



2012 WILDLIFE DIVERSITY REPORT



Lake Sturgeon



Least Tern Chick



Franklin Ground Squirrel



Kidneyshell mussel attached to byssal thread and rocks.



Box Turtle



Green Salamander

On the Cover: We love babies!

The math required for a population to remain stable or grow is simple. Each adult in the population must be replaced by at least one new adult (i.e., a reproductively mature individual). If replacement does not occur, the population declines. If an individual is replaced by more than one adult, the population grows.

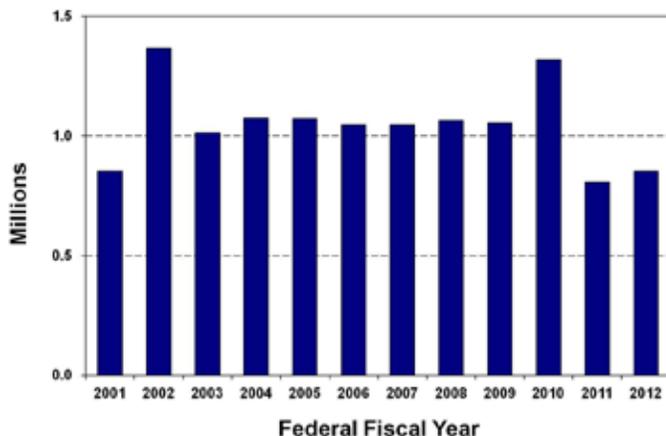
Endangered species managers often survey (count) individuals of rare species. These are species whose population numbers are low and perhaps still declining. That of course means specimens of such species are difficult to find, and finding their young can be even harder.

We of course like to find adult specimens of an endangered species each year but an increase in adult numbers may not indicate an improvement in status of the population. Increased numbers may be the result of sampling error or very old (non-reproductive) adults. What we really seek and hope to find is evidence of reproduction or, more simply, babies.

This report contains information on many endangered species survey efforts. We are pleased the counts for several listed species increased. But finding babies is what really excites us. We hope the evidence of such finds on the front cover and the progress they represent will excite you, too.

INDIANA RARE SPECIES CONSERVATION

State law charges the Wildlife Diversity Program (WDP) of the Department of Natural Resources with management and conservation of nongame and endangered species, terms that can be confusing unless explicitly defined. “Nongame” species are mammals, birds, reptiles, amphibians, fish, mollusks and crustaceans not normally pursued by people for sport or commercial purposes. The Indiana Nongame and Endangered Species Conservation Act (IC14-22-34) defines “endangered species” as those “whose prospects of survival or recruitment within Indiana are in jeopardy” or might soon be in jeopardy. Whereas wildlife that is pursued



Federal matching funds for Indiana’s Nongame Fund for the last 12 years.

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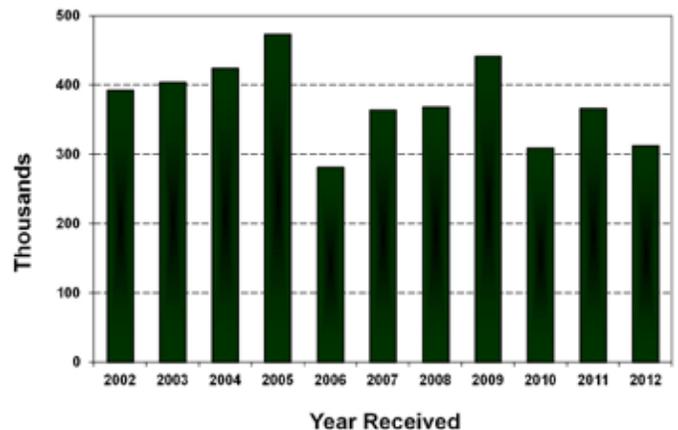
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Note: The Wildlife Diversity staff took many of the photos in this publication. Others were taken by DNR photographers or are in the public domain unless otherwise noted.



Donations to the Nongame Fund during the last 11 tax years in thousand-dollar increments.

as game is managed using hunting and fishing license fees and federal funds, the conservation of nongame and endangered wildlife is funded by citizen donations (Nongame Fund), and since 2000, federal matching funds (State Wildlife Grants, Endangered Species Funds). These funds support the WDP, a modern scientific resource program, including survey and monitoring, research and habitat management, and protection. This 2012 report includes information on the status of specific nongame and endangered species, new emerging threats, and updates of ongoing contracted research and studies.

FUNDING

The WDP appreciates the continued support of Indiana citizens. Despite the slowly recovering economy, Nongame Fund supporters donated \$312,104 in 2012, meaning support for the Wildlife Diversity Program remains relatively stable.

With the help of conservation partners, WDP continues to make progress and has been able to put to effective use all the federal State Wildlife Grant funds apportioned to Indiana. This year, an additional \$73,600 in federal funds was obtained for Indiana for bat and box turtle conservation. In addition, a Section 6 Endangered Species grant (\$54,715 in federal funds) was secured to start a population augmentation for the endangered snuffbox mussel.

The future of federal support remains uncertain. That limits effective long-range planning efforts, which could result in halting the recovery progress of some species. As we endeavor to leave future generations a rich and diverse natural world, there is no shortage of conservation challenges and opportunities to address.

Thanks to those who have donated to this program over the years. We look forward to your continued support as well as the support of others who join us, as we efficiently and economically move Indiana's rarest wildlife to healthy, self-sustaining populations and protect their habitats.

SURVEY AND MONITORING

Inventory is the critical first step in WDP planned management. Working with species that are rare or secretive complicates identifying the starting point. Nongame personnel conduct numerous surveys to determine a species' current status, (i.e., endangered, special concern or secure). Additionally, adaptive wildlife management requires management activities and habitat alteration impacts to be evaluated for their effects on rare species. Through monitoring, appropriate conservation actions can be determined and management refined to minimize adverse activities. To achieve the goal of maintaining Indiana's biological diversity, the status of species and habitats must be determined and conservation efforts prioritized.



HOW TO DONATE

The Indiana Wildlife Diversity Program invites you to play an active role in conserving Indiana's nongame and endangered wildlife. This program is funded through public donations to Indiana's Nongame Fund. The money you donate goes directly to the protection and management of more than 750 wildlife species in Indiana—from songbirds and chipmunks to state-endangered barn owls and spotted turtles. You can help Indiana's wildlife by looking for the eagle logo and the line provided on your Indiana state tax form to donate all or part of your refund. To donate directly, please write to:

Nongame Fund
402 W. Washington St. Rm. W273
Indianapolis, IN 46204

or donate directly online at
www.IN.gov/ai/appfiles/dnr-inf/index.html

BIRDS Breeding Bird Atlas

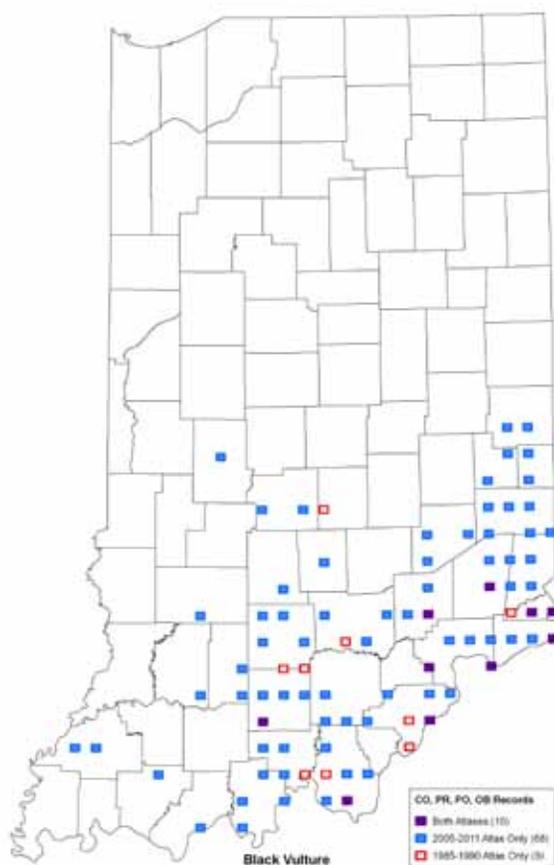
The Indiana Breeding Bird Atlas is a formidable undertaking that employs the skills and efforts of hundreds of birders in Indiana. The objective of the project is to determine the current distribution of breeding birds in the state and portray it in a map for each species. This is accomplished by making observations in 646 priority blocks, each consisting of 1/6th (approx. 10 square miles in area) of a standard 7.5-foot topographic map. Observers recorded breeding evidence for each bird species encountered during its presumed breeding period. The first atlas of breeding birds in Indiana was conducted from 1985-1990, and the current atlas was planned as an update 20 years later. Besides documenting changes in distribution, the current atlas should provide indirect evidence for changes in abundance for some species.

Field effort devoted to making an atlas was completed during 2011. The results are being summarized and analyzed. Maps showing the distribution of each species can now be viewed at: www.pwrc.usgs.gov/bba/index.cfm?fa=explore.ResultsBySpecies&BBA_ID=IN2005.

More than 45,000 bird records were tallied in priority blocks by volunteers, staff and contractors. This averages about 70 different species per block and is a 4.7 percent increase over the 1985-1990 atlas. During the current

atlas, 163 bird species were confirmed breeding with another 24 species categorized as unconfirmed. This compares to 159 confirmed and 22 unconfirmed species during the 1995-1990 atlas project. A total of 146 species was confirmed breeding during both atlas periods. Thus, 17 additional species were found breeding during the most recent atlas, while 13 confirmed species were found in 1985-1990 but not in 2005-2011. New breeders included two ducks (gadwall, ruddy duck), five wading birds (double-crested cormorant, great egret, snowy egret, cattle egret, black-crowned night-heron), one hawk (Mississippi kite), four shorebirds (black-necked stilt, Wilson's snipe, Wilson's phalarope, Caspian tern), two non-native species (Eurasian collared dove, monk parakeet), and three songbirds (Western kingbird, red-breasted nuthatch, and Brewer's blackbird). Bird species not found this time included five duck species, two wading birds, one shorebird, two owls, and three songbirds.

Birds encountered in the most priority blocks were: American robin, Northern cardinal, mourning dove, song sparrow, European starling, red-winged blackbird, indigo bunting, chipping sparrow, barn swallow, and American goldfinch. Compared to the previous atlas, more spe-



Breeding Bird Atlas map showing the increase in summer distribution of black vultures. Purple boxes indicate occurrence in priority blocks during both atlas periods. Blue boxes are from the recent atlas. Red are those from the 1985-1990 atlas.

cies showed increases (59%) than decreases (37%) in the number of blocks in which they were found. Species with the most significant increases in occurrence included: tree swallow, Eastern phoebe, wild turkey, Canada goose, Northern parula, house finch, ruby-throated hummingbird, Cooper's hawk, blue grosbeak, and blue-gray gnatcatcher. Declines in occurrence were most significant for: ruffed grouse, rock pigeon, black-billed cuckoo, grasshopper sparrow, Eastern whip-poor-will, loggerhead shrike, American woodcock, blue-winged teal, Northern flicker, and Northern bobwhite.

