ohio, over half of our native mussel species are now listed (24 endangered, 4 threatened, 8 species of concern), extirpated (11), or extinct (6). Habitat degradation/destruction and harvest have historically been the primary culprits in the decline of mussel species, and recently ANS in the form of zebra mussels have contributed.

Ohio has an especially rich heritage of freshwater mussels, from both a biological and a historical perspective. Eighty species have been reported from the state. This number represents 27% of all mussel species known to be from North America (Watters et al. 2009). Major factors responsible for the decline in mussel species diversity and distribution have been the construction of impoundments, dredging of streams for navigation and flood control, sediments from agricultural and construction activities, and the addition of a wide spectrum of solid, semisolid, and liquid waste materials from the industries of a rapidly growing human population (Watters et al. 2009). Mussel research in Ohio has focused primarily on trying to stem the tide of extirpations – consequently listed mussel species have been at the forefront of most of these efforts. Recent research has included the construction of refugia for mussel species facing extirpation due to the expansion of the zebra mussel, laboratory efforts to identify hosts for imperiled mussel species, captive rearing of listed species, and reintroduction efforts.

The following species information has been assembled from Watters (1992,1995), Watters et al. (2009), and the USFWS Midwest Endangered Species website at <http://www.fws.gov/midwest/endangered/index.html> unless otherwise noted.

Endangered Mussels

The northern riffleshell was historically found in the Ohio River and Maumee River drainages, and in a few tributaries of western Lake Erie. Today, the northern riffleshell occurs only in Big Darby Creek. Similarly, the clubshell historically was commonly found in the Ohio River basin and tributaries of western Lake Erie. Presently it is known from relatively few streams in Ohio, including Big Darby Creek. Efforts to augment the Big Darby Creek population of both the northern riffleshell and clubshell began in 2008 with the translocation of mussels from Pennsylvania.

The rabbitsfoot was once common in Lake Erie and Ohio River drainages. Today it is known only from Fish Creek, Killbuck Creek, Big Darby Creek, Little Darby Creek, and the Walhonding River. The rayed bean historically occurred in parts of the upper and lower Great Lakes systems, and throughout most of the Ohio and Tennessee River systems. It was common in many Ohio River system streams, and the population in Lake Erie was once considerable (but has been eliminated by the zebra mussel). Today the distribution of the rayed bean has been limited to Swan Creek, Fish Creek, Blanchard River, Tymochtee Creek, Walhonding River, Mill Creek, Big Darby Creek, Scioto Brush Creek; Great Miami River, Little Miami River (including the East Fork), and Stillwater River.

The Snuffbox has been historically found in both the Lake Erie and Ohio River drainages. It has declined rangewide and is now estimated to occupy about 38 percent of originally occupied streams. It is estimated that total range reduction and overall population losses for the snuffbox each approximate 90 percent. Its current distribution Ohio is now limited to the Grand River, Ohio River, Muskingum River, Walhonding River, Killbuck Creek, Olentangy River, Big Darby Creek, Little Darby Creek, Salt Creek, Scioto Brush Creek, South Fork of Scioto Brush Creek, Little Miami River, and Stillwater River. Most populations are small and isolated, further increasing their risk of extinction.

The white cat's paw is currently known to exist only in a 3-mile portion of Fish Creek in Williams County in northwest Ohio. Records indicate that the white cat's paw historically occurred in the Maumee and St. Joseph rivers, and Fish Creek. It may have also occurred in the Ohio River. The last observation of a live white cat's paw pearly mussel occurred in 1999. The eastern pondmussel is present in Lake Erie and the Cuyahoga River, the Bass Islands of Lake Erie, and much of Lake Erie proper. Previous records from the Muskingum River are thought to be erroneous. Invasive zebra mussels are a major threat to this species in the lower Great Lakes. The purple lilliput is very rare if not extirpated. It was previously found in the

Maumee River drainage (Fish Creek, St. Joseph River, Blanchard River). Also a single record for the Little Miami River exists.

The fanshell historically occurred in the Ohio River and many of its large tributaries in Ohio. Presently, the fanshell is believed to be reproducing in only three rivers in Kentucky, Tennessee and Virginia. A few small (likely nonreproducing) populations (based on the collection of a few old specimens in the 1980s) may still persist in the Muskingum River. The pink mucket was historically found in the Ohio River tributaries in Ohio, but may now be extirpated in Ohio. The purple cat's paw historically occurred in the Ohio River and its larger tributaries in Ohio. Today it is one of the rarest mussels, considered to be on the brink of extinction. When listed as endangered in 1990 it was considered functionally extinct. However in 1994 a reproducing population was discovered in Killbuck Creek in northeast Ohio.

Historically, the sheepsnose occurred in the Ohio River drainage and tributaries including the Muskingum, Tuscarawas, Walhonding, Mohican, Scioto, and Little Miami rivers. Today the sheepsnose is found (but rare) in most mainstem pools of the Ohio River. Two additional rivers, the Muskingum River and its tributary the Walhonding River, have unknown populations. The ebonyshell is now extirpated from the Scioto River (where it formerly occurred up to Columbus), the lower Muskingum River, and much of the Ohio River. The butterfly is presently limited to the lower Muskingum River and Ohio River, but can be locally common.

The elephantear is common in the Ohio River and rarer in the upstream sections of smaller tributaries, but does not reach the Lake Erie drainage. It historically was found in the Scioto River to Columbus and Tuscarawas River at New Philadelphia. The longsolid is believed extirpated from the Scioto River (where it formerly occurred up to Columbus), and Great Miami River (only a single record known). It is now limited to the Muskingum River system where it is rare, including Tuscarawas and Walhonding Rivers. The pocketbook was once found in larger creeks and rivers throughout Ohio, but today may only occur in the Muskingum and Scioto River drainages (where it is rare), and perhaps Ohio Brush Creek. It is extirpated from the Black River as well as the Great Miami River.

The yellow sandshell is now extirpated from the state except for one site in lower Ohio Brush Creek where the last live specimen was collected in 1988. It is however, locally common below the Gallipolis Lock and Dam in the Ohio River. The washboard is sporadic in many streams in the southern part of the state, but may only be reproducing in the lower Muskingum River and Ohio River mainstem. It is absent from the Lake Erie drainage. The Ohio pigtoe is limited to the lower Muskingum River, Big Darby Creek, and a few sites in the Ohio River. This species was recently reported for the first time in Ohio Brush Creek (Matter et al., 2006). It is apparently extirpated from a number of other tributaries in Ohio.

The pyramid pigtoe historically occurred in the Ohio River from Marietta to Cincinnati, the Muskingum River to the Tuscarawas River, and the Scioto River in Pickaway County, but today is limited to the lowest reaches of the lower Muskingum River where it is rare. The wartyback historically may have lived in the lowest reaches of larger Ohio River tributaries, but is now limited to the Ohio River at Cincinnati and Ohio Brush Creek. It was historically as far upstream in the Ohio River as Portsmouth, and is now extirpated from the lower Great Miami River, and only a single stray record exists from the Scioto River at Columbus. The little spectaclecase is uncommon and on the northern edge of its range in Ohio, but occurs in Salt Creek, Symmes Creek, Little Miami River, Ohio Brush Creek, Pine Creek, and several other southern Ohio creeks. The monkeyface is now limited to the lower Muskingum and Ohio Rivers.

Threatened Mussels

The black sandshell was historically found in most of Ohio, but now only in the mainstem and west branch of the St. Joseph River, Big Darby Creek, Muskingum River, and Walhonding River. The threehorn wartyback is sporadic in rivers in the southern part of the state, including Ohio Brush Creek (Hoggarth et al. 2007), the Muskingum River, Little Miami River, and Scioto River. It may be extirpated from the Lake Erie drainage. The fawnsfoot is now found in some Ohio River tributaries (Little Miami, Scioto, Muskingum, and Hocking rivers), and western Lake Erie and tributaries (Maumee, Portage, and Vermillion rivers), but is rare in the Ohio River. It was recently found in Ohio Brush Creek (Matter et al. 2006). The pondhorn is localized in prairie areas like Hellbranch Run, Big Darby Creek, Olentangy River

(all upper Scioto drainage), and Salt Creek (lower Scioto drainage) in Jackson County. It has also been found in Lake Erie embayments and tributaries.

Mussel Species of Concern

The purple wartyback is found in the Ohio River drainage (Great and Little Miami, upper Muskingum, and Scioto rivers, and Ohio Brush Creek), and the western Lake Erie drainage (absent from northeast Ohio), including the Maumee and Sandusky rivers. The wavyrayed lampmussel is found only in good quality streams in Ohio River (Big Darby Creek and Scioto River) and Lake Erie tributaries, but absent from unglaciated Ohio. It may be extirpated from the upper region of the Ohio River (Ohio/ West Virginia).