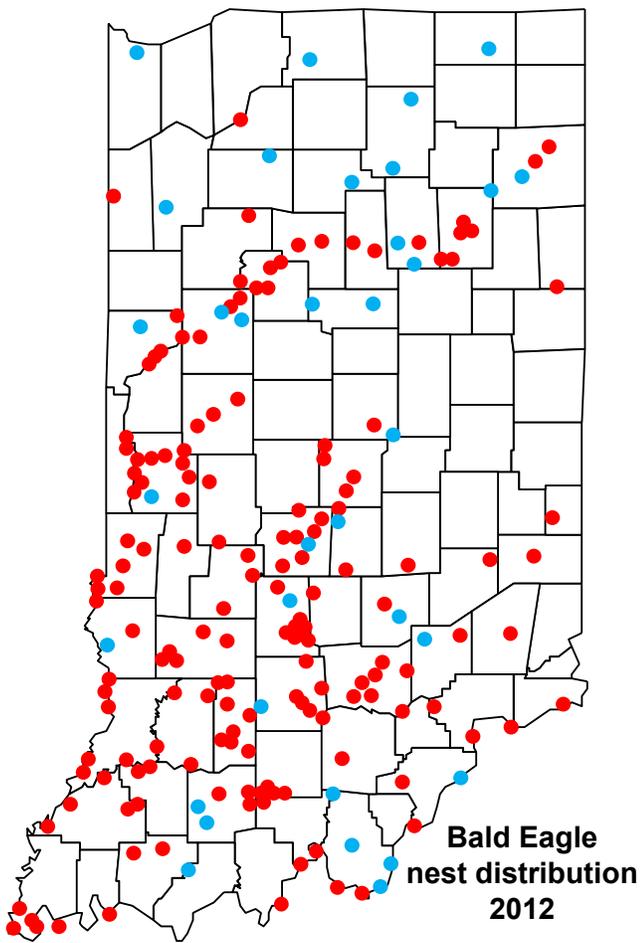
The current Breeding Bird Atlas will serve as a benchmark for future changes in the occurrence and relative abundance of birds in Indiana.

Bald eagle

Helicopter surveys to monitor bald eagle nesting in Indiana were discontinued after 2010, but biologists still catalog new nest sites in the state. Property managers and the public bring newly discovered eagle nests to our attention. In 2010, at least 120 eagle pairs were known in Indiana, and nearly 20 new nests were reported in 2011. In 2012, 32 bald eagle nests were discovered, and two additional nests were found in formerly active territories where the nest had been lost due to storms or high winds. Nine nests represented new county records, all but one in the northern part of the state. This is a remarkable expansion into northern Indiana. In recent times, bald eagle nesting has been documented in 63 of Indiana's 92 counties.

Another way to keep tabs on long-term eagle population trends in the region has been to conduct winter surveys. Nationwide midwinter bald eagle surveys, now coordinated by the Army Corps of Engineers, have been conducted in Indiana since 1979. For many years, these were conducted by helicopter, but were discontinued in 2009. In January 2012, eight locations, mainly fish and wildlife properties or public lakes, were surveyed for eagles from the ground. A total of 91 bald eagles was tallied this year—37 at the West Union bridge along Sugar Creek in Parke County, 34 at Monroe Lake, six at Muscatatuck National Wildlife Refuge, five at Patoka Lake, four at Brookville Lake, three at Willow Slough Fish & Wildlife Area and two at Hovey Lake FWA. Eagle Creek Reservoir was observed but no eagles were seen. In addition, one golden eagle was observed at the Parke County site and single unidentified eagles were recorded at Monroe Lake and Hovey Lake. The 2012 count of 91 bald eagles was somewhat less than the 109 bald eagles counted at the same sites last year, and compares to the 61 tallied in 2010 and 116 in 2009. Winter eagle counts can vary dramatically depending on the severity of the winter and the availability of prey (fish and waterfowl) and open water. Indiana attracts more eagles during cold winters when more Northern birds are forced to venture south for food.

After showing dramatic population declines after World War II primarily from the devastating effects of

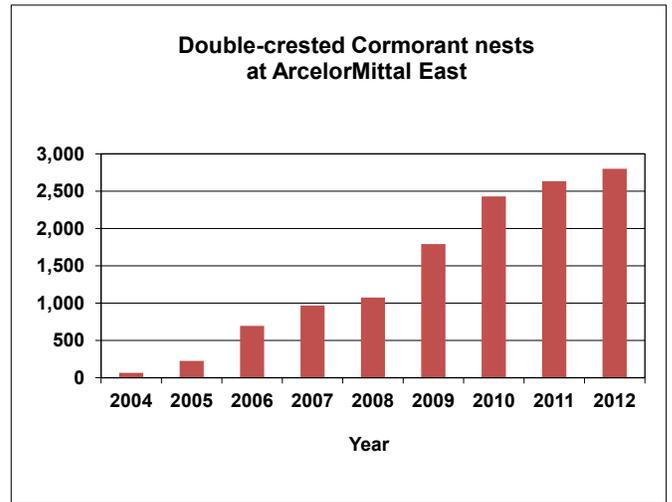


Bald eagle nests in Indiana. Blue dots represent nests discovered in 2012. Red dots were found in previous years.

DDT and other pesticides, our national symbol was declared recovered in 2007 and removed from the federal endangered species list. Indiana followed suit in 2008 after a goal of 50 nesting pairs was reached, a remarkable achievement considering that no eagles were known to have nested in the state from about 1900-1988. Restoration efforts from 1985-1989, when 73 eaglets from Wisconsin and Alaska were raised and released at Monroe Lake, contributed greatly to the statewide recovery. The current population is in the range of 160-180 nesting pairs.

Colonial waterbirds

The term "colonial waterbirds" refers to a number of different bird groups that nest close to each other. In Indiana, these include cormorants, herons, egrets, terns and gulls. Colonies consist of fewer than 10 nests up to the tens of thousands. Great blue herons are the most frequently encountered colonial waterbird in Indiana, with more than 100 known nesting colonies. Heron colonies have been surveyed every five years. The most recent census was in 2008. Two large gull colonies along



Growth in the number of double-crested cormorant nests at a steel mill in East Chicago, Indiana.



Double-crested cormorant chicks in a nest at Gibson Lake.



Black-crowned night heron chicks in a nest at ArcelorMittal Steel East in Lake County.

Lake Michigan (Lake County) have been assessed periodically as part of the Great Lakes Colonial Waterbird Survey. Counts of nests in 2011: 9,517 ring-billed gull and 205 herring gull nests at ArcelorMittal Steel West and 23,899 ring-billed and 28 herring gull nests at ArcelorMittal Steel East.

Other species are surveyed more often. The double-crested cormorant has been viewed with concern in the Midwest because increasing populations pose a potential threat to local fisheries. These birds also can compete for nest sites with less common heron and egret species. Since cormorants were discovered nesting at a Lake County site in 2004, annual counts of cormorants and associated heron nests have been made at two steel mills in Lake County. Biologists are concerned that cormorants may crowd out the rarer herons and egrets, forcing them to move elsewhere. Guano from cormorants can also kill trees used for nesting.

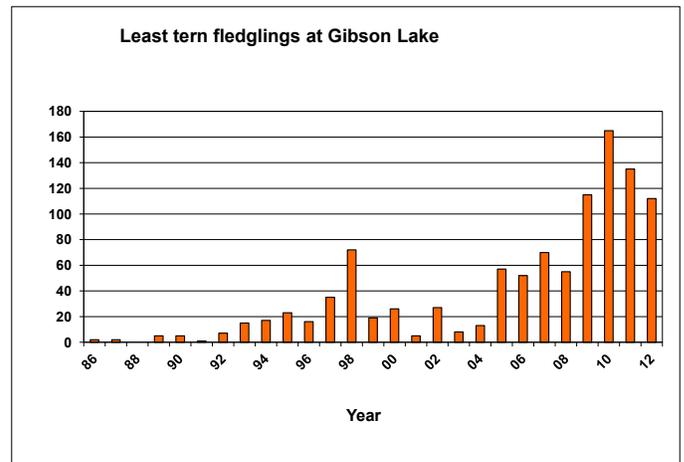
Counts of cormorants, state-endangered black-crowned night-herons, and great egrets, a species of special concern, were conducted at the two ArcelorMittal Steel colonies on May 22, 2012. At ArcelorMittal Steel West, nesting cormorants were again absent and great egrets and black-crowned night herons nested in small trees along the Indiana Harbor. Numbers of black-crowned night herons showed a modest increase from 61 nests in 2011 to 81 nests this year, while the number of great egrets exploded from seven to 43 nests. Black-crowned night herons nested here in the 1990s but disappeared after beavers cut down nest trees. The night herons were first noted again in 2008 after trees and shrubs became re-established. Great egret nesting was first observed in 2009.

At ArcelorMittal Steel East, double-crested cormorants showed another, more modest, increase with 2,800 nests in 2012 compared to 2,633 last year. The number of black-crowned night heron nests declined from 172 nests in 2011 to 66 nests in 2012. Great egrets showed a more modest decline with 112 nests tallied in 2012 compared to 125 in 2011. Trees and shrubs available for nesting are scarce. This forced a shift to ground nesting by cormorants and night herons. All but one great egret nest was in a tree or shrub, while 98 percent of double-crested cormorant nests and 93 percent of black-crowned night herons were on the ground. Nesting locations by each species are also segregated with cormorant nests closest to the Lake Michigan shoreline and great egrets farthest away, where more live shrubs and small trees are present. Black-crowned night herons nest in lower reaches of trees used by great egrets and on or near the ground along the perimeter of two small impoundments amid the gulls.

Continued monitoring at these sites will be used to guide management decisions regarding the need to control double-crested cormorants.

Least tern

As a ground-nesting bird found along major rivers,



Annual number of least tern chicks raised at the Gibson County nesting colonies

interior least terns are greatly influenced by water levels. They feed on small fish and aquatic invertebrates, and benefit from the protection of water surrounding islands or river bars that makes their ground nests less accessible to ground predators. However, too much water at the wrong time floods nests and reduces the amount of suitable area available for nesting.

It was no surprise that the pronounced spring and summer drought of 2012 greatly influenced the numbers and distribution of least terns in Indiana. During most years the Wabash River offers few of the large sandbars and islands desired by least terns during the breeding season. That changed this year. For the first time, a number of locations on the Wabash had small colonies. With the Mississippi River also at low levels in the major portion of their summer range, fewer least terns were expected to venture north to Indiana seeking breeding spots. Indeed, the record number of 280 adult least terns last year at the Gibson Lake nesting sites was reduced to about 135 adults. Another 50 individuals were observed nesting south along the Wabash River. In Spencer County, 40 adults were observed at the AEP power plant and a nearby dredge island in the Ohio River. Overall, this is a remarkable increase in Indiana's population—a single nesting pair was first discovered in Gibson County during 1986.

Working closely with power companies and the U.S. Fish and Wildlife Service, biologists closely monitor least tern colonies at two locations and take steps to maximize the chances for successful nesting. The original and largest colony is found in Gibson County. Birds are present on properties owned and managed by Duke Energy, the U.S. Fish and Wildlife Service (Cane Ridge Wildlife Management Area), and the DNR (Tern Bar Slough). A few early least terns were observed for a couple of days beginning April 23, but most birds showed up in mid-May and were present until the end of August. The number of least tern chicks raised was conservatively estimated at 112 young, not far below last year's number



Two recently hatched least tern chicks at Gibson Lake in Gibson County.

of 135 fledglings. Fifty nests were found during the early part of the breeding season. Another 47 were tallied later, the result of pairs re-nesting after failed attempts and of birds showing up from other parts of their range.

Low water levels in the Wabash River greatly hampered pumping to supply water to the created nesting islands at Cane Ridge and Tern Bar Slough, making them less attractive to least terns. Only 12 pairs were thought to have nested at Cane Ridge, raising 12 young. None nested at Tern Bar Slough. The narrow center dike in the middle of Gibson Lake produced about 80 chicks. Another 20 fledglings were raised at a nearby coal ash disposal area. At least four sites along the Wabash River in Gibson and Posey counties showed evidence of nesting but estimates of fledglings were not made.

Nearly 50 miles southeast of the Gibson Lake colony, a smaller population has been present since 2003 at the American Electric Power Plant near the Ohio River in Spencer County. The nesting site is a short, narrow dike separating some retention ponds. As many as 40 adult terns were counted, and 25 nests were discovered. However, only two chicks were thought to have been produced. On a nearby dredge island in the Ohio River, at least 14 adults were seen but nesting was not confirmed.

Management of least terns is challenging and consists of maintaining nesting sites free of dense vegetation, using fencing and manipulating water levels to deter ground predators, and employing least tern decoys to attract birds to suitable sites. These efforts have resulted in adequate production most years and a steadily increasing number of least terns in Indiana.

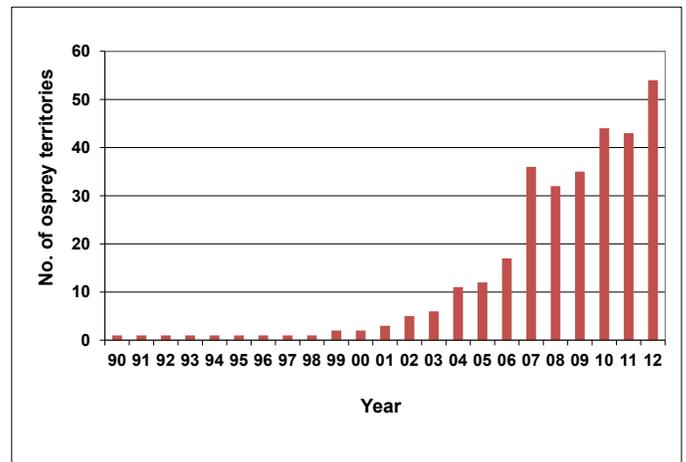
Osprey

A restoration effort was undertaken for this state-endangered bird from 2003-2006, when 96 young ospreys taken from nests in coastal areas of Virginia were raised and released at four locations in Indiana. As a result of this effort and the erection of nesting platforms in a partnership between the DNR and private groups and in-

dividuals, Indiana's osprey population has shown steady growth. The goal is to sustain a population of 50 pairs. Ospreys are only a couple of years away from being considered for removal from the Indiana list of endangered species.

Ospreys are large, eagle-like birds that are fascinating to watch. They are most commonly seen during spring and fall migrations while hovering, diving and catching fish in the open waters of Indiana's lakes, ponds and rivers. Historically a few remained to nest, building large stick nests in dead trees near the shoreline or on islands in lakes, rivers or wetlands. In recent times, osprey nests are most often found on man-made structures, including utility poles, cell towers and especially nesting platforms built specifically for them.

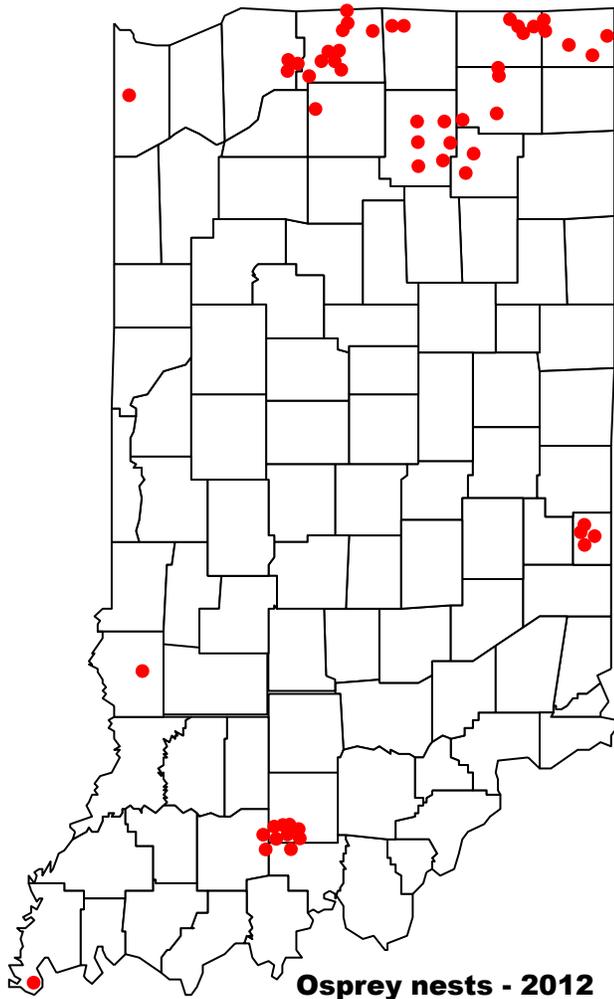
Monitoring efforts continued for osprey in Indiana during 2012, with 69 sites checked, including previous nests, nesting platforms and reports of new nests. Eleven new nests were found this year, resulting in a total of 54 pairs, with 49 pairs believed to have laid eggs, 40 of which were thought to be successful. At least 74 chicks were produced, but this is a significant underestimate



Annual number of osprey nests in Indiana.



Two osprey chicks in a Chesapeake Bay nest before being relocated to Indiana in 2003.



Location of osprey nests in Indiana in 2012.

because it is difficult to observe all young in the nest from the ground. These figures compare to two pairs and one active nest in 1999, 12 pairs and active nests in 2005, and 43 pairs and 36 active nests in 2011.

The distribution of ospreys is clustered in Indiana and includes 16 counties. The most nests are in St. Joseph and adjacent counties (15 nests or pairs), Kosciusko County and adjacent areas (12), Patoka Lake (10), Pigeon River Fish & Wildlife Area (6), and Brookville Lake (4). Nests in 2012 were built on nesting platforms (22), cell towers (14), dead trees (6), wooden utility poles (6), metal utility towers (5), and a water tower (1). Communication towers have become increasingly used of late, and this has caused some maintenance and operation problems at these structures. Nests can be removed from towers after nesting is complete but companies are encouraged to move nests a short distance away from problem areas rather than remove them altogether.

The outlook for ospreys in Indiana is good as long as we provide unpolluted waterways, healthy fish populations and suitable nest sites.

Peregrine falcon

Indiana's small peregrine falcon population showed a solid increase in numbers this year, setting new records in number of known territories (20), nesting attempts (18), successful nests (14) and number of young fledged (38). This was partly due to the discovery of four new territorial pairs, two along Lake Michigan and two at southern Indiana power plants with nest boxes near Petersburg and Lawrenceburg.

Three long-time breeders in Indiana met their demise in 2012, two at the end of successful nesting seasons. Kinney, who at 19 years was one of the oldest known wild peregrines on record, was found dead in late July on a ledge of the building in downtown Indianapolis where he had nested since 1995. He helped raise two chicks this year, increasing his Midwestern record of producing 61 young over his life span. Another male of note was Zephyr, a 13-year-old that had been released in Muscatine, Iowa, and had been nesting in downtown South Bend since 2003. Early last year he was discovered missing his right foot. Even with this handicap, he raised two chicks in 2011 and raised another three chicks to banding age this year. He was found injured after colliding with a light pole on June 19 and later died. Freedom, a bird released in Evansville in 1994, has been present in Fort Wayne since 1996 and nested for 12 years, raising 38 chicks. However, she has not nested since 2007, most likely because of advanced age. In 2012, she was observed at the nest box in mid-March, but was replaced by a yearling female. Although this young bird did not lay eggs, she is expected to do so next year.

Because many young falcons are banded in the nest each year, much is known about them. Of the 41 adults noted in the 20 territories during 2012, seven were unbanded, 25 were identified by their leg bands, and



Three peregrine falcon chicks in their nest box at the IPL power plant in Indianapolis.

nine were not observed well enough to identify. Identified adults had origins in eight different states: Kentucky (5), Illinois (5), Indiana (4), Wisconsin (3), Missouri (3), Ohio (1), Michigan (1), and Iowa (1). Two of the banded adults had been initially captured and banded at their breeding sites in Indiana. Their origin is unknown. One pair consists of full siblings, a rather unusual event in peregrines. Only five birds had been bred in captivity and released (only two remained alive by the end of the season); the rest were produced in the wild.

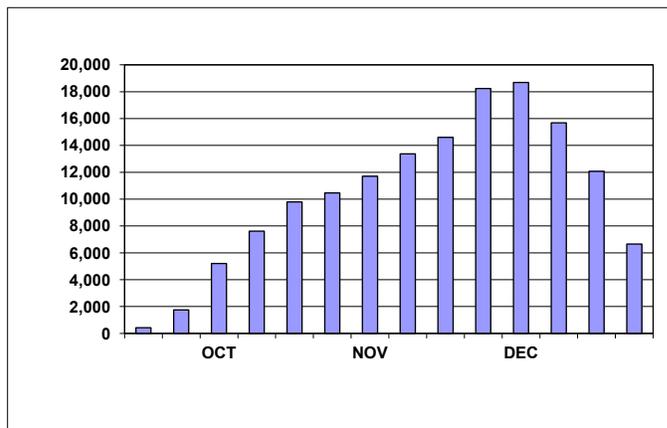
Thirty-eight chicks were banded at their nest sites. Only two were left unbanded because of the inaccessibility of their nest site. Two chicks died after being banded but before taking their first flight. During visits to nests, researchers collected 14 unhatched eggs for future chemical analysis.

The 20 sites in Indiana are unevenly distributed around the state. Most peregrine territories are close to a larger body of water. Indiana's nesting pairs were found near Lake Michigan (10 pairs), the Ohio River (3), White River (3), St. Joseph River (1), Kankakee River (1), Wabash River (1), and the three rivers of Fort Wayne (St. Mary's, Maumee, St. Joseph). Five nests are in downtown urban areas (four on office buildings, one on a bridge), and the remainder in industrial areas: power plants (7), steel mills (6), an oil refinery, and a lime plant. All but three nests were in nest boxes. Fourteen nests were on buildings, five on smokestacks, and one under a bridge.

The Midwestern population of peregrine falcons continues to grow. More than 300 pairs are present, a total several times greater than the 60-80 pairs estimated to have been present historically. In 2011, 240 nesting attempts were reported and more than 505 young were produced. In 1999, the peregrine falcon was considered recovered nationally and taken off the federal endangered species list. In Indiana, the goal of sustaining 16 pairs has been reached, and it has been proposed to remove the peregrine falcon from the state list of endangered species. One result of that action would allow one or two unbanded juvenile peregrines to be taken by falconers annually for use in their sport. The timing of trapping is such that any birds caught would most likely be migrating tundra peregrines and not locally produced falcons.