The round pigtoe was historically widespread but has declined, with only a few recent records from the St. Joseph River and tributaries in Williams County, Olentangy River, Big and Little Darby creeks, Caesar Creek, Walhonding River, lower Muskingum River, and western basin of Lake Erie. The salamander mussel is considered rare (but widespread) in Ohio, and is known from the Grand River, St. Joseph River, Big Darby Creek, Little Miami River, Ohio Brush Creek, lower Little Scioto River, Salt Creek, and Symmes Creek (Raccoon Creek basin) (Hoggarth et al. 2007). It was historically recorded from the Ohio Canal at New Philadelphia, Tuscarawas River, Scioto River at Columbus, Sandusky Bay, upper Scioto River, and Licking River. Weathered shells have recently been found in the Muskingum River at Marietta.

The deertoie is uncommon but apparently widespread in Ohio. Likewise, the kidneyshell is widespread but sporadic, though it can be locally abundant in locations like Fish Creek and Big and Little Darby Creeks. The elktoe has over 100 occurrences primarily in larger free-flowing creeks in many Ohio River and Lake Erie tributaries. It is rare in unglaciated Ohio and likely extirpated from Swan Creek (lower Maumee drainage) (Grabarciewicz 2008). The creek heelsplitter is found throughout (but sporadically) the Lake Erie and Ohio River drainages, Swan Creek (lower Maumee drainage) (Grabarciewicz 2008), and Raccoon Creek (Hoggarth et al. 2007).

Table 7M. Ohio's Mussel Species of Greatest Conservation Need

The conservation status (rank) for each species represents input from professionals in mammal taxonomy, distribution, and abundance. This table represents the best professional knowledge available at this time, and as such is subject to modification as additional data is obtained.

Conservation Status Rank*	Common Name	Scientific Name	Species Listing		Habitat Association	Rangewide Occurrence	Statewide Occurrence	Ohio Population Trend
			Fed	State				
1	White Wartyback	<i>Plethobasus cicatricosus</i>	E	EX	L, M	B	n/a	n/a
2	White Catspaw	<i>Epioblasma obliquata perobliqua</i>	E	E	N	E	D	D
3	Purple Catspaw	<i>Epioblasma obliquata obliquata</i>	E	E	N	E	D	D
3	Pink Mucket	<i>Lampsilis abrupta</i>	E	E	L	B	D	U
5	Snuffbox	<i>Epioblasma triquetra</i>		E	J, K, M	C	B	D
6	Long Solid	<i>Fusconaia subrotunda</i>		E	L, M	C	C	D
7	Little Spectaclecase	<i>Villosa lienosa</i>		E	N	B	D	D
8	Pyramid Pigtoe	<i>Pleurobema rubrum</i>		E	L, M	A	D	D
8	EbonysheIl	<i>Fusconaia ebena</i>		E	L, M	A	D	U
8	Elephantear	<i>Elliptio crassidens</i>		E	L, M	A	C	D
8	Eastern Pondmussel	<i>Ligumia nasuta</i>		E	J, K	A	C	D
12	Orange-foot Pimpleback	<i>Plethobasus cooperianus</i>	E	EX	L, M	B	n/a	n/a
13	Ohio Pigtoe	<i>Pleurobema cordatum</i>		E	L, M	A	C	D
13	Sheepnose	<i>Plethobasus cyphus</i>	E	E	L, M	A	D	D
15	Purple Lilliput	<i>Toxolasma lividum</i>		E	K, N	B	D	D
16	Monkeyface	<i>Quadrula metanevra</i>		E	L, M	A	C	D
16	Slippershell Mussel	<i>Alasmidonta viridis</i>			J, K, L, M, N	A	A	D
18	Winged Mapleleaf	<i>Quadrula fragosa</i>	E	EX	L, M	B	n/a	n/a
18	Ring Pink	<i>Obovaria retusa</i>		EX	L, M	B	n/a	n/a
18	Scaleshell	<i>Leptodea leptodon</i>		EX	L, M	B	n/a	n/a
21	Rayed Bean	<i>Villosa fabalis</i>	E	E	J, K, M, N	A	C	D
21	Butterfly	<i>Ellipsaria lineolata</i>		E	L, M	A	C	D

23	Creek Heelsplitter	<i>Lasmigona compressa</i>		SC	J, K, M, N	A	A	D
23	Pondhorn	<i>Unio merus tetralasmus</i>		T	J, N, M	A	D	D
25	Rabbitsfoot	<i>Quadrula cylindrica</i>	T	E	K, M, N	A	C	D
25	Wartyback	<i>Quadrula nodulata</i>		E	L, M	A	D	D
25	Salamander Mussel	<i>Simpsonaias ambigua</i>		SC	K, M, N	A	C	D
25	Fanshell	<i>Cyprogenia stegaria</i>	E	E	L, M	A	D	D
29	Grooved Fingernailclam	<i>Sphaerium simile</i>			Q	A	A	U
29	Long Fingernailclam	<i>Musculium transversum</i>			Q	A	A	U
29	Ridged-back Peaclam	<i>Pisidium compressum</i>			Q	A	A	U
29	River Fingernailclam	<i>Sphaerium fabale</i>			Q	A	A	U
29	River Peaclam	<i>Pisidium fallax</i>			Q	A	A	U
29	Striated Fingernailclam	<i>Sphaerium striatinum</i>			Q	A	A	U
35	Rough Pigtoe	<i>Pleurobema plenum</i>	E	EX	L, M	A	n/a	n/a
35	Clubshell	<i>Pleurobema clava</i>	E	E	K, M, N	A	C	D
37	Yellow Sandshell	<i>Lampsilis teres</i>		E	L, M	A	D	D
37	Purple Wartyback	<i>Cyclonaias tuberculata</i>		SC	K, M, N	A	B	D
39	Spectaclecase	<i>Cumberlandia monodonta</i>		EX	L, M	A	n/a	n/a
40	Washboard	<i>Megalonaias nervosa</i>		E	L, M	B	C	D
40	Threeridge	<i>Amblema plicata</i>			J, K, L, M, N	A	A	D
42	Pocketbook	<i>Lampsilis ovata</i>		E	L, M	A	D	D
42	Round Hickorynut	<i>Obovaria subrotunda</i>			J, K, M, N	A	C	D
42	Cracking Pearlymussel	<i>Hemistena lata</i>	E	EX	L, M	A	n/a	n/a
45	Pond Fingernailclam	<i>Musculium securis</i>			Q	A	A	U
45	Ubiquitous Peaclam	<i>Pisidium casertanum</i>			Q	A	A	U
47	Black Sandshell	<i>Ligumia recta</i>		T	K, M, N	A	B	S
48	Kidneyshell	<i>Ptychobranchus fasciolaris</i>		SC	J, K, M, N	A	A	D
48	Northern Riffleshell	<i>Epioblasma torulosa rangiana</i>	E	E	J, K, L, M	A	D	D
50	Rainbowshell	<i>Villosa iris</i>			J, K, N, M	A	B	D

50	Round Pigtoe	<i>Pleurobema sintoxia</i>		SC	J, K, L, M, N	A	B	D
52	Elktoe	<i>Alasmidonta marginata</i>		SC	J, K, L, M	A	A	D
53	Deertoe	<i>Truncilla truncata</i>		SC	J, K, L, M	A	B	D
53	Fawnsfoot	<i>Truncilla donaciformis</i>		T	J, K, L, M	A	B	D
55	Threehorn Wartyback	<i>Obliquaria reflexa</i>		T	J, K, L, M	A	B	S
56	Fat Pocketbook	<i>Potamilus capax</i>	E	EX	L, M	A	n/a	n/a
56	Cylindrical Papershell	<i>Anodontiodes ferussacianus</i>			J, K, M, N	A	A	S
58	Fluted Shell	<i>Lasmigona costata</i>			J, K, M, N	A	A	D
59	Flat Floater	<i>Anodonta suborbiculata</i>			L, M	A	C	S
60	Creeper	<i>Strophitus undulatus</i>			J, K, L, M, N	A	A	S
61	Spike	<i>Elliptio dilatata</i>			J, K, L, M, N	A	A	S
61	Lilliput	<i>Toxolasma parvum</i>			J, K, L, M, N, O	A	A	S
61	Wabash Pigtoe	<i>Fusconaia flava</i>			J, K, L, M, N	A	A	S
64	Mucket	<i>Actinonaias ligamentina ligamentina</i>		EX	L, M	B	n/a	n/a
64	Mucket	<i>Actinonaias ligamentina carinate</i>			K, L, M	A	B	D
66	Pistolgrip	<i>Quadrula verrucosa</i>			L, M, N	A	B	S
66	Paper Pondshell	<i>Utterbackia imbecillis</i>			J, K, M, N, O	A	A	I
68	Wavyrayed Lampmussel	<i>Lampsilis fasciola</i>		SC	K, L, M, N	A	B	D
69	Hickorynut	<i>Obovaria olivaria</i>		EX	L, M	A	n/a	n/a
69	Rock-pocketbook	<i>Arcidens confragosus</i>		EX	L	A	n/a	n/a
71	Fragile Papershell	<i>Leptodea fragilis</i>			J, K, L, M, O	A	A	S
72	Plain Pocketbook	<i>Lampsilis cardium</i>			J, K, L, M, N	A	A	S
73	Mapleleaf	<i>Quadrula quadrula</i>			J, K, L, M	A	A	I
74	Pimpleback	<i>Quadrula pustulosa</i>			J, K, L, M	A	B	I
74	Pink Papershell	<i>Potamilus ohioensis</i>			L, M	A	B	I
74	White Heelsplitter	<i>Lasmigona complanata</i>			J, K, L, M, N	A	A	I
77	Fatmucket	<i>Lampsilis radiata</i>			J, K, L, M, N, O	A	A	S
77	Giant Floater	<i>Pyganodon grandis</i>			J, K, L, M, N, O	A	A	I