Sandhill crane

The sandhill crane is a long-legged, long-necked water bird that can be confused with the somewhat similar-appearing but totally unrelated great blue heron, sometimes inappropriately referred to as the blue crane. Sandhills fly with their necks outstretched and are seldom seen alone, but an individual is almost always in company with its mate, family group, or flocks, which number from a couple of dozen birds to the hundreds. During fall and spring migratory periods, groups of 50-100 are most commonly encountered flying in a loose V-



Average weekly counts of sandhill cranes at Jasper-Pulaski Fish & Wildlife Area, 2003-2011.



Breeding Bird Atlas map showing summer occurrences of sandhill cranes in Indiana, 2005-2011.

formation, circling as they catch updrafts, or descending to a field to feed or roost for the night. During migration, their bugling calls are most often heard before the flock is sighted. The Eastern population nests in marshes in the upper Great Lake states and southern Canada and

has been expanding. Nesting has been noted in Indiana since the early 1980s and now occurs in the northern quarter of the state. Sandhill cranes feed on a variety of aquatic plants, invertebrates and small vertebrates, as well as on waste grains in agricultural fields. At night, they normally roost in shallow water of marshes or fields.

Each year, the U.S. Fish and Wildlife Service coordinates a fall survey of the Eastern population of sandhill cranes to monitor changes in population size. Much of the population makes a stop at Jasper-Pulaski Fish & Wildlife Area (FWA) in northwestern Indiana before venturing south to wintering areas in Tennessee, Georgia and Florida. Public properties and other areas with a history of stopovers by sandhill cranes were surveyed, while bird-watchers were also asked to report sightings of cranes on the target survey date of Oct. 28, 2011. Jasper-Pulaski had 6,607 sandhill cranes present with lesser numbers at Kingsbury FWA (427), Pigeon River FWA (278), Boot Lake (100), Pisgah Marsh Wildlife Diversity Area (8), Muscatatuck National Wildlife Refuge (4), Tri-County FWA (2), and Goose Pond FWA (1). No cranes were observed at Willow Slough FWA, Atterbury FWA, Lake Monroe, Brookville Lake, or the Ewing Bottoms in Jackson County. Many sandhill cranes had not yet moved south into Indiana from Wisconsin, Michigan, and other northern locales. Numbers on weekly counts at Jasper-Pulaski exceeded 6,000 birds from early October to early December with more than 10,000 cranes from late November to mid-December. The peak count occurred on Dec. 13, when 12,685 cranes were counted. Additional birds were present in the area. Sandhill cranes now regularly use open water areas at a NIPSCO power plant just west of Jasper-Pulaski.

Kentucky held a 30-day experimental hunting season for sandhill cranes beginning December 17, 2011. This was the first legal hunt of cranes in the eastern United States in recent times. Permits were issued to allow take of up to 400 birds but only 50 cranes were harvested. The fall population of Eastern sandhill cranes exceeds 72,000 individuals.

Whooping cranes

Whooping cranes continue to make stops in Indiana during spring and fall migration from Wisconsin to Florida. Some use the Tern Bar Slough Wildlife Diversity Conservation Area, while larger numbers regularly use Goose Pond FWA. From fall 2011 to spring 2012, 27 different whooping cranes spent at least 988 bird-days at Goose Pond. Some juvenile cranes are still being taught their initial fall migration by following ultra-light aircraft, but the flight path in recent years has shifted west from Indiana to Illinois.

Marshbird surveys

Marshbirds consist of a diverse group of birds from different taxa that include bitterns, rails, gallinules,

Number of birds detected during marshbird surveys in 2012.

	Survey period				Total
	April 15-30	May 1-15	May 16-31	June 1-15	
Goose Pond FWA					
<i>No. points</i>	22	26	23	23	94
American bittern	6	10	2	1	19
Least bittern		1	1	3	5
Sora	40	14	1		55
Virginia rail	3				3
King rail	2				2
Black rail		1			1
Tern Bar Slough					
<i>No. points</i>	9	9	9	9	36
American bittern	1				1
King rail	2		2		4

Number of birds detected during marsh bird surveys in 2012.

grebes and Wilson's snipe. These birds are difficult to survey because they reside in dense emergent vegetation and are inconsistently vocal during the breeding season. Thus, little is known about their numbers, population trends, and responses to habitat changes and land management practices. However, a standardized protocol using playbacks of vocalizations has been developed and is used throughout North America. In Indiana, short-term surveys using playbacks have been used on occasion, primarily to learn about the distribution and relative abundance of marsh birds.

In 2010, the Indiana office of the National Audubon Society set up survey points at the 8,000-acre Goose Pond FWA in Greene County. This expansive mix of shallow wetlands, ditches and upland grasslands provides extensive habitat for rails and bitterns. In 2012, the Wildlife Diversity Program overtook the administration of this survey at Goose Pond and set up additional routes at the 840-acre Tern Bar Slough Wildlife Diversity Conservation Area in Gibson County. The purpose of these surveys was to determine the relative density of rail and bittern species and study how diversity and populations change over time.

In 2012, state agency staff and volunteers surveyed 26 points along eight routes at Goose Pond. The much smaller Tern Bar Slough site had two routes with a total of nine points. Surveys were conducted during four two-week time periods from mid-April through mid-June. Four rail species and two bittern species were detected at Goose Pond; only an American bittern and king rails were found at Tern Bar Slough. The most common species tallied at Goose Pond was the sora, followed by the American bittern. Three other rails were heard along with least bitterns. King and black rails are rare species throughout most of their range. Breeding numbers of king rails in southwestern Indiana may be some of the highest in the nation. Detection differences are noticeable among the survey periods for the various species. These reflect the timing of migration and differences

in calling frequencies during the breeding cycle. Calling behavior is thought to be most pronounced before egg-laying, when territories are being established and maintained. Water levels in marshes during the breeding season may play a large role in attracting marsh birds and ultimately influencing nest productivity for the year. Water conditions were good through the winter, but levels began to fall by mid-February and the lack of regular spring rains eventually caused a widespread drought and drastically reduced the amount of quality habitat for rails and bitterns.

All the rails and bittern species except the sora are on the Indiana list of endangered species. Marshes and other wetlands have been destroyed or degraded over the years and quality wetlands are difficult to find. Restorations such as Goose Pond and Tern Bar Slough demonstrate that wetland birds will readily discover and use these habitats.

FISH AND MUSSELS

Lake sturgeon

Annual sampling and study of the lake sturgeon population of the East Fork White River has been ongoing since 1996. Although lake sturgeon once inhabited most of the largest rivers of the Ohio River drainage, only a remnant population remains in portions of the East Fork White River in primarily Lawrence and Martin counties.

Gill and trammel nets have been used to sample lake sturgeon annually at several locations in the East Fork White River. Basic information such as length and weight are taken from collected lake sturgeon, and all lake sturgeon are tagged with PIT (passive integrated transponders) tags, so individual fish can be tracked over time. Many lake sturgeon have been recaptured multiple years over the course of this work. For example, a lake sturgeon caught this year that weighed 43 pounds (19.5kg) and had a length of 5 feet (1521mm) was first captured in 2002 at a weight of 18 pounds (8.1kg) and length of 3.7 feet (1120mm). This fish was also caught in 2004, 2005 and 2008. Another lake sturgeon caught this year at 55 pounds (24.9kg) and 5.3 feet (1624mm) was first captured in 1999 at 42 pounds (19.1kg) and 4.8 feet (1469mm).

Several lake sturgeons over the years have been fitted with radio tags, in order to track their movements using radio telemetry. Successful reproduction was first documented in 2005 when spawning lake sturgeon were tracked to below Williams Dam; the spawning run has been monitored annually since, and usually occurs during the first two weeks of April. This past year, with unseasonably warm temperatures, lake sturgeon spawned the last week of March.

Tracked lake sturgeons have shown similar annual movement patterns since the telemetry study began. Little movement occurs during the winter months until water temperatures reach about 50 F. At that point those



Well-developed lake sturgeon eggs near hatching.



Area downstream of Williams Dam where lake sturgeon spawning takes place.



A "new" lake sturgeon (i.e., did not have a PIT tag) collected during this past field season's sampling. It weighed 24 pounds.

lake sturgeon participating in the year's spawning activities make an impulsive movement upstream until they are blocked from further upstream migration by Williams Dam. Lake sturgeons remain in the Williams Dam area until water temperatures approach 60 F, at which point they spawn. Once the spawning activity ends, lake sturgeon re-distribute downstream to locations where they spend the summer until the next year's spawning migration takes place.

Freshwater mussels

New federal and state designations for freshwater mussels in Indiana

A final rule to designate the rayed bean (*Villosa fabalis*) and snuffbox (*Epioblasma triquetra*) as federal endangered species was published in the Federal Register on Feb. 14, 2012 (Vol. 77, No. 30); sheepsnose (*Plethobasus cyphus*) and spectaclecase (*Cumberlandia monodonta*) were designated as federal endangered species in the Federal Register on March 13, 2012 (Vol. 77, No. 49). The rabbitsfoot (*Quadrula cylindrica cylindrica*) was proposed for federal threatened status in the Federal Register on Oct. 16, 2012 (Vol. 77, No. 200). It was also proposed that critical habitat be designated for this species in Carroll, Pulaski, Tippecanoe, and White counties. Indiana now has 19 federal endangered freshwater mussel species (and one proposed for threatened) among the 77 species historically known from the state. Unfortunately many of these are no longer found live in Indiana. Clubshell (*Pleurobema clava*), fanshell (*Cyprogenia stegaria*), fat pocketbook (*Potamilus capax*), rabbitsfoot, rayed bean, sheepsnose, and snuffbox still maintain limited populations, while the others are considered extirpated.

The round hickorynut (*Obovaria subrotunda*), currently a state species of special concern, was proposed for state endangered status in May 2012. This species at one time inhabited up to 50 watersheds in the state, but is now likely reproducing in only two (Tippecanoe River and Richland Creek). This recommendation was preliminarily adopted in November and is currently in the public comment phase, with final adoption likely at the beginning of 2013.

Snuffbox augmentation in the Tippecanoe River

Federal funding was obtained to initiate an augmentation for snuffbox in the Tippecanoe River. Snuffbox populations in the Tippecanoe have declined drastically over the last couple of decades. They may no longer be reproducing in the watershed. Glochidia (parasitic freshwater mussel larval stage) will be harvested from gravid female snuffbox from a viable population in the Salamonie River and used to infect logperch (known snuffbox host) collected from the Tippecanoe. These logperch will then be held in cages in the river until the glochidia they are holding transform and fall off. The newly produced larval snuffbox will then be grown in



Snuffbox collected from Sugar Creek in Shelby County.



Rabbitsfoot collected from Flatrock River in Shelby County.



Round hickorynut collected from Tippecanoe River in Fulton County.



Low water conditions and location of freshwater mussel survey in Flatrock River in Shelby County.

the cages until they are of a size that they can be translocated to another section of the Tippecanoe. The hope is to re-establish a self-sustaining snuffbox population in the Tippecanoe.