79	Pink Heelsplitter	<i>Potamilus alatus</i>		J, K, L, M	A	A	I
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* Rank derived from Conservation Status Score calculated using Millsap et al. (1990) modified for Ohio

Habitat Association Key

- A = grassland
- B = forest
- C = wetlands
- D = caves & mines
- E = oak savannahs
- F = Lake Erie islands
- G = boreal communities
- H = riparian corridors
- I = artificial/man-made environments
- J = Lake Erie
- K = Lake Erie Tributaries
- L = Ohio River
- M = Ohio River Tributaries
- N = headwater and small inland streams
- O = man-made lakes and ponds
- P = natural lakes
- Q = generalist

Statewide Occurrence Key

- A = broadly distributed (>30 counties)
- B = common (11-29 counties)
- C = uncommon (6-10 counties)
- D = rare (<5 counties)
- E = unknown

Rangewide Occurrence Key

- A = extensive range (multiple states/Canada) – which includes Ohio
- B = periphery of range is in Ohio
- C = disjunct from main portion of its range; occurs in Ohio
- D = center of range in/near Ohio
- E = very limited range with most of its rangewide population occurring in Ohio

Ohio Population Trend Key

- D = decreasing
- I = increasing
- S = stable
- U = unknown

Species Listing Key

- E = endangered
- T = threatened
- SC = species of concern
- SI = species of interest
- EX = extirpated

Taxa Group: Crayfish

The list of crayfishes of the United States and Canada includes 363 taxa. The conservation status categories of "Possibly Extinct", "Endangered", "Threatened", or "Vulnerable" are recognized for 174 taxa (47.9%). Of these, 2 (< 1%) are possibly Extinct, 66 (18.2%) are Endangered, 52 (14.3%) are Threatened, and 54 (14.9%) are Vulnerable. Taxa classified as currently stable total 189 (52.1%). The number of imperiled crayfishes (48%) is on a level similar to that of freshwater mussels (Taylor et al. 2007).

For many crayfishes, limited natural range (e.g., one locality or one drainage system) drives recognition as Endangered or Threatened; but for many others, status assignments continue to be hampered by a lack of current distributional information. While progress has been made in this area, basic ecological and current distributional information are lacking for 60% of the U.S. and Canadian fauna. In addition, threats such as habitat loss and the introduction of nonindigenous crayfishes are greatly magnified by the limited distributions of many species. While taxa with restricted natural ranges are particularly vulnerable to habitat destruction or degradation, the recognized displacement abilities of nonindigenous crayfishes when coupled with a high level of endemism represent a threat of unequalled severity (Taylor et al. 2007).

Twenty-one species of crayfish occur in Ohio – 2 species are listed as threatened (cavespring crayfish and Sloan's crayfish) and 3 are listed as species of concern (Allegheny crayfish, northern clearwater crayfish, and virile crayfish).

Threatened Crayfish

The cavespring crayfish is known from only two sites in unglaciated sections of Ohio (R. Thoma, personal communication), however, rangewide there are no known major threats for this species and population numbers are believed to be stable. Sloan's crayfish, found in southwestern Ohio appears to be experiencing a reduction in its distribution due to the range expansion of the invasive rusty crayfish *Orconectes rusticus* (Thoma and Jezerinac 2000).

Crayfish Species of Concern

Allegheny crayfish is presently found only in the Mahoning River drainage. This species has been negatively impacted by rusty crayfish, and as Thoma and Jezerinac (2000) theorize, its inability to compete with rusty crayfish will likely continue to reduce its abundance in the future. The northern clearwater crayfish is confined to the Lake Erie basin, primarily in northeast Ohio where it is found in the lake and its tributaries. It has either disappeared or been reduced in abundance from much of its original Ohio range (Thoma and Jezerinac 2000). Like a number of crayfish species, it is impacted by water quality as well as the presence of rusty crayfish. The virile crayfish has a very restricted range in Ohio, being found only in the East branch of the Chagrin River. This population in the Chagrin basin is believed to be a relict remaining from a wider distribution that existed when the climate was colder (Thoma and Jezerinac 2000).

Table 8C. Ohio's Crayfish Species of Greatest Conservation Need

The conservation status (rank) for each species represents input from professionals in mammal taxonomy, distribution, and abundance. This table represents the best professional knowledge available at this time, and as such is subject to modification as additional data is obtained.

Conservation Status Rank*	Common Name	Scientific Name	Species Listing		Habitat Association	Rangewide Occurrence	Statewide Occurrence	Ohio Population Trend
			Fed	State				
1	Teays River Crayfish	<i>Cambarus sciotensis</i>			M	E	C	D
2	Norwood River Crayfish	<i>Orconectes raymondi</i>			M	E	D	D
3	Devil Crayfish	<i>Cambarus diogenes</i>			C, N	B	D	D
4	Northern Clearwater Crayfish	<i>Orconectes propinquus</i>		SC	J, K, N	B	C	D
5	Digger Crayfish	<i>Fallicambarus fodiens</i>			C, F	B	B	D
6	Sanborn's Crayfish	<i>Orconectes sanbornii</i>			K, M, N	D	A	D
7	Big Water Crayfish	<i>Cambarus robustus</i>			J, K, M	A	B	D
8	Paintedhand Mudbug	<i>Cambarus polychromatus</i>			C, K, M, N	A	B	S
9	Little Brown Mudbug	<i>Cambarus thomai</i>			C, K, M, N	A	A	S
10	Ortman's Mudbug	<i>Cambarus ortmanni</i>			N	A	B	S
11	Spiney Stream Crayfish	<i>Orconectes cristavarius</i>			M, N	B	D	D
12	Cave Spring Crayfish	<i>Cambarus tenebrosus</i>		T	D, N	B	D	S
13	Red Swamp Crayfish	<i>Procambarus clarkii</i>			C, J, M	C	D	I
13	Papershell Crayfish	<i>Orconectes immunis</i>			K, N, M	B	B	S
13	Virile Crayfish	<i>Orconectes virilis</i>		SC	K, N, M	B	D	D
16	Appalachian Brook Crayfish	<i>Cambarus bartonii cavatus</i>			K, M, N	A	B	S
17	White River Crayfish	<i>Procambarus acutus</i>			C, K, M, N	B	B	S
18	Rusty Crayfish	<i>Orconectes rusticus</i>			J, K, L, M, O	A	A	I
19	Rock Crawfish	<i>Cambarus carinirostris</i>			M, N	B	D	S
20	Sloan's Crayfish	<i>Orconectes sloanii</i>		T	M, N	D	D	S
21	Allegheny Crayfish	<i>Orconectes obscurus</i>		SC	M	B	C	D

* Rank derived from Conservation Status Score calculated using Millsap et al. (1990) modified for Ohio

Habitat Association Key

A = grassland
B = forest
C = wetlands
D = caves & mines
E = oak savannahs
F = Lake Erie islands
G = boreal communities
H = riparian corridors
I = artificial/man-made environments
J = Lake Erie
K = Lake Erie Tributaries
L = Ohio River
M = Ohio River Tributaries
N = headwater and small inland streams
O = man-made lakes and ponds
P = natural lakes
Q = generalist

Statewide Occurrence Key

A = broadly distributed (>30 counties)
B = common (11-29 counties)
C = uncommon (6-10 counties)
D = rare (<5 counties)
E = unknown

Rangewide Occurrence Key

A = extensive range (multiple states/Canada) – which includes Ohio
B = periphery of range is in Ohio
C = disjunct from main portion of its range; occurs in Ohio
D = center of range in/near Ohio
E = very limited range with most of its rangewide population occurring in Ohio

Ohio Population Trend Key

D = decreasing
I = increasing
S = stable
U = unknown

Species Listing Key

E = endangered
T = threatened
SC = species of concern
SI = species of interest
EX = extirpated

Aquatic Invertebrates

The Division's statutory authority for management of aquatic invertebrates is limited to species classified as endangered only. Consequently, data on the status of the majority of aquatic invertebrates is extremely limited, and the primary reason that conservation status ranks have not been determined for most invertebrate species groups. The Division of Wildlife has statutory authority for the conservation of 22 species of aquatic invertebrates (13 dragonflies, 3 damselflies, 3 caddisflies, 2 mayflies, 1 midge) designated as endangered in Ohio. As noted earlier in this section however, the only taxa group for which sufficient data exists to permit calculation of conservation status scores/ranks is dragonflies and damselflies.

Taxa Group: Dragonflies and Damselflies

As a group, odonates are not well understood, and our knowledge of the status of Odonata in Ohio is certainly limited by lack of information. Odonates are not an easy group to study for a number of reasons. Approximately 20% of North American species cannot be accurately identified as larvae. There are also very few detailed analyses of the total life history of Odonata species. Several species observed in Ohio are only accidentals, such as the Georgia River Cruiser, Varigated Meadowhawk (a frequent accidental that migrates from western states), Striped Saddlebags, Little Blue Dragonlet, Band-winged Dragonlet, and Golden-winged Skimmer. Additionally, there appears to be some confusion over early records of the Common Baskettail - some of which are likely Slender Baskettails. We have only recently realized that the Slender Baskettail was here in Ohio in significant numbers. A review of all museum collections of Common Baskettails would help to clarify this (B. Glotzhober, pers. communication).

To date, 164 species of odonates have been recorded in Ohio, many of which have appeared outside of their normal range. The newest addition to Ohio's Odonata were several striped saddlebags which were found in late summer of 2006 at Magee Marsh Wildlife Area on western Lake Erie – far from their normal range in the extreme southern U.S. Dragonflies and damselflies spend the majority of their life as eggs or larvae in the water. Since Ohio has lost over 90 percent of its wetlands and many of its rivers and streams have been adversely impacted by pollution, it's not surprising that 16 species of Odonata have been listed as endangered in Ohio. The cause of endangerment in every case has been habitat destruction or degradation. The solution to protecting dragonflies and damselflies is to protect our aquatic resources.

Endangered Dragonflies

The yellow-sided skimmer is known from only a single site in Ohio - an acidic sphagnum pond in a sand mining site privately owned in Pike County. The racket-tailed emerald was known historically from a single boggy pond in Geauga County, but not seen there since 1924. An apparently healthy population was discovered in 1999 at Singer Lake Bog in Summit County and a smaller population was found in 2002 near the historic site in Geauga County. Since the racket-tailed emerald seems confined to boggy pond and lake edges, the draining of wetlands likely caused significant loss of this species.

Throughout its range, the elfin skimmer lives in widely scattered populations. Ohio's populations are 130 miles apart, and an equal distance from the next closest known populations. Elfins were known to occur at three areas around the state between 1930 and 1960 before they disappeared due to drainage for agriculture and other habitat changes. This species is currently known only from Cedar Bog Nature Preserve in Champaign County, and Singer Lake Bog and Myersville Fen Preserve in Summit County. It is unknown why this species does not survive at other remnant fens or bogs in Ohio.

The Hine's emerald dragonfly was discovered by Professor James Hine, first curator of natural history of the Ohio Historical Society, from specimens in a shallow stream near Indian Lake in west central Ohio. Once known from the Indian Lake area of Logan County, around Mud Lake in Williams County, and the Oak Openings of Lucas County, it is possibly now extirpated from Ohio, having not been found since 1961.

Table 9D. Ohio's Dragonfly and Damselfly Species of Greatest Conservation Need

The conservation status (rank) for each species represents input from professionals in mammal taxonomy, distribution, and abundance. This table represents the best professional knowledge available at this time, and as such is subject to modification as additional data is obtained.

Conservation Status Rank*	Common Name	Scientific Name	Species Listing Fed State	Habitat Association	Rangewide Occurrence	Statewide Occurrence	Ohio Population Trend
1	Appalachian Jewelwing	<i>Calopteryx angustipennis</i>			B	D	D
2	Atlantic Bluet	<i>Enallagma doubledayi</i>			C	D	D
3	Riverine Clubtail	<i>Stylurus amnicola</i>			B	D	D
4	Little Blue Dragonlet	<i>Erythrodiplax minuscula</i>			B	D	D
5	Taper-Tailed Darner	<i>Gomphaeschna antilope</i>			B	D	D
6	Variable Darner	<i>Aeshna interrupta</i>			C	D	D
6	Incurvate Emerald	<i>Somatochlora incurvata</i>			B	D	U
6	Kennedy's Emerald	<i>Somatochlora kennedyi</i>			C	D	U
9	Spine-crowned Clubtail	<i>Gomphus abbreviatus</i>			B	D	D
10	Sphagnum Sprite	<i>Nehalennia gracilis</i>			A	C	D
10	Hine's Emerald	<i>Somatochlora hineana</i>	E E	C, N	B	D	D
12	Tiaga Bluet	<i>Coenagrion resolutum</i>			B	D	D
13	Hagen's Bluet	<i>Enallagma hageni</i>			A	B	D
14	Golden-winged Skimmer	<i>Libellula auripennis</i>			B	D	D
15	Eastern Red Damsel	<i>Amphiagrion saucium</i>		C, N	A	A	S
15	Mottled Darner	<i>Aeshna clepsydra</i>		E	B	D	D
17	Seepage Dancer	<i>Argia bipunctulata</i>		E	C	D	D
18	Band-Winged Dragonlet	<i>Erythrodiplax umbrata</i>			C	D	D
19	Yellow-sided Skimmer	<i>Libellula flavida</i>		E	B	D	D
20	Umber Shadowdragon	<i>Neurocordulia obsoleta</i>			B	C	D
21	Green-faced Clubtail	<i>Gomphus viridifrons</i>		T	A	C	D
22	Boreal Bluet	<i>Enallagma boreale</i>		T	B	C	D
23	Saffron-winged Meadowhawk	<i>Sympetrum costiferum</i>			A	C	D

24	River Jewelwing	<i>Calopteryx aequabilis</i>	E		A	C	D
24	Marsh Bluet	<i>Enallagma ebrium</i>	T		A	B	D
24	Furtive Forktail	<i>Ischnura prognata</i>			C	D	D
24	Canada Darner	<i>Aeshna canadensis</i>	E		A	D	D
28	Eastern Ringtail	<i>Erpetogomphus designatus</i>			B	D	D
29	Elusive Clubtail	<i>Stylurus notatus</i>			A	B	S
30	Aurora Damsel	<i>Chromagrion conditum</i>		C, N	A	A	D
30	Turquoise Bluet	<i>Enallagma divagans</i>			A	B	D
32	Cherry-faced Meadowhawk	<i>Sympetrum internum</i>			A	C	D
33	Southern Pygmy Clubtail	<i>Lanthus vernalis</i>			B	D	S
34	Striped Saddlebags	<i>Tramea calverti</i>			C	D	U
35	American Emerald	<i>Cordulia shurtleffii</i>	E		B	D	D
36	Sedge Sprite	<i>Nehalennia irene</i>			A	B	D
37	Harlequin Darner	<i>Gomphaeschna furcillata</i>	T		B	D	S
37	Skillet Clubtail	<i>Gomphus ventricosus</i>			A	C	S
37	Northern Pygmy Clubtail	<i>Lanthus parvulus</i>			B	B	D
37	Brown Spiketail	<i>Cordulegaster bilineata</i>			A	D	D
37	Racket-tailed Emerald	<i>Dorocordulia libera</i>	E	C, O	B	D	S
42	Smokey Rubyspot	<i>Hetaerina titia</i>			A	C	D
43	Georgia River Cruiser	<i>Macromia illinoiensis georgina</i>			A	D	D
43	Stygian Shadowdragon	<i>Neurocordulia yamaskanensis</i>			A	C	D
43	Plains Emerald	<i>Somatochlora ensigera</i>			B	D	D
46	Gray Petaltail	<i>Tachopteryx thoreyi</i>		C	A	B	S
46	Frosted Whiteface	<i>Leucorrhinia frigida</i>	E		A	D	S
46	Elfin Skimmer	<i>Nannothemis bella</i>	E	C	A	D	D
49	Allegheny River Cruiser	<i>Macromia alleghaniensis</i>			B	C	D
49	Brush-tipped Emerald	<i>Somatochlora walshii</i>	E		B	D	D
51	Spatterdock Darner	<i>Aeshna mutata</i>			A	B	D