Freshwater mussel surveys completed this past field season

Drought conditions and corresponding low water levels persisted for much of the summer/fall across the state. In many areas these conditions increased the public's awareness of freshwater mussels. Exposed gravel/sand bars are a normal summer occurrence in most of Indiana's rivers and streams, although in some places this year levels likely reached near-record lows. These conditions provided some excellent opportunities for surveys in areas that would normally be less accessible by wading. General mussel surveys were completed in portions of the following watersheds: Flatrock Creek (Allen County), upper Elkhart River drainage (Noble), Salamonie River (Huntington), Maumee River (Allen), Tippecanoe River (Fulton, Pulaski, White, Carroll and Tippecanoe), Flatrock River (Rush, Shelby and Bartholomew), Sugar Creek (Hancock, Shelby and Johnson), Sand Creek (Jennings, Jackson and Bartholomew), Clifty Creek (Decatur and Bartholomew), Wabash River (Huntington, Carroll,



Low water conditions and location of freshwater mussel survey in Tippecanoe River in Pulaski County.



JoAnne Davis digging a quadrat looking for live mussels during a quantitative survey in Fish Creek in Dekalb County.



Numerous aged spike collected from a single quadrat in Fish Creek in Dekalb County.



Surveyors become familiar with acoustic equipment at regional training session.

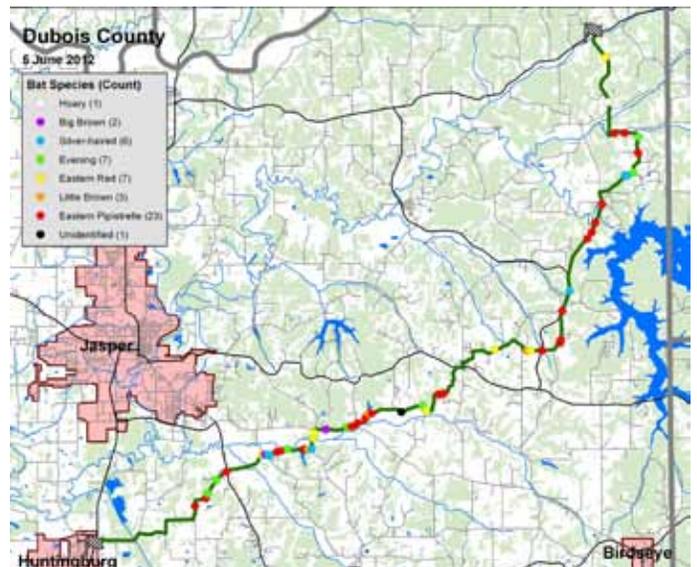
Tippecanoe, Warren and Fountain), West Fork White River (Randolph and Delaware), Vermillion River (Vermillion), Eel River (Miami and Cass), Cedar Creek (Dekalb), and Pigeon River (La Grange).

Interesting finds included a single live snuffbox from Sugar Creek in Shelby County. The last live snuffbox seen in this watershed was found in 1990. There is likely not a reproducing population still present in the Sugar Creek watershed, although a few remnant older individuals still persist. A few live rabbitsfoot were collected from the Flatrock River in Shelby County and Sugar Creek in Johnson County. Live rabbitsfoot had not been recorded live anywhere in the upper East Fork White River watershed in recent years. The reproducing status of this population is still not known; future surveys will be targeted in these watersheds to determine viability.

More intensive, quantitative surveys were completed in the lower Tippecanoe River (below Oakdale dam), Fawn River (Steuben), and Fish Creek (Steuben and Dekalb). Systematic sampling was conducted in each of these locations which included digging substrate from ¼ square-mile quadrats and sifting through it to find small juvenile mussels. The density estimates derived from these surveys and information gained on population structure will be used to monitor the long-term health of the freshwater mussel communities in these watersheds.



A roof-mounted microphone is used to record the ultrasonic calls of bats.



Preliminary results of a mobile acoustic survey in Dubois County. Fifty bats of seven different species were detected.

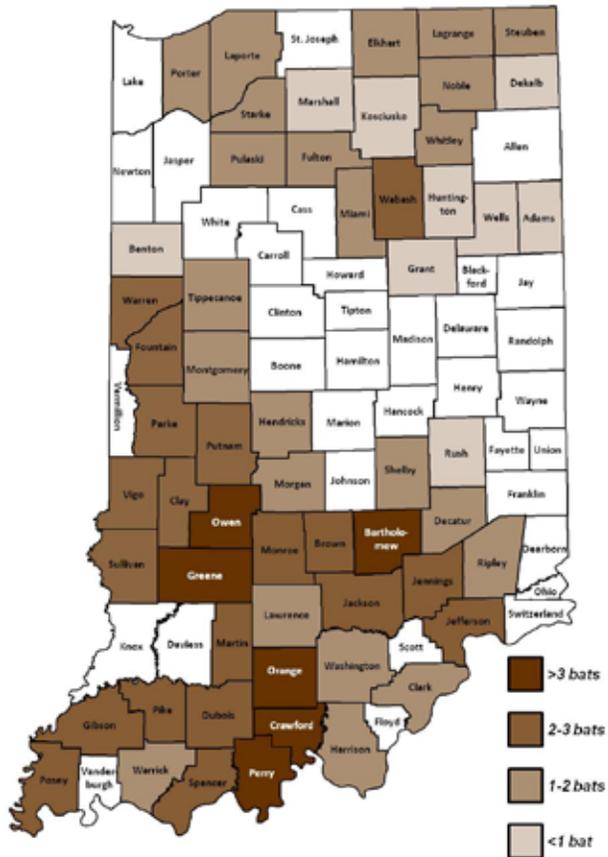
MAMMALS

Mobile acoustic bat survey program

First summer yields nearly 200 surveys statewide

Nongame biologists launched a new project in 2012

2012 Mobile Acoustic Bat Surveys (number of bats detected per mile driven)



to monitor the statewide distribution and relative abundance of bat populations in their summer range. The project uses acoustic equipment in which an ultrasonic detector and vehicle-mounted microphone record echolocation calls emitted by bats in the environment. Surveyors drive a predetermined route (25–30 miles in length) shortly after sunset, when bats become active. The same routes will be surveyed each year, allowing biologists to monitor multiple species of bats at different locations in the state and across years.

In 2012, there were 198 mobile acoustic surveys completed in 57 of Indiana's 92 counties. Surveys in each county were conducted two-to-four times across the six-week survey period that began in late May and ended in early July. These efforts produced nearly 35,000 acoustic files, approximately 10,000 of which contained echolocation calls of free-ranging bats (other files may contain noise from insects, machinery, birds or static). The number of bats detected per mile driven averaged 1.9 across all surveys and ranged from a high of 4.2 (Crawford County) to 0.3 (Adams County).

Data analysis will continue through the winter as non-game personnel develop program standards for the acoustic identification of bats that summer in Indiana. Manual analysis of acoustic files allows greater accuracy in species identification but is impractical for long-term studies that

generate tens-of-thousands of files. An automated system of call identification is needed to process data in a timely manner and to ensure consistency across surveys and from year to year. Several software programs, each with advantages and disadvantages, are available or nearing completion that will aid biologists in analyzing acoustic data and reporting survey results in a standardized format.

The Wildlife Diversity Program oversees many projects with decades of invaluable data for understanding population trends of targeted species or groups. Just as every journey begins with a single step, the 2012 mobile acoustic surveys represent the first step in what promises to be a long-term program to monitor trends in summer bat populations in Indiana. This information will be vital in the ongoing process to preserve one of Indiana's most valuable resources.

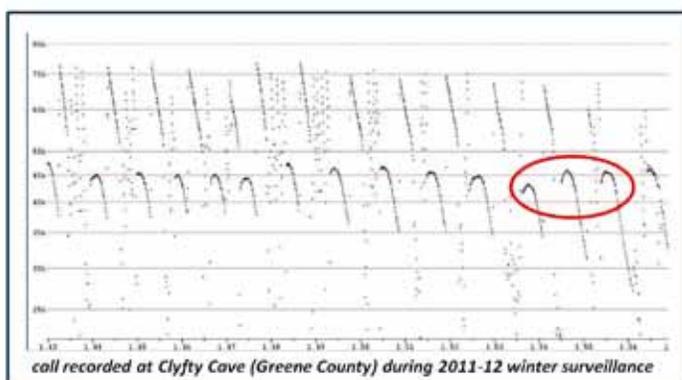
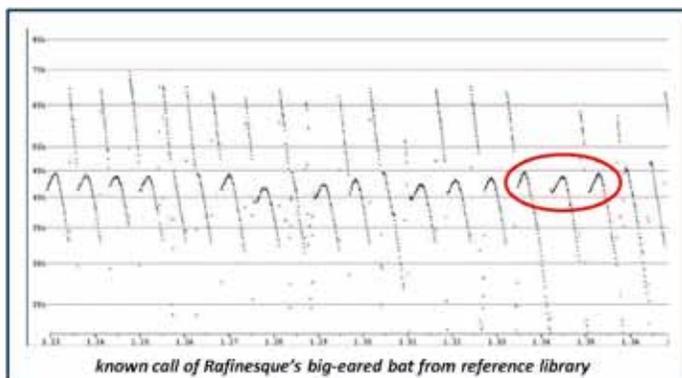
Rafinesque's big-eared bat

Detectors record calls suggestive of rare bat last seen in Indiana 50 years ago

An unexpected discovery from the ongoing White-nose Syndrome (WNS) acoustic surveillance program



Enormous ears distinguish the Rafinesque's big-eared bat from any other bat species found in Indiana. (Photo by Tim Carter, Ball State University.)



Comparison of a known Rafinesque's big-eared bat call (top) to a call recorded at Clyfty Cave in Greene County (bottom) during the 2011-12 winter acoustic surveillance. Red circles highlight the characteristic "dip" at the start of a Rafinesque's big-eared bat call.

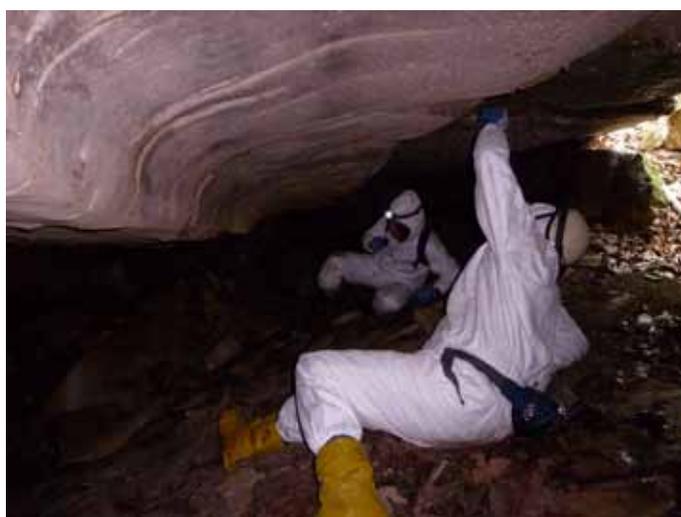
has been the detection of calls from what appears to be Rafinesque's big-eared bats outside several caves in Crawford, Greene, Martin, and Washington counties. This rare bat is found throughout the southeastern United States and is generally considered to be an accidental visitor to the state rather than a permanent resident. Since 1894, there have been only 18 verified records of a "Raf bat" in Indiana, the last of which was 50 years ago.

The Rafinesque's big-eared bat is virtually unmistakable and resembles no other bat found in the state. It has a medium-sized body but is instantly recognizable by its large, rabbit-like ears, which are more than an inch in length. Further, a Raf bat flying in an open environment emits an ultrasonic call with a distinctive "dip" at the start (top) of most pulses. It is unlikely this unique call could be confused with those of Indiana's other cave-dwelling bats, which lack this initial "dip" and are typically made at a higher frequency.