52	Northern Bluet	<i>Enallagma cyathigerum</i>	T		A	D	D
53	Rapids Clubtail	<i>Gomphus quadricolor</i>			A	B	I
53	Uhler's Sundragon	<i>Helocordulia uhleri</i>	E		B	D	D
55	Riffle Snaketail	<i>Ophiogomphus carolus</i>	T		B	D	D
56	Laura's Clubtail	<i>Stylurus laurae</i>			B	D	D
57	Tiger Spiketail	<i>Cordulegaster erronea</i>	SC		A	C	I
58	Splendid Clubtail	<i>Gomphus lineatifrons</i>			A	C	S
59	Dusky Clubtail	<i>Gomphus spicatus</i>			A	B	D
60	Lilypad Forktail	<i>Ischnura kellicotti</i>	E		B	D	S
60	Russet-tipped Clubtail	<i>Stylurus plagiatus</i>			B	C	S
60	Gilded River Cruiser	<i>Macromia pacifica</i>			B	C	I
60	Smoky Shadowdragon	<i>Neurocordulia molesta</i>			B	B	S
64	Ocellated Darner	<i>Boyeria grafiana</i>			A	C	S
64	Handsome Clubtail	<i>Gomphus crassus</i>			A	C	U
64	Chalk-fronted Corporal	<i>Libellula julia</i>	E		A	D	D
67	Beaverpond Baskettail	<i>Epitheca canis</i>			B	D	S
68	Common Sanddragon	<i>Progomphus obscurus</i>			A	B	I
69	Rusty Snaketail	<i>Ophiogomphus rupinsulensis</i>			A	B	S
69	Delta-spotted Spiketail	<i>Cordulegaster diastatops</i>			B	C	S
69	Twin-spotted Spiketail	<i>Cordulegaster maculata</i>			A	B	SI
69	Arrowhead Spiketail	<i>Cordulegaster obliqua</i>		N	A	B	S
73	Wabash River Cruiser	<i>Macromia wabashensis</i>			E	D	S
74	Comet Darner	<i>Anax longipes</i>			A	B	I
74	Plains Clubtail	<i>Gomphus externus</i>	E		B	C	SI
76	Black-tipped Darner	<i>Aeshna tuberculifera</i>			A	B	S
77	Cobra Clubtail	<i>Gomphus vastus</i>			A	B	S
77	Banded Pennant	<i>Celithemis fasciata</i>			A	C	S
79	Stream Cruiser	<i>Didymops transversa</i>			A	B	S

80	Eastern Least Clubtail	<i>Stylogomphus albistylus</i>			A	B	I
81	Cyrano Darner	<i>Nasiaeschna pentacantha</i>			A	B	I
82	Northern Spreadwing	<i>Lestes disjunctus</i>			A	D	S
82	Flag-tailed Spinyleg	<i>Dromogomphus spoliatus</i>			A	B	I
84	Tule Bluet	<i>Enallagma carunculatum</i>			A	B	D
85	Dragonhunter	<i>Hagenius brevistylus</i>		K, M, N	A	B	S
86	Variiegated Meadowhawk	<i>Sympetrum corruptum</i>			B	B	I
87	Blue-faced Meadowhawk	<i>Sympetrum ambiguum</i>			A	A	I
88	Arrow Clubtail	<i>Stylurus spiniceps</i>			A	B	S
89	Band-winged Meadowhawk	<i>Sympetrum semicinctum</i>		C, O	A	A	I
90	Vesper Bluet	<i>Enallagma vesperum</i>			A	B	I
91	Midland Clubtail	<i>Gomphus fraternus</i>		K, M	A	A	I
92	Rainbow Bluet	<i>Enallagma antennatum</i>		N, O	A	A	S
92	Red Saddlebags	<i>Tramea onusta</i>			A	B	UI
94	Azure Bluet	<i>Enallagma aspersum</i>		C, O	A	A	I
95	Green-striped Darner	<i>Aeshna verticalis</i>			A	B	I
95	Lilypad Clubtail	<i>Arigomphus furcifer</i>			A	C	D
95	White-faced Meadowhawk	<i>Sympetrum obtrusum</i>			A	A	S
98	Dusky Dancer	<i>Argia translata</i>			A	A	I
98	Western Slender Bluet	<i>Enallagma traviatum</i>			A	A	I
100	Shadow Darner	<i>Aeshna umbrosa</i>		C, N	A	A	I
100	Springtime Darner	<i>Basiaeschna janata</i>		K, M, N, O	A	A	I
102	Blue Corporal	<i>Libellula deplanata</i>	E		B	D	I
103	Swamp Darner	<i>Epiaeschna heros</i>		C, N	A	A	S
104	Ashy Clubtail	<i>Gomphus lividus</i>		K, M, O	A	A	I
104	Mocha Emerald	<i>Somatochlora linearis</i>			A	B	I
104	Great Blue Skimmer	<i>Libellula vibrans</i>			A	B	I
107	Lance-tipped Darner	<i>Aeshna constricta</i>			A	A	S

108	Four-spotted Skimmer	<i>Libellula quadrimaculata</i>			C	D	D
109	Swift River Cruiser	<i>Macromia illinoensis</i>		K, M, N	A	A	I
109	Royal River Cruiser	<i>Macromia taeniolata</i>			A	B	S
109	Clamp-tipped Emerald	<i>Somatochlora tenebrosa</i>			A	B	S
112	Great Spreadwing	<i>Archilestes grandis</i>			A	B	I
112	Blue-fronted Dancer	<i>Argia apicalis</i>		K, M, N, O	A	A	I
112	Skimming Bluet	<i>Enallagma geminatum</i>		K, M, O	A	A	I
112	Orange Bluet	<i>Enallagma signatum</i>		K, M, O	A	A	I
112	Slender Baskettail	<i>Epithea costalis</i>			B	D	U
112	Carolina Saddlebags	<i>Tramea carolina</i>			A	B	I
118	Unicorn Clubtail	<i>Argomphus villosipes</i>		K, M, O	A	A	I
119	Ebony Jewelwing	<i>Calopteryx maculata</i>		C, N	A	A	I
120	American Rubyspot	<i>Hetaerina americana</i>		K, M	A	A	S
120	Citrine Forktail	<i>Ischnura hastata</i>		C, O	A	A	S
120	Black-shouldered Spinyleg	<i>Dromogomphus spinosus</i>		K, M, O	A	A	S
120	Painted Skimmer	<i>Libellula semifasciata</i>		C, O	A	A	I
124	Dot-tailed Whiteface	<i>Leucorrhinia intacta</i>		O	A	A	I
124	Spangled Skimmer	<i>Libellula cyane</i>			A	B	I
124	Spot-winged Glider	<i>Pantala hymenaea</i>			A	A	I
124	Eastern Amberwing	<i>Perithemis tenera</i>		N, O	A	A	I
128	Sweetflag Spreadwing	<i>Lestes forcipatus</i>			A	A	S
128	Lancet Clubtail	<i>Gomphus exilis</i>			A	A	I
130	Double-striped Bluet	<i>Enallagma basidens</i>		K, M, O	A	A	I
131	Wandering Glider	<i>Pantala flavescens</i>		O	A	A	I
132	Amber-winged Spreadwing	<i>Lestes eurinus</i>			A	B	I
132	Elegant Spreadwing	<i>Lestes inaequalis</i>			A	B	I
132	Swamp Spreadwing	<i>Lestes vigilax</i>			A	B	S
132	Fawn Darner	<i>Boyeria vinosa</i>		K, M, N	A	A	I

132	Pronghorn Clubtail	<i>Gomphus graslinellus</i>			A	A	S
137	Spotted Spreadwing	<i>Lestes congener</i>			A	A	I
137	Southern Spreadwing	<i>Lestes australis</i>		C, N, O	A	A	I
137	Emerald Spreadwing	<i>Lestes dryas</i>			A	A	I
137	Lyre-tipped Spreadwing	<i>Lestes unguiculatus</i>			A	A	S
137	Common Green Darner	<i>Anax junius</i>		C, J, K, L, M, N, O	A	A	I
137	Common Baskettail	<i>Epitheca cynosura</i>		K, M, O	A	A	I
137	Prince Baskettail	<i>Epitheca princeps</i>		K, M, O	A	A	I
137	Calico Pennant	<i>Celithemis elisa</i>		O	A	A	I
137	Halloween Pennant	<i>Celithemis eponina</i>		C, K, M, O	A	A	I
137	Eastern Pondhawk	<i>Erythemis simplicicollis</i>		K, M, O	A	A	I
137	Slaty Skimmer	<i>Libellula incesta</i>		C, K, M, O	A	B	I
137	Twelve-spotted Skimmer	<i>Libellula pulchella</i>		C, N, O	A	A	I
137	Blue Dasher	<i>Pachydiplax longipennis</i>		C, N, O	A	A	I
137	Common Whitetail	<i>Libellula lydia</i>		N, O	A	A	I
137	Ruby Meadowhawk	<i>Sympetrum rubicundulum</i>		C, O	A	A	I
137	Autumn Meadowhawk	<i>Sympetrum vicinum</i>		N, O	A	A	I
137	Black Saddlebags	<i>Tramea lacerata</i>		C, N, O	A	A	I
154	Stream Bluet	<i>Enallagma exsulans</i>		N	A	A	I
155	Violet Dancer	<i>Argia fumipennis</i>		K, M, N, O	A	A	I
155	Widow Skimmer	<i>Libellula luctuosa</i>		C, N, O	A	A	I
157	Blue-ringed Dancer	<i>Argia sedula</i>		K, M, N, O	A	A	I
157	Blue-tipped Dancer	<i>Argia tibialis</i>		K, M, N	A	A	I
157	Familiar Bluet	<i>Enallagma civile</i>		N, O	A	A	I
157	Fragile Forktail	<i>Ischnura posita</i>		C, K, M, N, O	A	A	I
161	Slender Spreadwing	<i>Lestes rectangularis</i>		C, O	A	A	I
161	Powdered Dancer	<i>Argia moesta</i>		K, M, N, O	A	A	I
161	Eastern Forktail	<i>Ischnura verticalis</i>		C, K, M, N, O	A	A	I