Acoustic surveys are a relatively recent addition to the bat biologist's toolbox. While the possibility of this bat's return to Indiana is exciting, it also brings up the question of how to best interpret records that lack a photograph or physical specimen. Big-eared bats are sparsely distributed, even in the heart of their range, and exceedingly difficult to capture using traditional methods such as mist nets. Nonetheless, an actual "bat in hand" is



Cluster of 151 hibernating Indiana bats.



Surveyors count bats in a ceiling crack in a Washington County cave.

certainly more credible than a spectrogram of a bat call displayed on a computer screen, especially for documenting a species that has been absent for half a century.

Nongame personnel intend to use ultrasonic detectors throughout the year to better define seasonal use of caves by what appears to be Rafinesque's big-eared bats. Additional efforts and information are needed to help biologists fine-tune their search and improve the prospects of confirming this rare and elusive bat in Indiana.

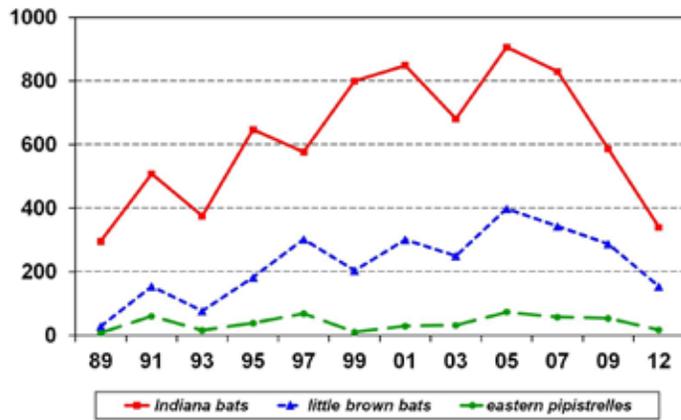
Winter bat surveys in Indiana

Surveys in 2012 target smaller populations

Biennial surveys of winter hibernation sites have been conducted in Indiana since the early 1980s. The result has been the creation of one of the longest-running datasets known for cave-dwelling bat populations. As a precautionary measure against the looming threat of white-nose syndrome (WNS), surveys in 2011 were limited only to the largest known winter roost sites. As a result, surveys in 2012 were made to many



A big brown bat.



Winter bat populations in Saltpeter Cave, 1989–2012. Note the overall declining trend for all species since 2007.

of the hibernacula that harbor fewer numbers of bats and were not visited the previous winter.

In February 2012, complete censuses were conducted in eight caves in six counties while Brough’s Tunnel in Clifty Falls State Park (Jefferson County) was surveyed in mid-March. Cumulatively, these efforts tallied approximately 1,875 little brown bats, 1,270 Indiana bats, 385 Eastern pipistrelles, 70 big brown bats, and three Northern long-eared bats. The total number of bats in six of these caves increased from the last count taken in 2009. Declining populations were documented in one site. Evidence of WNS was detected in all but one cave. The perceived severity of the disease ranged from a single infected bat in three caves to more pervasive conditions affecting large numbers of individuals in three other sites. The surveys proved timely. They provided abundance estimates of hibernating bats in caves that were omitted from 2011 studies and will help nongame biologists continue to monitor population trends of bats that winter in Indiana.

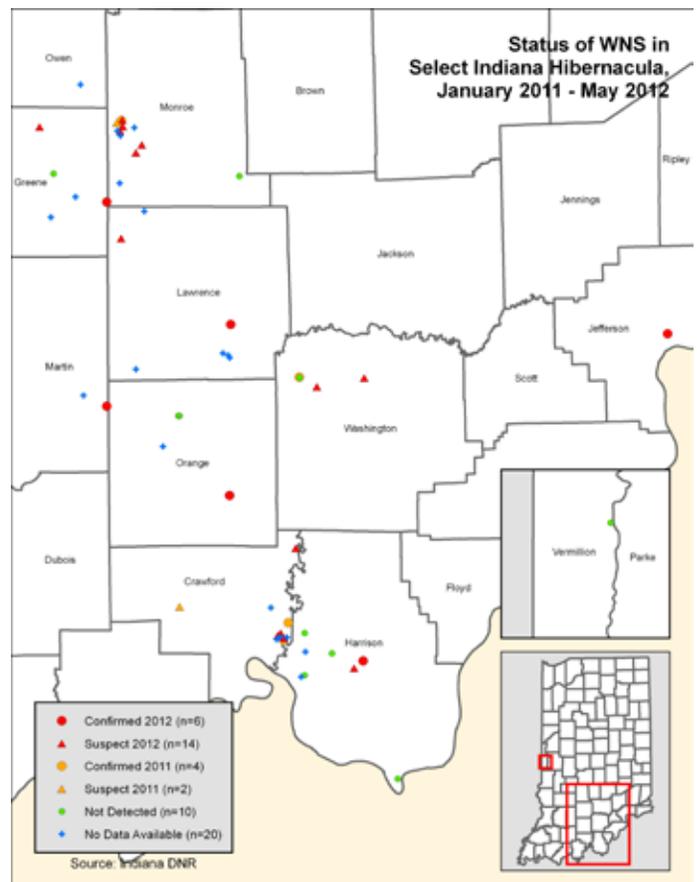
Two years of white-nose syndrome in Indiana

Surveillance documents spread of disease in second winter

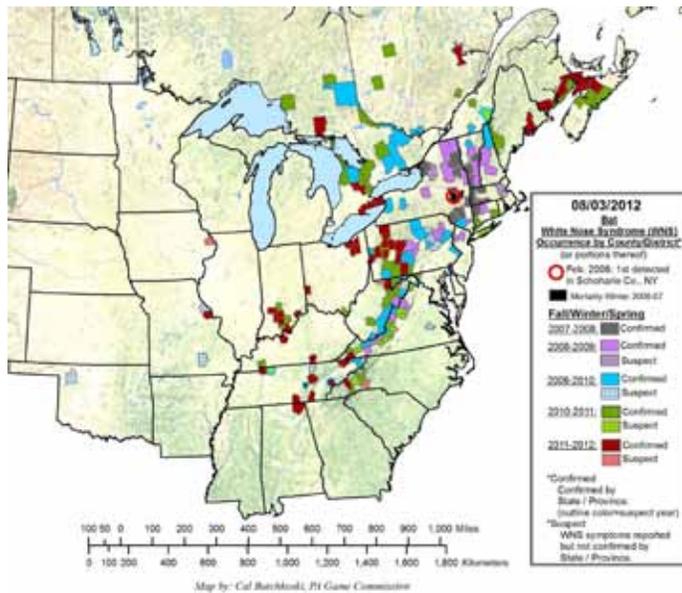
White-nose syndrome (WNS) is an infectious disease associated with a newly identified fungus responsible for unprecedented levels of mortality among hibernating bats in North America. WNS is named for the white fungus that invades the skin tissue on the muzzle, wings and ears of infected bats. It was first noted in New York in 2006 and has since spread unchecked to 19 states and four Canadian provinces. The disease is responsible for the death of an estimated 5.7–6.7 million bats across the eastern United States.

Nongame biologists first detected WNS in Indiana in January 2011 while conducting surveys to census winter bat populations. By the end of the hibernation season, the disease had been suspected or confirmed in five caves in three counties. The 2011-12 winter marked the second known year of WNS in Indiana. Additional evidence points to a continued geographic spread of the disease across the southern third of the state.

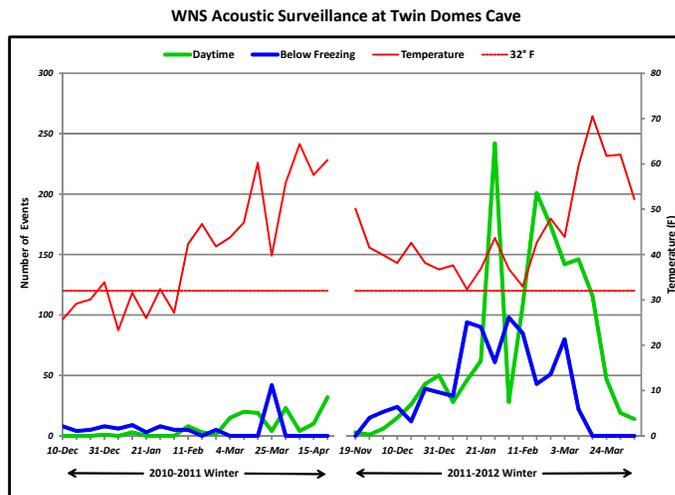
From December 2011 through March 2012, there were 15 reports submitted via the “Report Sick Bats” link on the DNR Division of Fish & Wildlife website, more than twice the number reported the previous winter. Biologists



Status of WNS in select hibernacula in Indiana, 2011-2012.



Distribution of WNS by county/district, August 2012.
(Cal Butchkoski, Pennsylvania Game Commission)



Acoustic surveillance at Twin Domes shows little atypical behaviors in first winter, followed by a progression to excessive daytime and sub-freezing emergences in second winter. Note the difference in average weekly temperature patterns between the two winters.



Little brown bat with visible signs of WNS infection on its forearm and muzzle roosting in an Indiana cave.



Ultrasonic detector positioned outside cave entrance to record echolocation calls of exiting bats.

avoid mid-winter cave trips solely to check for signs of WNS infection because they disturb hibernating bats. Instead, they place acoustic equipment at the cave entrance to record the echolocation calls of any bats leaving the cave in the daytime or during sub-freezing temperatures. Both actions are abnormal behaviors often exhibited by WNS-infected bats. Information gleaned from Indiana's acoustic surveillance in 2012 suggests that WNS may have recently infected two important caves that together harbor more than 55,000 Indiana bats, a federally endangered species. Biologists found evidence of WNS in eight of nine caves visited during 2012 bat censuses. Brief surveillance trips to two other sites also noted infected bats.

The collective result from all monitoring and surveillance activities during the last two winters confirms WNS in 10 caves across nine counties. An additional 16 caves are suspect. Seventeen (65%) of the 26 caves are located in three counties (Crawford, Monroe and Washington). WNS appears to be widely distributed throughout much of the western portion of the karst region in south-central Indiana and locally established within most of the state's major concentrations of important hibernacula.

To date, Indiana has not experienced the massive mortality events seen in other parts of the country, particularly near the disease's origin in the northeastern United States. The ultimate impact to the state's cave-dwelling bats remains to be seen. Substantial differences in time ranging from weeks to years may pass between the detection of visible fungus and the onset of mass mortalities. Because WNS has recently reached Indiana, it may not have progressed to levels that result in high rates of mortality. Surveys that are slated for the upcoming 2012-13 winter will provide the first opportunity to evaluate the impact of WNS on bat populations in some of Indiana's most significant hibernacula.

Spying on bats

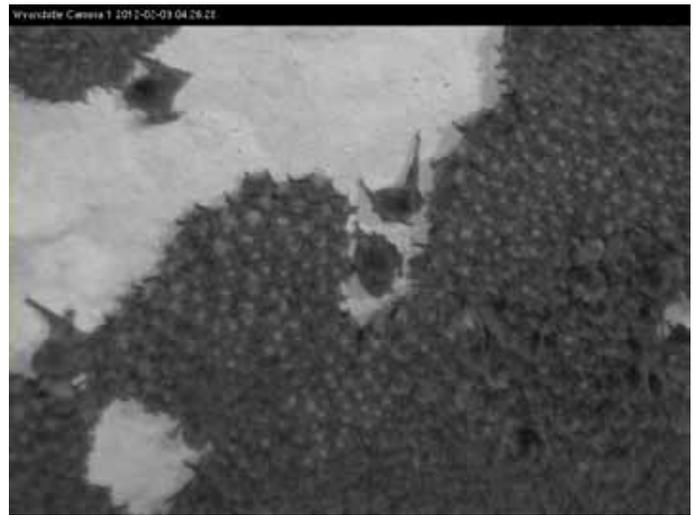
Cameras shed light on hibernation behavior of WNS-infected bats

Wyandotte Cave in O'Bannon Woods State Park is the site of a collaborative study including DNR, the U.S. Geological Survey Fort Collins Science Center, University of Tennessee, and Southern Illinois University that examines hibernation behavior of bats that roost in sites infected with white-nose syndrome (WNS). The project, funded by the U.S. Fish and Wildlife Service's 2011 WNS Grants to States Program, uses near-infrared (NIR) and thermal cameras to obtain video imagery of hibernating bats. Similar systems were recently deployed at WNS-infected sites in New York, Ohio, Virginia and Tennessee.

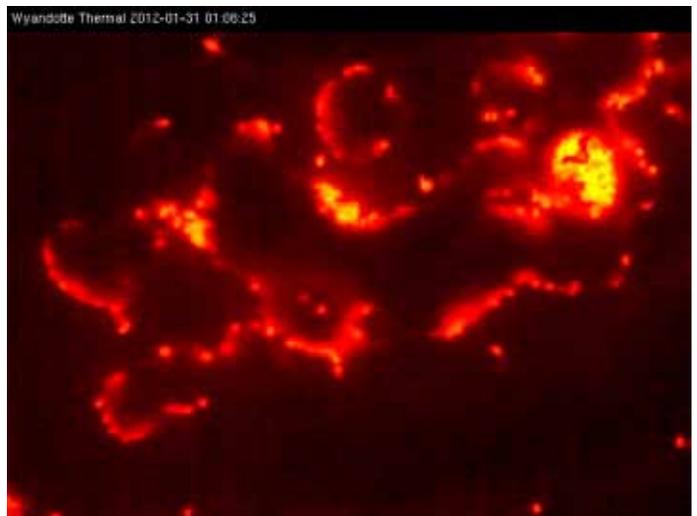
WNS is caused by a newly described fungus (*Geomyces destructans*) that invades the skin tissue of the nose, ears, and wings of cave-dwelling bats during hibernation. While the prolific white fungal growth that forms on the nose may be the most striking sign of infection, scientists believe bat wings may be the most important target. During hibernation, the large surface area of a bat's wings performs critical physiological services such as regulating the animal's body temperature, water balance and gas exchange with its external environment. These life processes that are vital



Each NIR camera is housed inside an airtight protective case.



Near-infrared image of an Indiana bat cluster.



Thermal image of a cluster of Indiana bats. The brighter areas represent bats that are awake and burning precious energy reserves. Darker areas represent bats in hibernation with lower body temperatures and reduced metabolic rates that conserve energy reserves.



Near-infrared (black) and thermal (white) cameras positioned in Wyandotte Cave.

to survival are disrupted when healthy wing membranes are digested by the invading fungus. Consequently, the hibernation strategy of WNS-infected bats can exhibit a number of harmful behaviors that appear to be triggered by their inability to regulate metabolic activities and maintain homeostasis (steady internal conditions).

Wyandotte Cave, which was found to be infected with WNS in January 2011, houses the largest known winter population of the federally endangered Indiana bat in the country. The 2012-13 winter marks the second consecutive year of video surveillance at this historic cave. Last winter, cameras were installed to monitor the behavior of bats hibernating near the cave entrance, a tell-tale sign of WNS infection. In fall 2012, additional cameras were placed at roost sites deeper in the cave to obtain imagery of bats that are possibly using a different hibernation strategy.

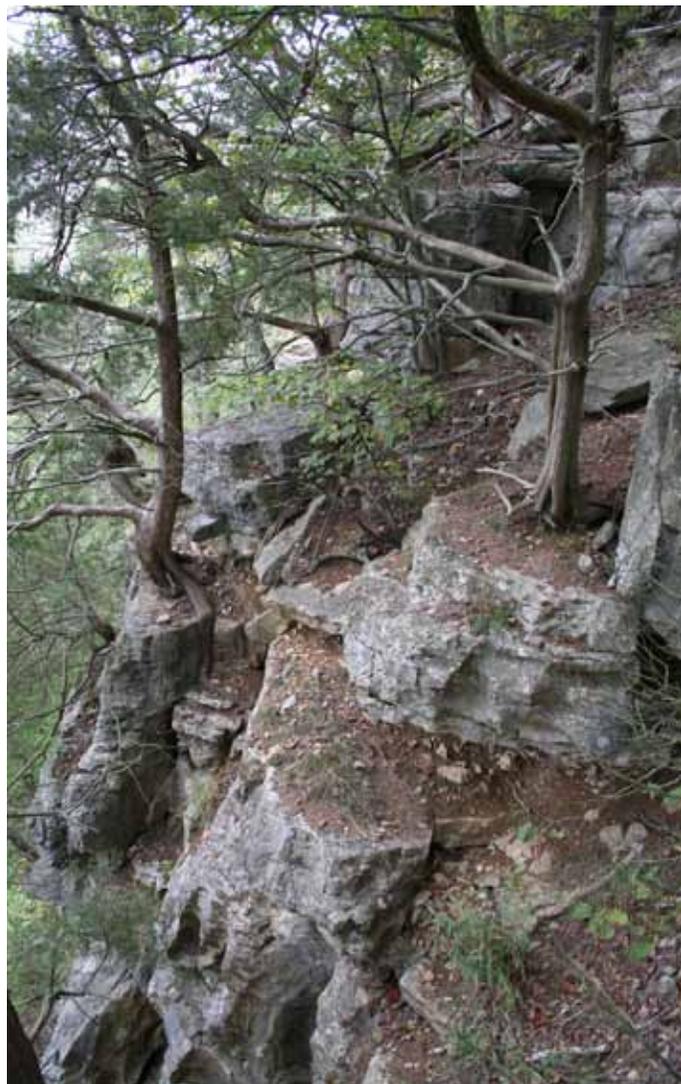
Each NIR camera records for five minutes every hour while the thermal cameras, which image temperature, record continuously. Cooperating researchers then examine the video files for uncharacteristic behaviors indicative of WNS infection such as elevated activity levels, longer and more frequent arousals from hibernation, and moving to colder roost sites at the cave entrance. Collectively, these behaviors greatly reduce hibernation efficiency and lower over-winter survival. Ongoing video surveillance in Wyandotte Cave will help scientists define the processes in which dermal infection by the fungus responsible for WNS results in the onset of disease and, ultimately, causes mortality.

Allegheny woodrat surveys

The Allegheny woodrat is a state-endangered species and one of the rarest and least-observed mammals in Indiana. The species lives among the limestone cliffs, rock outcrops and caves in the forested hills bordering the Ohio River. Also known as trade rats or packrats, woodrats are nocturnal and stay close to the deep crevices and ledges that protect them from predators and provide a safe place to raise young and store food.

Allegheny woodrats are listed as a species of conservation concern in 10 of the 14 Eastern states in which they occur. Indiana has been at the forefront of woodrat conservation since 2005, when the DNR partnered with Purdue University and The Nature Conservancy to initiate a comprehensive analysis of the state's remaining populations. These efforts included a thorough review of the species' genetic diversity, releases of woodrats collected from other states with more robust populations into vacant Indiana habitats, and an innovative captive-breeding program to produce new woodrats to replenish depleted populations (see links to external projects).

The present-day distribution of woodrats in Indiana includes about 15 cliff sites scattered along nearly 40 river miles from Rosewood in Harrison County downstream to Alton in Crawford County. These sites,

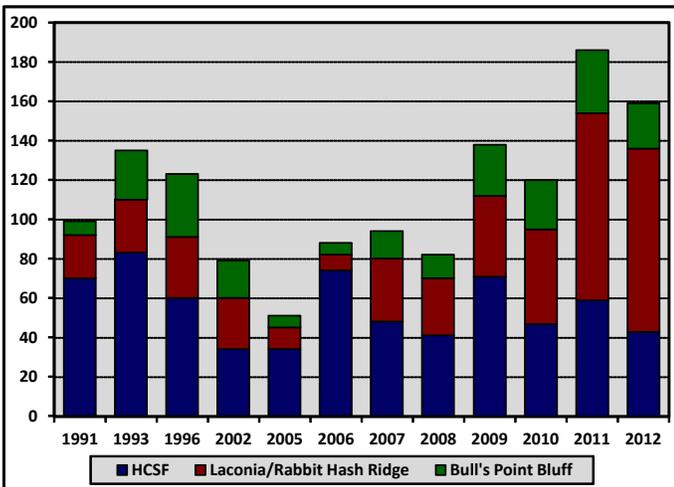


Allegheny woodrats occupy deep crevices and ledges on steep limestone cliffs.

however, separate into three distinct subpopulations (Harrison-Crawford State Forest, Bull's Point Bluff, Laconia/Rabbit Hash Ridge) that are spatially and genetically isolated from one another. For more than 20 years, nongame personnel have periodically conducted live-trapping surveys at these sites to monitor the species' distribution and relative abundance in Indiana. In 2012, biologists captured 159 woodrats (64 males, 95 females) across nine cliff sites. Although this figure is a 14.5 percent decrease from last year's number, it is still the second highest total recorded during 12 annual surveys dating back to the early 1990s. The majority of the woodrats were captured along four cliffs in the Laconia/Rabbit Hash Ridge complex that collectively yielded 93 individuals. Thirty-nine woodrats were captured at Tobacco Landing, the highest number ever recorded at a single site. These survey results provide proof that Indiana's woodrats continue to benefit from the translocation and captive-breeding programs started five years ago.



Woodrat is released from a live trap after it was processed.



Number of Allegheny woodrats captured at three main population centers in Indiana (Harrison-Crawford State Forest, Laconia/Rabbit Hash Ridge, and Bull's Point Bluff) during 12 surveys spanning more than 20 years.



An Allegheny woodrat poised on a ledge in a southern Indiana cave. (Photo by Kevin Kazacos, Purdue University.)

REPTILES AND AMPHIBIANS

A tale of two turtles

Indiana is home to 18 species and subspecies of turtles, six of which are on the state's endangered species list and one of which is offered special protection (Eastern box turtle).

The ornate box turtle and the Eastern box turtle are the state's only terrestrial turtles. This means they live on land rather than spending most of their time in the



The carapace (top of shell) of an ornate box turtle.



The carapace of two Eastern box turtles.



An Eastern box turtle from Pike County.