* Rank derived from Conservation Status Score calculated using Millsap et al. (1990) modified for Ohio

Habitat Association Key

A = grassland
B = forest
C = wetlands
D = caves & mines
E = oak savannahs
F = Lake Erie islands
G = boreal communities
H = riparian corridors
I = artificial/man-made environments
J = Lake Erie
K = Lake Erie Tributaries
L = Ohio River
M = Ohio River Tributaries
N = headwater and small inland streams
O = man-made lakes and ponds
P = natural lakes
Q = generalist

Statewide Occurrence Key

A = broadly distributed (>30 counties)
B = common (11-29 counties)
C = uncommon (6-10 counties)
D = rare (<5 counties)
E = unknown

Rangewide Occurrence Key

A = extensive range (multiple states/Canada) – which includes Ohio
B = periphery of range is in Ohio
C = disjunct from main portion of its range; occurs in Ohio
D = center of range in/near Ohio
E = very limited range with most of its rangewide population occurring in Ohio

Ohio Population Trend Key

D = decreasing
I = increasing
S = stable
U = unknown

Species Listing Key

E = endangered
T = threatened
SC = species of concern
SI = species of interest
EX = extirpated

Terrestrial Invertebrates

The Division's statutory authority for management of terrestrial invertebrates is limited to species classified as endangered only. Consequently, data on the status of the majority of terrestrial invertebrates is extremely limited, and the primary reason that conservation status ranks have not been determined for most invertebrate species groups. The Division of Wildlife has statutory authority for the conservation of 24 terrestrial invertebrate species (8 butterflies, 14 moths, and 2 beetles) designated as endangered in Ohio. As noted earlier in this section however, the only taxa group for which sufficient data exists to permit calculation of conservation status scores/ranks is butterflies and skippers.

Endangered Invertebrates

The unexpected tiger (cycnia) moth occupies prairie in the eastern Great Plains and Upper Midwest. Most of the Ohio Valley and Upper Midwest records are recent and primarily associated with high quality barrens remnants. This complex of woodland and grassland is known to occur in Adams County, and this community type is considered globally significant and imperiled. Because the species is fire-sensitive, these now isolated populations are susceptible to extirpation from fire management activities, if the entire population is contained within a given burn unit. Larvae of the Hebard's noctuid moth feed on flowers and seeds of *Collinsonia canadensis*, but little else is known about this species.

The larval host plant of *Spartiniphaga inops* (moth) is prairie cordgrass (*Spartina pectinata*). *Hypocoena enervate* (moth) is also an obligate feeder on prairie cordgrass. Research to obtain additional information on these species' life history and ecology and to assess potential threats should be conducted. Sites at which the species have been documented should be protected and maintained. Protection and recovery efforts need to address declines in the host plant, prairie cord-grass. Displacement of host plant populations due to the spread of invasive *Phragmites* is a significant risk.

Papaipema silphii (moth) is restricted to the northeastern fringe of the tallgrass prairie region of North America. It prefers sunny areas where host plants (*Silphium* spp., including prairie dock, cup-plant, rosinweed, and compass plant) exist in good numbers. Habitat is generally wet to dry-mesic prairie. Its congener, *Papaipema beeriana* occurs with its larval host plant, blazing star or snakeroot (*Liatris* spp.) The species has been recorded from a variety of plant communities crossing gradients from wet to dry. Almost all major workers on the genus have commented on the fire sensitivity of *Papaipema* eggs. Overwintering eggs are exposed and may be killed by controlled burns conducted in fall or early spring. Adults are sedentary and would not be expected to quickly recolonize an isolated site from which they had been extirpated, though they should move quickly between adjacent burn units.

There is little information concerning the principal habitat associations, biology, and life histories of the remaining endangered moths – Graceful underwing, *Lithophane semiusta*, *Trichoclea artesta*, *Tricholita notata*, *Melanchra assimilis*, Pointed sallow, and *Ufeus plicatus*.

U.S. Fish and Wildlife Service Recovery Plans are being implemented for the American burying beetle. There is one cave beetle on Ohio's endangered species list. The Ohio cave beetle has been collected from a cave system in Adams County. The now extinct Kramer's cave beetle was formerly collected from this same area. There are many *Pseudanophthalmus* (cave beetle) species described from the limestone caves of Kentucky and Tennessee, but the Ohio cave beetle and Kramer's cave beetle are the only two known from north of the Ohio River. They were most likely cut off from the cave systems of Kentucky when the Teays River changed course during a glaciation event.

Very little is known about the endangered Fern cave isopod and buckskin cave pseudoscorpion.

Threatened Invertebrates

Eight terrestrial invertebrate species are listed as threatened. In Ohio, the pink-streak moth may be found in short grass prairie, cedar glades, and wet and mesic prairies. Eggs and larvae may be on switchgrass and evidence suggests the species may also be associated with Indiangrass in Ohio. *Spartiniphaga panatela* (moth) appears to be associated with wetlands and marshy wooded areas, but the host plant is unknown. *Cicindela hirticollis* (beetle) typically occurs in close association with a body of water. Physical disturbance of its sandy beach habitat is a major threat to this species.

The cobblestone tiger beetle is almost always associated with cobblestone islands in rivers. Usually found on medium to large rivers, and occasionally creeks. The island cobblestone habitat is the single factor which is critical to conservation of this species. Little is known concerning the habitat and life history requirements, or threats faced by the remaining threatened species – silver-bordered fritillary, wayward nymph, frost cave isopod, and *Fagitana littera* (moth).

Invertebrate Species of Concern

There are 31 terrestrial invertebrate species of concern including 22 moth species. Milnei's looper moth habitat is not known but appears to be within hardwood forests. Gypsy Moth spraying could impact this species since larvae feed approximately July-September and April-June. Buck moth habitat includes savannahs and oak woods. The larval food plants of the one-eyed sphinx moth are willows and poplars. Adults do not feed. This species occupies valleys and streamsides. Typical habitat for the precious underwing is swamp forest, but it will breed in other forested habitats. Best habitats are usually headwaters swamps. This species may be extirpated in Ohio. Habitats for *Macrochilo bivittata* (moth) seem to be sedge meadows. Larvae of this genus are poorly known but thought to feed on graminoids, possibly including dead material. *Apamea mixta* (moth) appear to occur in association with sedges and grasses, however food plants and habitat needs are unknown.

Extremely little is known concerning the remaining moths. Basic habitat and life history requirements are needed before conservation measures can be planned. These species include: Osmunda borer moth, *Paectes abrostolella*, *Tarachidia binocular*, columbine borer, bracken borer, *Chytonix sensilis*, *Amolita roseola*, goat sallow, *Brachylomia algens*, *Agonopterix pteleae*, *Trichosilia manifesta*, and the scurfy quaker (which is found only in Ohio). *Phalaenostola hanhami*, *Capis curvata*, *Agroperina lutosa*, and Purple arches likely prefer bogs, fens, and other wetlands, but little else is known concerning their biology.

There are 6 beetles listed as species of concern. The six-banded longhorn beetle inhabits mature hardwood forests with large mature trees. Feeding continues until after trees die and bark has fallen off. Management plans should include the retention of large overmature trees and dead snags in floodplains and mesic forests. *Cicindela splendida* was known from Cave Hollow in Adams County. A recent survey of the area found the location is now extremely disturbed and the species was not found. Given this tiger beetles' sensitivity to habitat disturbance, and given the present condition of Cave Hollow, *C. splendida* is likely extirpated in Adams County, leaving it only in Hocking and Vinton counties. Most common habitats are on moist clay soil with sparse vegetation such as road cuts, eroded slopes, and clay banks. *Cicindela ancocisconensis* is a habitat specialist that prefers open sand or a mix of sand and cobble along permanent streams to medium-sized rivers. It is likely critically imperiled in Ohio, if present. *Cicindela cursitans* has been found in a variety of habitats, including wet ditches, prairies, and alkali habitats, and has been recorded in Ross County. *Cicindela cuprascens* is commonly closely associated with water and is usually found on sandy or loamy stream and riverbanks, and was thought to be one of the more limited species in the state, but has been collected in Brown, Clermont, and Scioto counties, extending the species farther along the Ohio River than previously believed. *Cicindela macra* occur in close association with water, on sandbars and shorelines of large lakes, rivers, and streams.

The laricis tree cricket is a species of concern that inhabits dense to open tamarack swamps and fens with trees of medium height (6 to 13 meters) in Michigan and Ohio. It may occur in both large intact wetland complexes, as well as smaller disturbed sites. Maintenance and restoration of sensitive prairie fen and tamarack swamp habitat is essential to its conservation.

Eleven moths, including the Slender clearwing, *Sphinx lucitiosa*, *Tathorhynchus exsiccatus*, *Catocala marmorata*, *Catocala maestosa*, Subflava sedge borer moth, *Caradrina meralis*, *Calophasia lunula*, *Leucania insueta*, *Protorthodes incincta*, and variegated orange moth are designated as species of special interest. While these invertebrates are occasionally documented within the state, they are not believed to have viable populations. In the future, if increased numbers and locations of these species are found, their status will be further evaluated.

Taxa Group: Butterflies & Skippers

Extirpated Butterflies & Skippers

The mustard white butterfly is the only known extirpated terrestrial invertebrate in Ohio. This butterfly is known from literature records in the vicinity of Toledo and may have occurred throughout much of the original Black Swamp. Because Ohio represents the extreme southern limit of the mustard white's range and extensive habitat destruction in the Black Swamp region has occurred, restoration of this species may not be biologically feasible, but should be evaluated.

Endangered Butterflies & Skippers

The Mitchell's satyr butterfly is associated with fens supporting lush stands of sedges and bullrush. It was recorded in 1 location in northeastern Ohio in the 1920s and may be extirpated. However, continued attempts to locate this species in Ohio and identify its host plant are needed. Both the swamp metalmark and the purplish copper butterflies are also found in association with fens. The swamp metalmark is known from only 2 locations while the purplish copper has a wider western (10 counties) distribution. Continued surveys by members of the Ohio Lepidopterists Society may find additional locations for these 2 butterflies.

The regal fritillary butterfly is associated with tall grass prairie and other open sites including wet meadows, marshes, and wet fields. It is rapidly declining over much of its range. In addition to development or conversion of grasslands to agriculture, remaining prairie has been affected by pesticide use and fire (usually prescribed burning) in ways that impact butterfly populations. A better understanding of the impact of fire on butterfly populations, and efforts to restore prairies and wetlands in areas where the regal fritillary still occur may help stabilize its population.

U.S. Fish and Wildlife Service Recovery Plans are being implemented for the Karner blue butterfly. The Karner Blue inhabits sandy pine prairies, oak savannas, and lakeshore dunes in the east. Its host plant, *Lupinus perennis* is necessary for proper management. The eastern Persius dusky wing butterfly, the frosted elfin butterfly, and the *Ufeus satyricus* moth also occur in open woods, oak savannas, and forest openings – and will likely benefit from management for the Karner Blue. Oak savannas in Ohio are limited to the northwestern portion of the state, in parts of Henry, Fulton, and Lucas counties. Protection of this area will provide the necessary habitat to sustain viable populations of the Karner blue butterfly, the Eastern Persius dusky wing butterfly, frosted elfin butterfly, and the *Ufeus satyricus* moth. The only recorded host for *Ufeus satyricus* is quaking aspen (*Populus tremuloides*), and additional information for this species and host(s) is needed.

The grizzled skipper inhabits eastern shale barrens and has been declining in part due to the widespread spraying for gypsy moths. Immediate action should be taken to protect existing populations from further habitat degradation and loss. Fire suppression has encouraged the closing of formerly open-canopied oak and oak-pine barrens and reduced the size and quality of adjoining open lands or prairies. Managing the prairie and barrens communities, especially through carefully controlled prescribed burns is critical to the long-term survival of this skipper.

Butterfly & Skipper Species of Concern

The two-spotted skipper typically occupies wetland areas, whereas the dusted skipper is an inhabitant of grasslands, old fields, and savannas. More information is needed concerning their habitat and life history requirements, as well as reasons for their declines.

The olympia marblewing butterfly is designated as species of special interest. While it is occasionally documented within the state, it is not believed to have viable populations. In the future, if increased numbers and locations of this species are found, it's status will be further evaluated.

Table 10B. Ohio's Butterfly and Skipper Species of Greatest Conservation Need

The conservation status (rank) for each species represents input from professionals in mammal taxonomy, distribution, and abundance. This table represents the best professional knowledge available at this time, and as such is subject to modification as additional data is obtained.

Conservation Status Rank*	Common Name	Scientific Name	Species Listing		Habitat Association	Rangewide Occurrence	Statewide Occurrence	Ohio Population Trend
			Fed	State				
1	Mitchell's Satyr	<i>Neonympha mitchellii</i>	E	E	B, C	C	D	S
2	Persius Dusky Wing	<i>Erynnis persius</i>		E	E	B	D	D
3	Grizzled Skipper	<i>Pyrgus centaureae wyandot</i>		E	B	B	D	D
4	Olympia Marble	<i>Euchloe olympia</i>		SI	A, B	A	D	D
5	Gold-banded Skipper	<i>Autochton cellus</i>			B	B	B	D
6	Swamp Metalmark	<i>Calephelis mutica</i>		E	C	B	D	D
6	Confused Cloudy Wing	<i>Thorybes confusus</i>			B, C	B	D	U
6	Duke's Skipper	<i>Euphyes dukesi</i>			B, C	B	B	I
9	Diana Fritillary	<i>Speyeria diana</i>			B	B	D	D
9	Mottled Dusky Wing	<i>Erynnis martialis</i>			A, B	B	B	D
11	Regal Fritillary	<i>Speyeria idalia</i>		E	A	B	B	D
11	Harris Checkerspot	<i>Chlosyne harrisii liggetti</i>			A, C	B	C	D
11	Two-spotted Skipper	<i>Euphyes bimacula</i>		SC	C	B	B	S
14	Cobweb Skipper	<i>Hesperia metea</i>			A, B	B	B	S
14	Mulberry Wing Skipper	<i>Poanes massasoit</i>			C	B	B	S
14	Broad-winged Skipper	<i>Poanes viator viator</i>			C	A	B	I
17	Dusted Skipper	<i>Atryonopsis hianna</i>		SC	E	B	C	D
18	Frosted Elfin	<i>Incisalia irus</i>		E	E	B	D	D
19	Silver-bordered Fritillary	<i>Boloria selene myrina</i>		T	A, C	A	B	I
20	Dion Skipper	<i>Euphyes dion</i>			C	A	B	I
21	Black Dash Skipper	<i>Euphyes conspicua</i>			C	A	B	I
22	Silvery Blue	<i>Glaucopsyche lygdamus</i>			B	B	B	S
23	Atlantis Fritillary	<i>Speyeria atlantis</i>			B	A	C	I

23	Gray Comma	<i>Polygonia progne</i>		B, C	B	B	D
25	Zebra Swallowtail	<i>Eurytides marcellus</i>		B, H	B	A	D
26	Dusky Azure	<i>Celastrina nigra</i>		B	B	C	I
27	Northern Oak Hairstreak	<i>Fixsenia favonius ontario</i>		A, B	B	D	D
28	Falcate Orange Tip	<i>Anthocharis midea annickae</i>		B	B	B	S
28	Eastern Pine Elfin	<i>Incisalia niphon</i>		B	A	B	I
28	Northern Metalmark	<i>Calephelis borealis</i>		B	B	B	S
31	Early Hairstreak	<i>Erora laeta</i>		B	B	D	D
32	Baltimore Checkerspot	<i>Euphydryas phaeton</i>		C	A	A	I
33	Edward's Hairstreak	<i>Satyrium edwardsii</i>		A, B, E	A	B	I
34	White M Hairstreak	<i>Parrhasius m-album</i>		B	B	B	S
34	Compton Tortoise Shell	<i>Nymphalis l-album</i>		B	B	B	I
34	Eyed Brown	<i>Satyrodes eurydice</i>		C	B	B	I
37	Goatweed Butterfly	<i>Anaea andria</i>		A, B	B	B	U
37	Hayhurst's Scalloped Sootywing	<i>Staphylus hayhurstii</i>		B	B	B	S
39	Acadian Hairstreak	<i>Satyrium acadicum</i>		C	B	A	I
39	Hickory Hairstreak	<i>Satyrium caryaevorum</i>		B	A	A	I
41	Dog Face	<i>Colias cesonia</i>		A	B	C	U
41	Leonard's Skipper	<i>Hesperia leonardus</i>		A, B	B	A	S
41	Indian Skipper	<i>Hesperia sassacus</i>		A, E	A	B	I
41	Long Dash Skipper	<i>Polites mystic</i>		A	A	A	I
45	West Virginia White	<i>Pieris virginiensis</i>		B	B	B	S
45	Purplish Copper	<i>Lycaena helloides</i>	E	C	B	C	D
45	Brown Elfin	<i>Incisalia augustinus croesoides</i>		B, C	B	C	D
45	Appalachian Blue	<i>Celastrina negelectamajor</i>		B	B	B	S
45	Pepper & Salt Skipper	<i>Amblyscirtes hegon</i>		B	A	B	I
50	Striped Hairstreak	<i>Satyrium liparops strigosum</i>		A, B	A	A	I
51	Dainty Sulphur	<i>Nathalis iole</i>		A	B	C	U