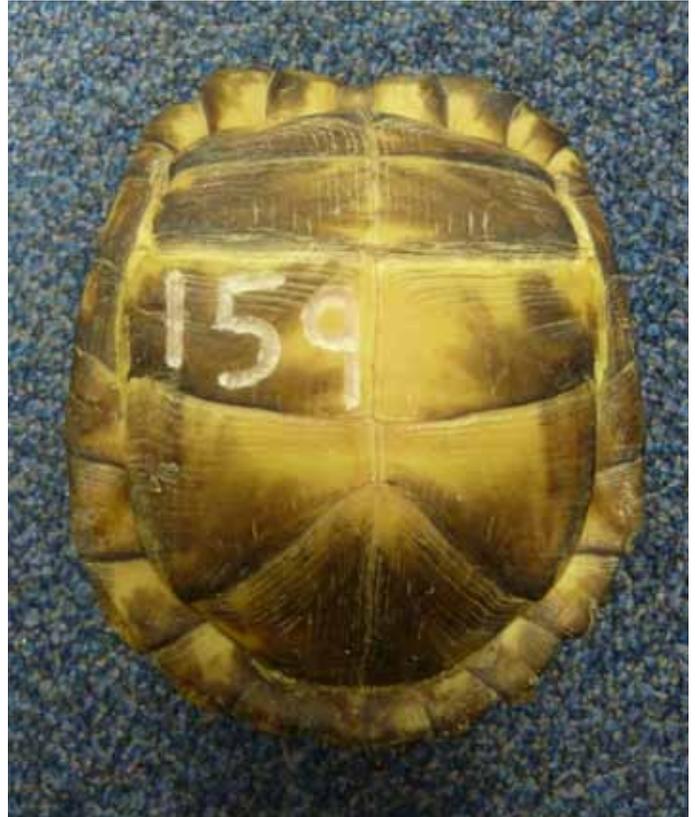
water like red-eared sliders and painted turtles. Both of these turtles have a domed shell (carapace) and have hinges on their underside (plastron) that allow them to close up inside for safety. Contrary to some cartoons that depict turtles coming out of their shells to run around, turtles cannot actually leave their shells—their spine is fused into the top of the carapace.

The ornate box turtle is a state-endangered species often confused with the larger Eastern box turtle. While Eastern box turtles can reach up to 6 inches in length, the smaller ornate box turtle only grows up to 4 inches long. The Eastern box turtle can feature some beautifully patterned shells, with varying amounts of yellows or oranges mixed with different patterns of black or brown lines, spots or blotches. Sometimes they have bright yellow or bright orange heads. The ornate box turtle has radiating yellow lines on the carapace, white or yellow streaks on the plastron, and usually has a dull-colored head.

Aside from size and coloration, these turtles can be distinguished based on habitat and geographic distribution. The Eastern box turtle is found mostly in well-drained woodlands, but also can be found in fields, pastures and marshes. While these turtles are terrestrial, they love to soak in puddles, small streams or on the edges of ponds, especially during the hottest parts of the summer. They are found throughout Indiana but are more common in the southern half. In contrast, the ornate box turtle is a sand prairie specialist, and is primarily found in the northwest portion of the state.

Both turtles are long lived—there is evidence of Eastern box turtles living up to 120 years, and the ornate may live up to 50. They both take eight to 10 years before they can reproduce, and their young have a low survival rate. An adult female turtle may lay up to 100 eggs over her lifetime, but only a few survive to reach adulthood.

All of these factors make them increasingly vulnerable



The plastron (bottom of shell) of an Eastern box turtle with the new identification number. Plastrons of Eastern box turtles can vary in color and pattern.



The plastron (bottom of shell) of an ornate box turtle. The plastrons of ornate box turtles exhibit this radiating line pattern.

to local extinction if too many adults are removed from the population or killed. Reasons for decline include habitat destruction or fragmentation, collection for pets and getting hit on the road by automobiles.

Surveys for ornate box turtles were initiated in 2010 to determine their presence in or absence from several previously known locations as well as from new locations with appropriate habitat. In spring 2012, seven properties were surveyed at various fish & wildlife areas, nature preserves and private properties with the help of specially trained dogs. Only 14 ornate box turtles were found, confirming that this species is appropriately classified as state-endangered.

Appearances may suggest that the Eastern box turtle is doing well in Indiana, based on the number of turtles seen on the road every year; however, research shows that there has been an almost 50 percent population decline in Indiana over 13 years. Similar research in other states indicates this is a national problem. In 2004, Indiana declared the Eastern box turtle a special protected species. Even though it is not an endangered species, it is illegal to possess an Eastern box turtle or any of its parts without a special permit.

In response to the growing concerns about box turtle declines across the country and how the construction of a new interstate would affect local populations, non-game biologists worked with INDOT to gain access to the right-of-way to sections 2 and 4 of Interstate 69. With the help of specially trained dogs, more than 100 Eastern box turtles were removed from the proposed interstate alignment in spring 2012. Each turtle was weighed, measured and given a unique identification number before being placed in a secure, semi-natural environment.

Based on scientific research, it was determined unsafe to return these turtles back where they came from after the construction of the interstate is completed, given the high mortality rates of turtles near large, busy roads. Instead, these turtles will be released on reclaimed mine land as part of a reintroduction program.

Due to the homing instinct of the turtles, this isn't as easy as merely releasing the turtles in the new area. To reset the turtles' site fidelity instinct, they will be kept in an enclosure in their new habitat for two years to prevent them from trying to return to their old home area. Current information indicates that a minimum of two years will be required to help them adopt a new home area.

This will be a multi-year project that will involve a lot of radio-telemetry and hard work. We anticipate that Eastern box turtle habitat will continue to be destroyed or fragmented rather than protected or restored. This translocation project could be significant in advancing our understanding of box turtle conservation, reintroductions, population augmentations, and land management, especially of reclaimed mine lands.

Green salamanders

The green salamander, with its green lichen-like mark-



A green salamander from Crawford County.

ings, slender body and rounded head, is one of Indiana's most distinct salamanders. The species has long toes that are squared off on the tip, allowing it to climb freely up and down vertical cliff faces or trees.

This salamander is better known as an Appalachian species. The bulk of its range occurs in West Virginia, Kentucky and Tennessee. It was first discovered in Indiana in 1993, when researchers were looking for Allegheny woodrat habitat. Green salamanders prefer wooded sandstone and limestone outcrops with deep crevices that are moist but not wet. These crevices serve as both protective hiding places and areas where females suspend their eggs from the overhead rock surface.

Currently, the green salamander is a state-endangered species because of its specific habitat requirements and limited distribution in Indiana—it is only known to live in Crawford and Perry counties.

After the initial 1993 discovery, no additional green salamander populations were located until 2007. Intensive surveys in fall 2010 and again in 2012 turned up six more sites (three each year) for a total of eight different sites. Signs of reproduction were noted at two of the new 2012 locations. There were three different clutches of hatchling salamanders, all being guarded by one adult each.

If you are lucky enough to see a green salamander, please observe but do not touch this beautiful yet vulnerable endangered species.

North American Amphibian Monitoring Program

Ever wonder what species of frog you hear calling on a warm spring night? Want to help frogs and toads in Indiana? If so, consider volunteering for the North American Amphibian Monitoring Program (NAAMP).

NAAMP is administered in cooperation with the United States Geological Survey. This program incorporates public volunteers to collect data on Indiana's 17 frog and toad species. The NAAMP program was started



NAAMP volunteer Julie Henricks makes sure her data recording is as accurate as possible.



NAAMP volunteer Robin Stark writes down her data after listening at one of her stops.

because of increasing concerns about global amphibian declines.

Each year, the state herpetologist recruits more than 40 volunteers to recognize the mating calls of Indiana's frogs and toads while conducting survey routes throughout the state. Volunteers must follow strict protocols for data collection and pass a frog- and toad-call identification test. Each driving survey route stops 10 times near suitable amphibian habitat. Observers listen for five minutes and record what species are present at each stop. Volunteers need to collect data a minimum of three times between February and June each year.

In 2012, 25 volunteers submitted data for 30 routes statewide. We are grateful to the volunteers for their invaluable assistance in monitoring this important group of animals. A statewide survey would not be possible without these citizen scientists.

If you are interested in becoming a NAAMP volun-

NAAMP VOLUNTEERS

The Wildlife Diversity Program thanks the volunteers who participated in NAAMP for 2012.

Volunteers that ran all 3 windows:

James Beck
 John Bednar
 Charles Boswell
 Bill Dean
 Tim Shier ®
 Jim Horton
 Taryn Hartle
 Dwayne Caldwell
 Robin Stark *
 Barbara Harcourt*
 Jack Still ®
 Darrel Joy
 Merilee Britt
 Noah Shields
 Jim Brown®
 Jason Mirtl*
 Erin Malcomb ®
 Julia Mast ®
 Julie Henricks*
 Nancy Stark
 Steve Trippel

Volunteers that ran 2 windows:

Wesley Wilson
 Angie Garcia Miller
 Jeremy Ross

Volunteer that ran 1 window:

Nicole Harmon ®

* Denotes volunteers that ran multiple routes

® Denotes new volunteers

teer, please see www.pwrc.usgs.gov/naamp, or e-mail naamp@dnr.IN.gov to learn more. If you would like to learn more about the frogs and toads of Indiana but are not interested in becoming a volunteer, see dnr.IN.gov/fishwild/3325.htm.

There are many NAAMP routes with no volunteers. Check to see if there are any vacant routes near you. The route availability map is at www.pwrc.usgs.gov/naamp.

Eastern hellbender

The Eastern hellbender is Indiana's largest salamander and can reach 2 feet or more in length. Once occurring in a handful of rivers and streams in southern Indiana, it is now only known to occur in the Blue

Rare Salamanders

Be on the lookout for these rare salamanders.

Hellbenders

- A giant aquatic salamander that can reach 2 ½ feet in length
- Found in the tributaries of the Wabash and Ohio Rivers in Southern Indiana
- Prefer cool, rocky, swiftly flowing streams
- Their presence indicates good water quality
- Feed mainly on crayfish, not fish
- They are NOT venomous
- Their slime is not poisonous
- They have no negative effects on fish populations
- Endangered in Indiana

If caught, please cut the line, release unharmed, and contact (812) 334-1137.



Mudpuppies

- A large aquatic salamander that can reach 16 inches in length
- Found throughout Indiana
- Live in lakes, ponds, rivers, and streams
- Their presence indicates good water quality
- Feed on crayfish, larval insects, and small fish
- They are NOT venomous
- Their slime is not poisonous
- They have no negative effects on fish populations
- Special concern in Indiana



This hellbender/mudpuppy page gives identification guidance and life history information about these two confusing species.

River. The hellbender prefers cool, highly oxygenated, fast-flowing rivers and streams and needs large rocks to hide under.

This state-endangered giant salamander has been the focus of long-term monitoring since 1996. During surveys, information such as weight, length, sex and location are recorded. Each hellbender is given a PIT tag (similar to the micro-chips used for pets) that enables biologists to identify that particular hellbender if it is found again. Unfortunately, the number of individuals found during the Indiana DNR annual surveys has decreased. Annual collections range from two to 49 hellbenders, with an average of 18 individuals found per year. In comparison, the annual average in 2005 was 23 individuals.

In addition to the annual surveys in the Blue River, the DNR has started surveying nearby streams that have historical occurrence records. Streams were surveyed for the presence or absence of hellbenders and habitat was assessed. Factors such as abundance of large rocks and stream flow were noted.

It is important to note that even though the hellbender exudes a slimy substance from its skin and may look menacing, it is neither poisonous nor venomous. It should also be noted that hellbenders feed primarily on crayfish, not fish, and do not affect sport fish populations. If you catch a hellbender while fishing, cut the line, leave the hook, and gently place the animal back in the water.



A common mudpuppy found during hellbender surveys.