52	Spring Azure	<i>Celastrina ladon</i>		A, B	A	A	I
53	Pipe-vine Swallowtail	<i>Battus philenor</i>		B	A	A	I
53	Black Swallowtail	<i>Papilio polyxenes</i>		A	B	A	D
53	Cloudless Sulphur	<i>Phoebis sennae eubule</i>		A, I	B	B	U
53	Olive Hairstreak	<i>Mitoura grynea</i>		A	B	B	S
53	Gulf Fritillary	<i>Agraulis vanillae</i>		A	B	D	U
53	Aphrodite Fritillary	<i>Speyeria aphrodite</i>		A, B	A	A	I
53	Appalachian Eyed Brown	<i>Satyrodes appalachia</i>		B	B	B	I
53	Southern Cloudy Wing	<i>Thorybes bathyllus</i>		A, B	A	A	I
53	Northern Cloudy Wing	<i>Thorybes pylades</i>		A, B	A	A	I
53	Sleepy Dusky Wing	<i>Erynnis brizo</i>		B	A	A	I
53	Swarthy Skipper	<i>Nastra lherminier</i>		A	A	A	I
53	Hobomok Skipper	<i>Poanes hobomok</i>		B	A	A	I
53	Zabulon Skipper	<i>Poanes zabulon</i>		B	A	A	I
66	Giant Swallowtail	<i>Papilio cresphontes</i>		A, B	B	A	S
66	Bronze Copper	<i>Lycaena hyllus</i>		A	B	A	D
66	Red-banded Hairstreak	<i>Calycopis cecrops</i>		B	A	B	I
66	American Snout	<i>Libytheana carinenta bachmanii</i>		B, H	B	A	U
66	Variegated Fritillary	<i>Euptoieta claudia</i>		A	B	A	U
66	Silvery Checkerspot	<i>Chlosyne nycteis</i>		B	A	A	I
66	Milbert's Tortoise Shell	<i>Aglais milberti</i>		A, B	A	A	I
66	Northern Pearly Eye	<i>Enodia anthedon</i>		B, H	A	A	I
66	Gemmed Satyr	<i>Cyllopsis gemma</i>		B	A	B	I
66	Carolina Satyr	<i>Hermeuptychia sosybius</i>		B	A	B	I
66	Hoary Edge Skipper	<i>Achalarus lyciades</i>		B	A	A	I
66	Horace's Dusky Wing	<i>Erynnis horatius</i>		B	A	A	I
66	Crossline Skipper	<i>Polites origenes</i>		A, B	A	A	I
66	Delaware Skipper	<i>Atrytone logan</i>		A, C	A	A	I

66	Roadside Skipper	<i>Amblyscirtes vialis</i>		A, B	A	A	I
66	Ocola Skipper	<i>Panoquina ocola</i>		A	B	B	U
82	Checkered White	<i>Pontia protodice</i>		A, I	B	A	U
82	Harvester	<i>Feniseca tarquinius</i>		B, C	A	A	I
82	Monarch	<i>Danaus plexippus</i>		A, B, H	B	A	U
85	Coral Hairstreak	<i>Satyrium titus</i>		A, B, E	A	A	I
85	Banded Hairstreak	<i>Satyrium calanus falacer</i>		B	A	A	I
87	Little Yellow Sulphur	<i>Eurema lisa</i>		A	B	A	U
87	Sleepy Orange	<i>Eurema nicippe</i>		A, I	B	B	U
89	Cabbage Butterfly	<i>Pieris rapae</i>		A	A	A	I
89	Henry's Elfin	<i>Incisalia henrici</i>		B	A	B	I
89	Mourning Cloak	<i>Nymphalis antiopa</i>		B, H	A	A	I
89	Painted Lady	<i>Vanessa cardui</i>		A, I	B	A	U
89	Buckeye	<i>Junonia coenia</i>		A	B	A	U
89	Tawny Emperor	<i>Asterocampa clyton</i>		B, H	A	A	I
89	Little Wood Satyr	<i>Megisto cymela</i>		B	A	A	I
89	Common Wood Nymph	<i>Cercyonis pegala alope</i>		A	A	A	I
89	Dreamy Dusky Wing	<i>Erynnis icelus</i>		B	A	A	I
89	Juvenal's Dusky Wing	<i>Erynnis juvenalis</i>		B	A	A	I
89	Checkered Skipper	<i>Pyrgus communis</i>		A, I	B	A	U
89	European Skipper	<i>Thymelicus lineola</i>		A	A	A	I
89	Fiery Skipper	<i>Hylephila phyleus</i>		A, I	B	A	U
89	Little Glassywing Skipper	<i>Pompeius verna</i>		A	A	A	I
89	Sachem Skipper	<i>Atalopedes campestris</i>		A, I	B	A	U
104	Eastern Tailed Blue	<i>Everes comyntas</i>		A, B	A	A	I
104	Karner Blue	<i>Lycaeides melissa samuelis</i>	E	E	B	D	D
106	Tiger Swallowtail	<i>Papilio glaucus</i>		A, B	A	A	I
106	Spicebush Swallowtail	<i>Papilio troilus</i>		B, E	A	A	I

106	Question Mark	<i>Polygonia interrogationis</i>		B, H	A	A	I
106	Hop Merchant (Comma)	<i>Polygonia comma</i>		B, H	A	A	I
106	Red Admiral	<i>Vanessa atalanta rubria</i>		A, B, H	A	A	I
106	Red-spotted Purple	<i>Limenitis arthemis astyanax</i>		B, H	A	A	I
106	Viceroy	<i>Limenitis archippus</i>		A, C	A	A	I
106	Hackberry Butterfly	<i>Asterocampa celtis</i>		B, H	A	A	I
106	Common Sooty Wing	<i>Pholisora catullus</i>		A	A	A	I
106	Peck's Skipper	<i>Polites peckius</i>		A	A	A	I
106	Tawny-edged Skipper	<i>Polites themistocles</i>		A	A	A	I
106	Northern Broken Dash Skipper	<i>Wallengrenia egeremet</i>		A, B	A	A	I
106	Dun Skipper	<i>Euphyes vestris metacomet</i>		A, C	A	A	I
119	Summer Azure	<i>Celastrina neglecta</i>		A, B	A	A	I
120	Meadow Fritillary	<i>Boloria bellona</i>		A	A	A	I
120	Wild Indigo Dusky Wing	<i>Erynnis baptisiae</i>		A	A	A	I
120	Least Skipper	<i>Ancyloxypha numitor</i>		A	A	A	I
123	Clouded Sulphur	<i>Colias philodice</i>		A	A	A	I
123	Orange Sulphur	<i>Colias eurytheme</i>		A	A	A	I
123	American Copper	<i>Lycaena phlaeas americana</i>		A, E	A	A	I
123	Gray Hairstreak	<i>Strymon melinus humuli</i>		A, B	A	A	I
123	Pearl Crescent	<i>Phyciodes tharos</i>		Q	A	A	I
123	American Painted Lady	<i>Vanessa virginiensis</i>		A	A	A	I
123	Silver-spotted Skipper	<i>Epargyreus clarus</i>		Q	A	A	I
130	Great Spangled Fritillary	<i>Speyeria cybele</i>		A, B	A	A	I

* Rank derived from Conservation Status Score calculated using Millsap et al. (1990) modified for Ohio

Habitat Association Key

A = grassland
B = forest
C = wetlands
D = caves & mines
E = oak savannahs
F = Lake Erie islands
G = boreal communities
H = riparian corridors
I = artificial/man-made environments
J = Lake Erie
K = Lake Erie Tributaries
L = Ohio River
M = Ohio River Tributaries
N = headwater and small inland streams
O = man-made lakes and ponds
P = natural lakes
Q = generalist

Statewide Occurrence Key

A = broadly distributed (>30 counties)
B = common (11-29 counties)
C = uncommon (6-10 counties)
D = rare (<5 counties)
E = unknown

Rangewide Occurrence Key

A = extensive range (multiple states/Canada) – which includes Ohio
B = periphery of range is in Ohio
C = disjunct from main portion of its range; occurs in Ohio
D = center of range in/near Ohio
E = very limited range with most of its rangewide population occurring in Ohio

Ohio Population Trend Key

D = decreasing
I = increasing
S = stable
U = unknown

Species Listing Key

E = endangered
T = threatened
SC = species of concern
SI = species of interest
EX = extirpated

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